Water For ME

Maine Water Utilities Association
ORGANIZED 1925

National Drinking Water Week

MAY 3-9, 2009

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Water For ME

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Resources

Maine Water Utilities Association - www.mwua.org, (207) 832-2263. Represents the Maine water works professional membership.

State of Maine Drinking Water Program - www.medwp.com, (207) 287-2070. State agency responsible for enforcing federal and state drinking water rules.

American Water Works Association - www.awwa.org. International scientific and educational society dedicated to the improvement of drinking water quality and supply.

U.S. Environmental Protection Agency - www.epa.gov, (800) 426-4791. Present and future federal regulations, water quality data, and source water information.

National Centers for Disease Control - www.cdc.gov, (800) 311-3435. Information on Disease Control and Prevention.

Welcome from John B. Storer

The Maine Water Utilities Association is pleased to provide this informational supplement celebrating Drinking Water Week 2009.

The great American Ben Franklin once said, "When the well is dry, we learn the worth of water." A safe, reliable water supply is critical to the success of any community. It creates jobs, attracts industry and investment, and provides for the health and welfare of citizens in ways ranging from disease prevention to fire suppression.

MWUA is a volunteer professional association that represents the water-works profession in advocating safe drinking water through education, legislation, policy, and networking. We consist of operators, engineers, scientists, biologists, managers, regulators, vendors, and material suppliers that help run, oversee, and service the public water suppliers here in Maine.

Maine's water utility profession is a large, vibrant, and dynamic business with very few other Maine businesses being able to compare to these 2008 statistics:

- $1 billion is assets
- $110 million in annual revenue
- 750,000 Mainers as customers
- 1,200 employees
- 5,000 miles of infrastructure
- 34 billion gallons of product sold annually

We provide a product essential for life, and we do it professionally and efficiently. We deliver right to your tap — every minute of every day.

Yours for safe drinking water,

John B. Storer, P.E., MWUA President

A few facts about the *Maine Water Utilities Association*

By Jeff McNelly, Executive Director

MAINE WATER UTILITIES ASSOCIATION

In 1925 Frederick C. Thayer, then president of the Kennebec Water District, sent a letter to the water districts of Maine. His letter stated: "Gentlemen: ….it must be perfectly obvious that an organization of our State Water Districts would not only enure to their advantage but would also reflect to the communities which they serve."

His invitation to attend an organizational meeting was accepted by 28 men who attended that first gathering, held on October 6 in Waterville. A constitution was adopted and the Maine Water Utilities Association was founded.

David E. Moulton, then attorney of the Portland Water District, was elected president and served continuously in that office for 25 years. He was characterized as "Counselor and Friend to the Waterworks Fraternity."

Other founding officers included James Bryne of Damariscotta, Horace Cook of Auburn, Walter Mayo of Dover-Foxcroft, and Walter Abbott of Bath.

It was decided that round-table and heart-to-heart discussions should be important aspects of each meeting of the organization. An agenda from 1926 stated: "Bring your problems and let's talk them over."

Since its inception, the Association has been active in all phases of water utility operation. Committees have studied and reported on all phases of waterworks operations, from accounting to the customers' faucets. The Association's mission is to represent its professional membership in advocating safe drinking water through education, legislation, policy, and networking.

A seven-person board of directors, elected to three-year terms by the members, administers the corporation's affairs. Early committees included the Committee on Cost of Fire Protection (1936), the Committee on Cross Connections in House Plumbing (1938), the Committee on Grounding Telephone Cable Sheaths to Water Mains (1939), and the Committee on State Defense (1940).

Today's committees are Education and Operations, Legislative and Regulatory Affairs, Nominating, Program, Water Resources and Public Awareness.

Membership meetings are held bimonthly, rotating statewide. The Association recently celebrated its 500th membership meeting, held on December 4, 2008 in Alfred.

A bimonthly newsletter keeps members informed of Association activities, legislative and regulatory events impacting the profession, and other happenings.

The Journal of the Maine Water Utilities Association, which records the proceedings of meetings and also includes technical and processional articles of interest to the water-supply profession, has become the voice and history of the Association. A review of historical Journals reflects the times and events of not only the waterworks profession, but the state and nation as well.

To learn more, visit www.MWUA.org.

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If you'd like to appear in next year's MWUA Water For ME supplement, contact Linda Hayes at 990-8136.
If you'd like to run a targeted Special Section for your business or organization (locally, regionally, or statewide), contact Paul Herrick at 990-8295.

MAINE'S LONG HISTORY OF WATER SUPPLY

By Jeff McNelly
EXECUTIVE DIRECTOR, MAINE WATER UTILITIES ASSOCIATION

Many early settlers in Maine utilized local springs for their water supplies. Innovative means were often used to convey water to local residences. In many situations, they constructed piping systems by connecting hollowed-out logs to allow water to flow through them.

Over time, as the population centers grew, people extended the piping systems further from the water sources, using more modern materials. In many of the larger communities, the springs proved to be inadequate, so people put rivers and streams capable of supplying larger volumes of water into service.

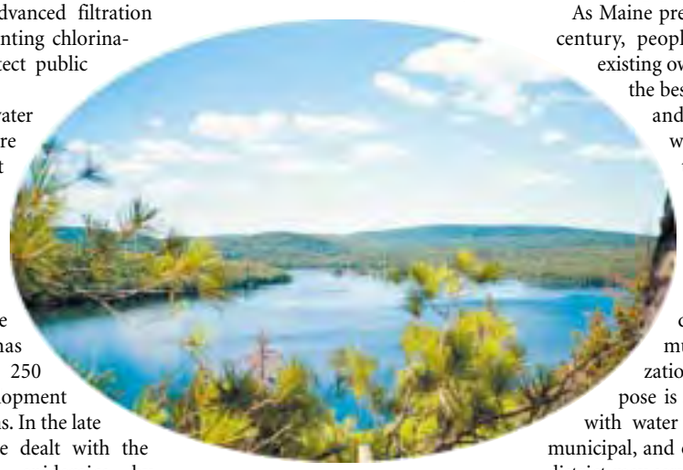
Unfortunately, many of these new sources were also used to dispose of domestic and industrial wastes. The Kennebec and Penobscot Rivers, Messalonskee Stream, and other water supplies were found to be the cause of epidemics of typhoid fever, a dreaded disease that plagued many communities.

In the 1850s, British scientist John Snow discovered the public-health connection between cholera and water contaminated by sewage. He had also learned that chlorine could be applied to purify the water. By the end of the 1800s, many communities across America were constructing more advanced filtration systems and implementing chlorination in order to protect public health.

In Maine, some water systems adopted more advanced treatment processes. Many communities, however, adopted a different approach.

Over the last 150 or more years, the Maine Legislature has enacted more than 250 charters for the development of public water systems. In the late 1800s, the Legislature dealt with the waterborne disease epidemics by amending or adopting charters that designated protected high-quality lakes, ponds, and groundwater resources that existing and developing water systems could use as supply sources. Over time, the contaminated rivers and steams were abandoned.

The form of water-system ownership 100 to 150 years ago was markedly different than it is today. Some systems were municipal, but many were originally private ventures. Some of Maine's population centers had numerous private companies, operating in various sections of town. In some of the mill towns, the water systems were expansions of the mill's system, made upon the requests of neighbors who saw the value of being connected to a reliable source and piping system.



As Maine prepared to enter the 20th century, people recognized that the existing ownership system was not the best model to ensure a safe and adequate supply of water on a long-term sustainable basis. In 1899, the Legislature established the nation's first water district when it created the Kennebec Water District. A water district is a quasi-municipal public organization whose primary purpose is supplying communities with water for domestic, sanitary, municipal, and other purposes. A water district may serve one or more communities.

While there are still privately owned water systems in the state, today the majority of systems are operated as water districts. Many private systems, and even some municipal operations, now function as water districts.

Over the past 20 years, Maine has constructed a number of water-treatment facilities to bring systems into compliance with new drinking-water regulations. Many of the components of Maine's water system are 50-100 years old; as a result, in recent years, we have replaced piping systems, storage tanks, and other structures — collectively known as infrastructure.

Water systems take advantage of a variety of funding sources, including low-interest loans. In certain situations, grants may be used for a portion of the cost the systems must bear. Even with attractive financing, the need to construct new facilities and replace aging components has resulted in systems having to raise water rates with increasing frequency.

Maintaining and replacing this infrastructure in a time of rapidly escalating costs is a significant challenge. Reliability of service cannot be maintained without making the necessary improvements. However, it is not expected to get any easier as time goes on.

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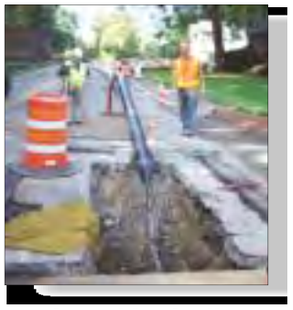

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Drinking-water protection in Maine: IT'S A LOCAL THING

By Paul Thomas Hunt, Environmental Mgr.
PORTLAND WATER DISTRICT

We view food and water differently. We wash our vegetables before we eat them. We are careful to cook meat completely to avoid illness. But we don't think twice about drinking water — we just fill a glass and drink. Why are we so sure it is safe to drink? What do water utilities do that gives us such confidence?

The answer: many things. A similar example is automobile safety. You have confidence that your car is safe because cars are made by reputable companies, are designed according to carefully engineered specifications, have built-in safety features, are routinely inspected, and have built-in alarms that alert us to potential problems. For a car to be systematically unsafe, many things would have to go wrong. Since this is unlikely, we're confident they're safe.

The same is true of drinking water. Water systems protect you with multiple barriers including protecting the source, providing proper disinfection and treatment, cleaning and maintaining the pipes and tanks that convey and store the water after treatment, and monitoring water quality throughout the process. For water to be unsafe, several of these barriers would have to fail — a very unusual event.

Source protection is the most important of these barriers. If pollutants never get into a lake, river, or groundwater source, then people won't consume them, even if other barriers fail. But if you're using a polluted source, you'd better be sure all the other barriers work perfectly or someone could get sick.

Few Statewide Protection Laws

The good news is that Maine is a largely rural state. Since human activity is usually what leads to pollution, most Maine lakes, rivers, and groundwater is clean and, with minimal treatment, safe to drink. The bad news is that, unlike many other states, Maine has few statewide laws that specifically protect our drinking-water sources.

There are many state environmental laws, such as shoreland zoning, that protect all water bodies, which is very helpful. And private and special laws, passed by the legislature to protect specific water bodies, protect some drinking water-sources; but those laws are not equally protective. For example, no bodily contact is allowed on Lake Auburn at all, but only a two-mile no-bodily-contact zone protects the Sebago Lake water supply. And such special laws do not protect most drinking-water sources in Maine at all.

Beyond state environmental laws that apply to any water body, and certain laws that protect a few water-supply lakes, each Maine drinking-water source is only protected by whatever local land-use ordinances are passed by the municipalities that make up the watershed. These ordinances often protect water indirectly by specifying how an individual development project must be designed and operated, including things like chemical- or fuel-storage restrictions, or limits on soil disturbance. These measures will indirectly protect nearby water bodies.

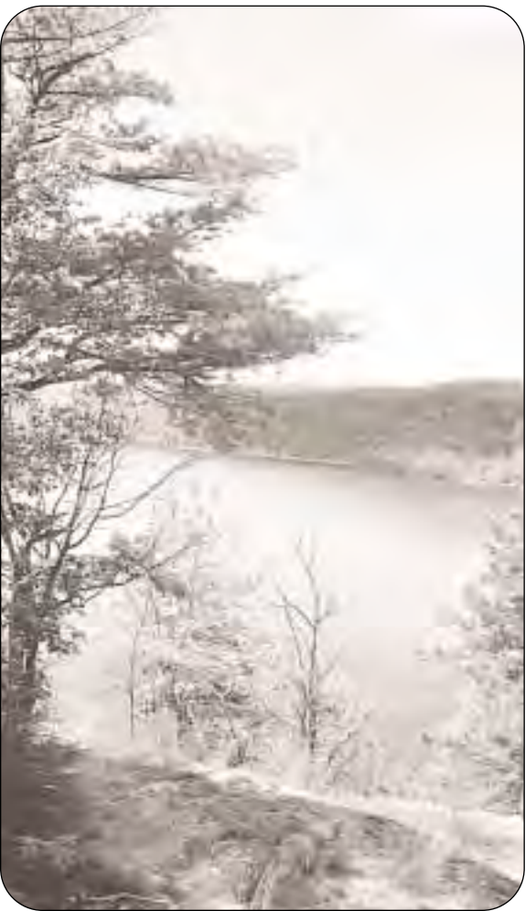
Different towns have different ordinances, and some are better than others, but a lake or river is only as safe as the weakest set of ordinances in the watershed. You might live in a town with very strong ordinances, but be next to a town with weaker ones. The degree to which any ordinance is able to protect is a function of the energy and ability of the local municipal officials, and this system works better in some towns than in others.

What the Future Holds

Despite the variable protections, Maine's sparse population is probably the biggest reason that it's rare to hear about waterborne disease or water-supply contamination. But as that population grows, the challenge of protecting our drinking-water sources will grow with it. Evidence from more-crowded states suggests that, eventually, the town-by-town system we rely on will become inadequate, and statewide laws to protect whole watersheds and wellhead-protection areas will be needed.

But how will we know when it's time to strengthen the protection of Maine's water supplies? Every few years, legislators and other state policymakers consider this question (as in 1980, 1989, 1995, 2000, and 2005-7). These periodic studies have added some recent protections and have tended to focus on regulating specific activities, but have always fallen short of comprehensive public water-supply protection. The Maine Water Utilities Association recommends improving protection now, before a major contamination renders the subject no longer debatable. The consequences of waiting can be tragic, especially if your family is drinking contaminated water. An ounce of prevention is truly worth a pound of cure.

Protecting our water quality is easy and vital



By Jane Carroll
AUGUSTA WATER DISTRICT

The most effective way to protect water quality is to teach better, less-hazardous ways to perform tasks we have been doing the same way for years.

As we add to our population, we must cut down trees and construct buildings and parking lots to accommodate our increasing numbers, and in so doing we stress Mother Nature. Water is one of the hardest-hit resources. Because of the impervious surfaces caused by building and paving, we are increasing the amount of runoff into various bodies of water. This runoff carries oil, gas, salt, sediment, metals, fertilizers, insect killers, and other types of hazards and poisons that degrade water quality and kills aquatic life.

Green spaces like wooded areas and lawns allow water to filter slowly back into the ground, going through a little natural water treatment along the way. At least, that is the way it is supposed to work. Unfortunately, we must have weedless, insect-free, green, and plush lawns. In order to achieve these results we use fertilizers, pesticides, herbicides and any other "cides" that might give us the coveted Lawn and Garden Award. All these tasty little hazards are being swept into our lakes, streams, rivers and oceans, polluting as they go.

So how do we protect our water quality without becoming chemists or living in yurts? Surprisingly, it is not that hard. For instance, if you would like to keep those pesky ants from marching into your home, sprinkle talcum powder or diatomaceous earth around your foundation. Ants will not walk through these substances; it gets their shoes dirty. Problem solved without contaminating one drop of water. If you want to clean a dirty drain, dump one cup of baking soda into the drain, add one cup of vinegar, and let it bubble and foam for 10 minutes. Then wash it down the drain with hot water, and you have a clean drain with no hazardous chemicals. How about one of the easiest water-quality protectors of all: Pick up the mess after Fido poos in the park, or anywhere else for that matter.

With the wonders of the Internet we can search such things as "integrated pest management," "natural pest control methods," and "environmentally friendly pest control methods" to find better ways to get our desired results. We can also use permeable-paving techniques for driveways and walkways. Porous asphalt and open-jointed bricks or blocks allow water to pass through into the ground instead of running along impermeable surfaces, gathering environmentally unfriendly material along the way, until it finds an outlet — or inlet, as the case may be.

For now, Earth is home. We all need to do our parts, no matter how small or how large we choose to make those parts, to help protect our natural resources. Even a small step, such as checking your car for leaks, is a step in the right direction.

Over 100 years of chlorine keeping our drinking water safe

September 26, 2008, marked the 100th anniversary of chlorine disinfection in the United States. Jersey City, New Jersey, was the first city in the country to begin routine disinfection of its drinking water. The American Water Works Association (AWWA) used the occasion to remind Americans of the importance of having safe, clean drinking water.

AWWA Executive Director Gary Zimmerman noted that the Centers for Disease Control estimates indicate that the average lifespan in America has increased more than 30 years since 1900, and the dramatic reduction in waterborne disease has contributed to this trend. He added that water providers across the country continue to add safe levels of chlorine to inactivate potentially harmful organisms and to keep water safe all the way to the tap.

Reprinted from On Tap, a free quarterly magazine published by the National Environmental Services Center. To learn more about services offered by the NESC, visit www.nesc.wvu.edu or call toll free 800-624-8301.

Education, licensing key to 'the silent service'

Alan J. Frasier, PE, General Manager
BRUNSWICK & TOPSHAM WATER DISTRICT

We give tours to many groups, from Cub Scouts to senior citizens. "Where does my water come from?" is the usual theme. The short answer is that the water comes from wells and is pumped to homes and businesses through underground piping systems, but there is far more to it than that.

People take it for granted that the water will be there when they open the faucet, 24/7 and 365 days every year, and they trust that it will be safe to drink. Some people in the industry refer to water utilities as "the silent service"; unless their service is disrupted or their water appears dirty, who stops to think about how they get their water?

Our system serves Brunswick and Topsham. By Maine standards we are large, in the top 10 in number of people served. We have three treatment plants, multiple wells, and two storage tanks that hold about 7.5 million gallons of water. We deliver water to our customers through a network of pipes of various sizes and materials. There are about 110 miles of pipe, 6,800 service connections, over 800 hydrants, and hundreds of valves. That is a significant infrastructure to operate and maintain.

Maintaining such a wide range of components requires people with a variety of skills and jobs. Customers know there's a billing department, and occasionally the meter reader comes by. There are people responsible for running the pumping equipment and treatment systems that ensure the water is properly treated and disinfected. Maintenance and repair crews do the most visible work. An operations manager usually keeps all of this organized, and support personnel such as financial, engineering, and management staff are needed.

Distribution-system operators must know about construction, chemistry, microbiology, physics, and hydraulics. Treatment-system operators must have specialized knowledge of hydraulics, physics, water chemistry, and microbiology, and have mechanical abilities and skills in electronics, computer systems, and computer applications.

In 1986, Congress passed the Safe Drinking Water Amendments that set a far-ranging set of rules that, among other requirements, limit contaminants in water. In response to this, more and more complex technologies have been developed to remove contaminants. Along with treatment technologies, there has been a corresponding increase in the complexity of monitoring and control systems.

Whether large or small, any system must provide the same level of reliability and ensure the water is safe to drink and meets all quality standards. Safe drinking water is absolutely essential for public health. Given the magnitude of this responsibility, the Environmental Protection Agency and the state require that water-system operators be licensed. Only licensed people may operate any part of a water system in a way that would affect the quality or quantity of water available to a customer.

Licensure programs have been in place in most states for decades. Maine was one of the first states to require licensing for water system operators. Legislation was passed in 1969 to establish a licensing program, standards, and certification requirements.

In 1998, the EPA adopted national regulations that set minimum standards for licensing programs. In Maine, that responsibility falls to the Board of Licensure for Water System Operators, which works closely with the Drinking Water Program (part of the Maine Center for Disease Control, Department of Health and Human Services), to ensure that licensing requirements for water systems and operators are met.

The Board has promulgated rules that set the criteria for operator licensure and water-system classification. Systems are classified according to complexity and size, and rules require that a water system be operated under the supervision of an operator with the same level of licensure. There are four classes of systems (and operators), with class four being the most complex. Within each class there are separate divisions for treatment-system operators and distribution-system operators.

A high school diploma or equivalent is required for licensing. Licensure requires a combination of education and experience to qualify for taking an exam that demonstrates a level of competency. Then candidates must gain experience working at a water utility or related field. After meeting one to two years of experience requirements (depending on the level of licensure sought), candidates are eligible to take a written examination. There is also an "Operator in Training" designation available for people who pass the examination but have not yet met the experience requirements.

There are few programs available at community or technical colleges that are tailored to provide operator training, but coursework in related disciplines could be applied toward the education and experience requirements. Other coursework to develop writing, reading, math, and communication skills is beneficial.

To fill the gap in education opportunities, various professional associations such as American Water Works Association, New England Water Works Association, and Maine Water Utilities Association provide formal training opportunities to water-system employees. In addition, many utilities provide in-house training for operators. These organizations also have scholarships available for students at post-secondary schools who are interested in pursuing careers in the industry.

Consumers have a level of trust that their drinking water is safe. Indeed, we routinely open the tap and drink water every day while only rarely considering whether it is "safe" or not. The professional operator is responsible for ensuring that the water is always indeed safe, and works diligently to ensure that that trust is not broken or lost.

MWUA awards scholarships to UMaine students

At its 83rd annual trade show in Portland, the MWUA has awarded two $1,000 scholarships to UMaine students. It was the first year the scholarships were offered.

One scholarship went to Corinth native Jacob Spinney, a UMaine junior who worked a summer internship at the Bangor Water District.

The other went to Keith Levasseur of Belgrade, a UMaine senior who worked a summer internship at Wright-Pierce Engineers of Topsham and the Brunswick-Topsham Water District.

"This is the first year we have had the privilege of awarding these scholarships," said Jeff McNelly, MWUA executive director, in a press release. "The Association's Public Awareness Committee undertook the challenge of developing this scholarship program and we were very pleased that we were able to raise enough funds to be able to award two scholarships this first year. We fully intend to make this an annual tradition for the association going forward."

The Maine Water Utilities Association is a membership organization with many utility volunteers working together to promote and ensure the delivery of quality water and service to some 750,000 Maine customers. For more information, visit www.MWUA.org or call (207) 832-2263.

PHOTOS BY CAITLYN ROBITAILLE

Keith Levasseur (center of left photo) and Jacob Spinney (center of right photo) each receive $1,000 scholarships from Mary Jane Dillingham and John Storer of the MWUA.

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The role of state and federal regulations in providing SAFE DRINKING WATER

Roger L. Crouse, P. E., Director
MAINE DRINKING WATER PROGRAM, MAINE CDC

Drinking-water regulations establish standards for safer drinking water to protect public health. In Maine, the Maine Center for Disease Control and Prevention's Drinking Water Program enforces state and federal drinking water regulations. These regulations require all public water systems to meet safety standards for drinking water quality. These standards are the same for every public water system, no matter how many people they serve.

Flood's Pond

In the early 1900s, cholera outbreaks and other waterborne diseases were common. In the 1920s, the U.S. Public Health Service began to establish water-quality standards. Adoption and enforcement of these standards was left to the discretion of individual states.

In 1974, Congress passed the Safe Drinking Water Act and charged the Environmental Protection Agency with its administration and enforcement. The SDWA established enforceable national standards for safe drinking water, and was amended in 1986 and 1996 to include additional public-health protections.

In the late 1970s, Maine's Drinking Water Program received primacy authority from the EPA to act on behalf of the federal government in the enforcement of the SDWA in Maine. In return, the EPA provides some funding and resources to the state to administer the Act.

The Maine CDC Drinking Water Program is both a regulatory program and a technical-assistance provider. With a staff of 32, the program regulates and assists approximately 2,100 public water systems that range in size from the largest municipal water districts to restaurants, mobile home parks, and schools. The staff is committed to protecting public health by helping water systems provide safe drinking water.

Some of the areas covered by regulations include:

Source-water protection: The protection of the land where water flows to a water-system well or intake is the first barrier to protect public health. Generally, keeping the water from becoming polluted is much less expensive than installing complex treatment systems to remove contaminants later. Water systems work with local governments, land trusts, and neighboring landowners to help protect their water quality and availability.

Monitoring for microbiological and chemical contaminants: The SDWA has established maximum levels for 86 contaminants. Water systems monitor for these contaminants on a regular schedule, and report the results to the Drinking Water Program. Water quality that exceeds any of these standards requires treatment, replacement, or blending with other sources to reduce the contaminant.

Monitoring of distribution-system water quality: Water supplied by many public water systems is

See REGULATIONS, Page 9

Internships inspire career paths

Mary E. Bowers, Superintendent
GREAT SALT BAY SANITARY DISTRICT

Sooner or later, most of us have to decide what we want to be when we grow up. Some of us know our career paths right away, perhaps even by grade school. Some stumble into it backwards, taking almost a lifetime to learn mostly what we don't want to do before we finally decide to take control of our destinies. Wouldn't it be great if those in the "undecided" category could first try on a job just as you would try on shoes or test-drive a car? Internships are the answer.

PHOTO BY MARY BOWERS

Sabryna, a 12-year-old intern at Great Salt Bay Sanitary District, performs a laboratory test. Internships at water utilities across Maine have resulted in career choices for many young people.

Sabryna was 12 when she began working last year at Great Salt Bay Sanitary District, which serves the drinking-water needs of Damariscotta and Newcastle and provides wastewater treatment to Damariscotta, Newcastle, and Nobleboro. Sabryna came here through the school's Community Mentoring Program, which gives students purpose and meaning as they see what it's like to work in the community while still attending classes. Sabryna was bright and eager to learn, and her computer skills were a great help. She analyzed water samples for pH, chlorine, and bacteria, and checked pumping stations. When asked what she had learned, she said, "I found out what the real world is about."

Kirsten Ness is a Water Resources Specialist position at the Portland Water District. With a keen interest in ecology in high school, she volunteered with the Auburn Water District, the drinking-water supplier for Auburn and Lewiston. Over seven summers, her job became an internship, and her responsibilities increased. She catalogued urban and rural development in the Lake Auburn watershed, analyzed its water-quality parameters, inspected it for invasive plant species, learned laboratory-testing techniques, and tested the raw and finished water processes. She also coordinated divers placing benthic barriers, which prevent and control the spread of invasive plant species such as Milfoil.

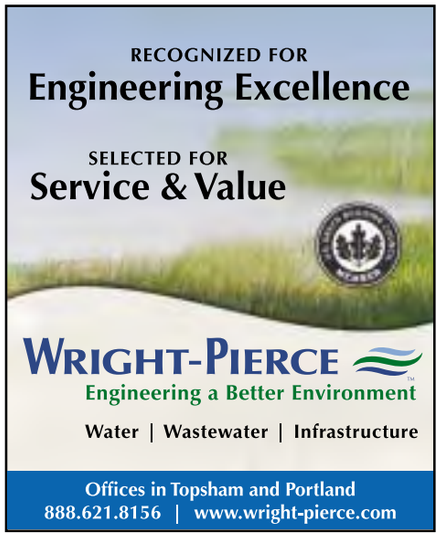
The work she did further sparked Kirsten's ecological interests, especially in the public-health issues of protecting drinking-water sources. She went on to take related courses in ecology and biology at Colby College and earned a degree with a concentration on environmental science. Her graduate thesis was "The Effect of Shoreline Development on Lakes."

"You never know where the experience of doing an internship will take you," Kirsten said. "You gain experience, confidence, and the networking opportunities are vast." She is quick to credit one of her mentors at the District, Mary Jane Dillingham, who knew when to keep challenging Kirsten with additional responsibilities.

Brian Thompson was in college when he took a summer job working with the Caribou Utility District, a drinking-water and wastewater-treatment facility. Brian said that, as a college student, he had developed a certain laid-back approach to the day, often sleeping in late, but this summer position required that his workday begin at 6:30 a.m. He said his coworkers, while supportive, were also very adamant that the rules were important.

Brian said his co-workers treated him not just as a laborer but as one of the team. He attended professional development and safety training sessions with

See INTERNSHIPS, Page 9



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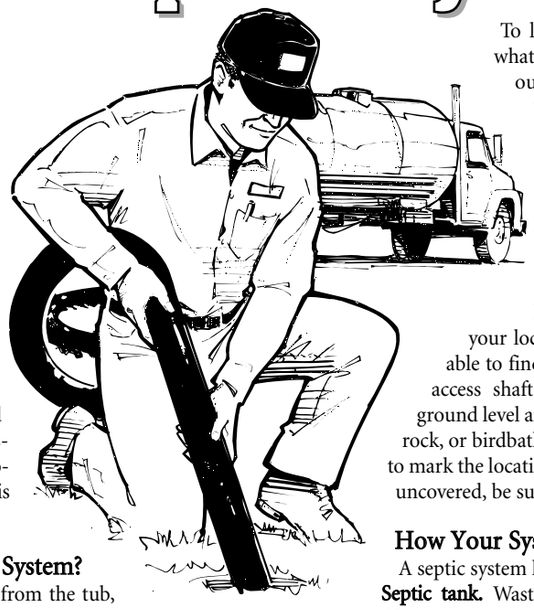


If you're a suburban or rural resident, you probably depend on a septic system to treat and dispose of your household wastewater. A septic system's purpose is to treat liquid wastes from your house in order to prevent contamination of your well and nearby lakes and streams.

A suitably located, properly designed, carefully installed, and adequately maintained waste-disposal system will be effective, economical, and safe. Maintenance is the key to a lasting septic system.

Why Maintain Your Septic System?

Household wastewater comes from the tub, shower, wash bowl, toilet, kitchen sink, clothes washer, and dishwasher. It carries chemicals, solids, grease, dirt, and bacteria and viruses that can cause disease. A good septic system treats and disposes of this wastewater; a failing septic system cannot, so pollution of wells, streams, and lakes can result. Even properly designed and operated septic systems may fail unless the sludge and scum are periodically pumped out and damaging materials are kept out. Routine maintenance and a little common sense can protect your investment and insure against the high cost of premature failure.

Pumping Out Your Septic Tank

Generally, septic tanks should be cleaned every three to five years, depending on the tank size and the amount and quality of solids entering the tank. As a rule of thumb, the clean-out interval is determined on the basis of 100 gallons per person per year. For example, a 1,000-gallon tank used by two people should be cleaned after five years [1,000 gallons / (100 gallons per year times two people)]. Note that using a garbage disposal increases solids loading by about 50 percent.

Checking sludge and scum build-up is an unpleasant task. To make maintenance easy, simply have the tank pumped regularly by a commercial tank-cleaning service.

Finding Your Septic System

The tank needs to be accessible for pumping, and the drainfield should be protected. Locating your system is not always easy, especially if the tank's access hole is buried under your lawn.

To locate your system, determine what direction the sewer pipe goes out through your basement wall. Trace the tank back from the drainfield by checking the yard for an area where the grass doesn't grow or grows very well, or for slightly depressed or mounded areas. Probe likely sites with a thin metal rod.

If you cannot find the tank, your local septic-tank pumper will be able to find it. You may want to have the access shaft extended up to just below ground level and marked clearly with a stake, rock, or birdbath. Do not plant a shrub or tree to mark the location. When your septic system is uncovered, be sure to draw a map.

How Your System Works

A septic system has two basic working parts:

Septic tank. Wastewater flows from the house into the tank. Heavy solids settle and are partially decomposed by bacteria to form sludge. Light solids and grease float to the top and form a scum layer.

Soil absorption field. Partially treated wastewater is discharged from the tank through perforated pipes into an absorption field, where the water is further purified by filtration and decomposition by microorganisms in the soil. This is the last line of defense to prevent polluted water from entering lakes, streams and groundwater.

Keep a Maintenance Record

Keeping a record of your septic-system maintenance will help you anticipate the next needed cleaning. Record the name and contact information of your septic-system installer and pumper, as well as the size of your tank in gallons. Also record the dates work is done, a description of the work, who did the work, and what it cost.

Make a rough sketch of your yard, indicating the locations of your septic tank and disposal field. Include reference points such as the house, driveway, trees, water bodies, etc. Measure and record distances from your house to the cover of your septic tank and to the corner of your disposal field.

Keep this information on file as a permanent record for use in maintenance and to pass on to subsequent owners.

Excerpted and adapted from "Maintaining Your Septic System," bulletin #7080 (Orono: University of Maine Cooperative Extension, 2002), http://extension.umaine.edu.

Maintenance Tips for Your Septic System

Evaluate Your Septic Practices

Homeowners have tremendous impacts on the efficiency of their septic systems. Evaluate your maintenance practices based on the suggestions below.

Safe Disposal

• Don't put substances such as motor oil, gasoline, paints, thinners, and pesticides in drains. They can pollute the groundwater and are toxic to the microorganisms that maintain an active system.

• Moderate use of household cleaners, disinfectants, detergents, or bleaches will do little harm to the system, but where there is a high density of septic systems, there may be a cumulative impact on groundwater from household cleaners.

• Fats, grease, coffee grounds, paper towels, sanitary napkins, disposable diapers, etc., will clog your septic system.

Protect the Absorption Field

• Keep automobiles and heavy equipment off the absorption field.

• Grass cover and shallow-rooted plants are beneficial over an absorption field, but the deep roots of trees and shrubs stress and may plug nearby drain tiles.

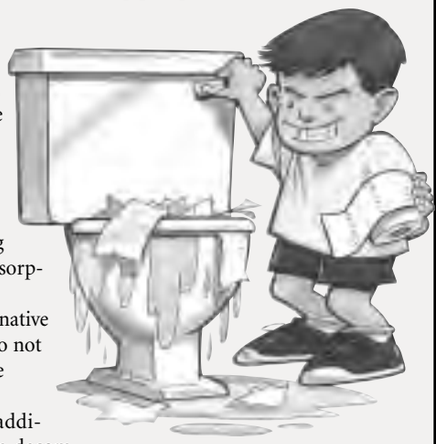
• Grass on an absorption field's surface should be mowed regularly to promote evaporation and transpiration.

Conserve Water

• Consider your septic system's capacity when installing new appliances or plumbing.

• Limit wastewater. Use water-saving fixtures. Repair toilet float valves and leaking and dripping faucets. Spread clothes washing over the entire week. Do not connect rooftop drains, a basement sump pump, or footing drains to the septic tank.

Avoid Tank Additives



• Yeasts, bacteria, enzymes, or chemicals are sold with the claim that they help systems work better. But there is no scientific evidence that they're effective, and some cleaners can suspend and clog the drainage lines and soil-absorption field.

• Additives are not an alternative to proper maintenance and do not eliminate the need for routine pumping.

• Commercial biological additives are not needed to begin decomposition after pumping because the sludge residue contains active microorganisms.

TRUE OR FALSE:

How much do you know about water?

1. Most of the time, the water from fire hydrants and home faucets goes through the same system of water mains, pumps, and storage tanks.
2. Firefighters need water to come out of hydrants at a high pressure.
3. Water pipes that run underground last forever and don't need to be replaced.
4. Many water utilities in North America add fluoride to their water to prevent tooth decay.
5. A well-maintained water delivery system has fewer leaks.
6. Community water providers do not need to meet strict federal and state water quality standards.
7. The infrastructure of the water system includes the people who use the water, like families, businesses, and firefighters.
8. Most businesses do not succeed without a safe and reliable water supply.
9. Most tap water in the United States and Canada is not safe to drink.
10. Most of the water pipes that run underground were built in the last ten years.
11. A break in a water main will never affect fire hydrants.

ANSWERS:

1. True.
2. True.
3. False. The infrastructure of the water system, such as pipes and pumps, wear out and need to be repaired or replaced over time.
4. True.
5. True.
6. False. In the United States, water utilities must meet close to 100 national rules for water quality, and there are additional rules in many states. Canadian provinces have similar rules.
7. False. The water system infrastructure means the "pieces" of the water delivery system: the pipes, pumps, tanks, and water mains that deliver water safely to our faucets.
8. True.
9. False. Tap water in North America is among the safest in the world. Our high standards for water quality prevent waterborne diseases that afflict people in many developing countries.
10. False. Many of the water mains and pipes in North America are more than 50 years old, and sometimes more than 100 years old.
11. False. A water main break could reduce the pressure of water coming out of a fire hydrant, which makes it harder for a firefighter to put out a fire.

Water Facts

- We drink a lot of water. Americans drink more than one billion glasses of tap water per day.
- We use a lot more water than we drink. On average, each American uses about 50 gallons of water a day in his home.
- Much of that can come from showering. A five-minute shower uses 25 to 50 gallons of water. Keep your showers short.
- Doing the dishes uses plenty of water, too. A dishwasher uses nine to 12 gallons of water per load. Washing dishes by hand uses up to 20 gallons.
- And we use a lot of it outside. On average, we use about 50-70 percent of our household water for gardenings and watering lawns.
- But it doesn't cost much. The average cost of water to a home in the U.S. is about $2.00 per 1,000 gallons, or about a penny for five gallons.
- Most toilets bought before 1980 use five to seven gallons of water per flush. Toilets bought from 1980 to 1993 use 3.5 gallons per flush. Newer toilets use 1.6 gallons. Don't use the toilet for flushing trash; stick to the garbage can.
- Fix that drip! A leaky faucet can waste 100 gallons of water every day.
- A leaky toilet can waste another 50 gallons per day.
- Turn off the tap if you don't need it. Running the faucet even for a minute while you brush your teeth, shave, or clean fruits and vegetables can waste about five gallons of water.
- Watch out for the washing machine. If you don't have a water-efficient model, an older washing machine can waste 30 to 50 gallons of water per load, especially if you're only washing a few items. When you do laundry make sure it's a full load.
- You can easily waste water by leaving it running while you're brushing your teeth, shaving, or washing fruits and vegetables. Only run the water when you need it.

How Healthy is Your Lake?

VLMP's 2008 Maine Lakes Report Now Available

Has your favorite Maine lake had a check-up recently? Is it routinely monitored for changes in water quality, and for the presence of invasive species? How is its current health? How vulnerable is it to existing threats? If you don't know the answers to these questions, you may want to contact the Maine Volunteer Lake Monitoring Program to request a copy of its 2008 Maine Lakes Report.

This annual report provides the most comprehensive documentation available on the current health of Maine lakes, and highlights the efforts of hundreds of volunteer lake monitors throughout Maine who collect scientific data on more than 400 water bodies. In addition to extensive background information on lake and watershed ecology, the report provides individual data summaries for lakes throughout the State of Maine.

In 2008, VLMP Certified Volunteer Lake Monitors collected data on 503,509 acres of Maine lakes, 42 percent of the lake surface area in Maine. The VLMP trains and certifies volunteers to collect lake-water-quality data, and to screen lakes and ponds for aquatic invaders like variable milfoil and zebra mussels.

The report, produced with the Maine Department of Environmental Protection, documents that in 2008 about equal numbers of Maine lakes and ponds were either clearer or less clear than they had been, with about 12 percent of them unchanged. Overall, however, the data show a reduction in clarity from 2007 to 2008; 2007 was one of the clearest years for Maine lakes in three decades. The 2008 downturn was likely due to extreme rain last summer throughout much of Maine. Rain leads to storm water runoff, which sweeps up soil particles and nutrients from lake watersheds and carries them into the water, resulting in an increase in the growth of algae and reduced water clarity.

The report also states that in 2008, VLMP volunteers also surveyed 136 individual bodies of water for invasive aquatic species. Of the 256 screening surveys that were conducted throughout Maine in 2008, 230 (about 90 percent) were conducted and reported by VLMP Certified Invasive Plant Patrollers. The VLMP Center for Invasive Aquatic Plants trains 225 to 300 plant patrollers annually and has trained nearly 2000 individuals since the first Invasive Plant Patrol workshop was offered in 2001.

VLMP staff identified 104 suspicious plant specimens in 2008, through a service that is provided at no cost to plant patrollers and the general public. Most of the suspicious plants were identified as harmless native "look-alike" plants (plants that share one or more common characteristics with their invasive counterparts).

The Maine Volunteer Lake Monitoring Program, formed in 1971 is the longest-standing, and one of the largest citizen lake monitoring programs in the U.S. The VLMP is the largest provider of lake data in the State of Maine. The nonprofit organization provides training, equipment and technical support to volunteers throughout Maine at no cost.

The 2008 Maine Lakes Report can be viewed online at the VLMP website: www.mainevolunteerlakemonitors.org. Check out the report, and while you are there, learn how you can get involved!

Regulations

Continued from Page 6

distributed through miles of buried piping. Public water systems must monitor water quality in the distribution system to assure that contamination has not occurred.

Customer notification: When a public water system exceeds a maximum contaminant level, fails to maintain proper treatment, or fails to monitor or report as required, the system's officials must alert their customers of the problem, violation, or deficiency, and how the problem will be addressed.

Inspection of public water systems: The Drinking Water Program provides routine inspections of public water systems to verify that the source of water is adequately protected, the treatment system is installed and operating properly, and the distribution network of pipes and tanks are maintained and monitored.

Since the 1996 amendments to the SDWA, Congress has provided a financing program for water systems to pay for capital improvements. The Maine CDC Drinking Water Program administers the Drinking Water State Revolving Fund; since its 1997 launch, the program has funded more than $100 million in water-system improvements in Maine, with an investment of only $16 million of state funds.

For more information about drinking-water regulations, visit the Maine CDC Drinking Water Program Web site at www.medwp.com EPA Web site at www.epa.gov/ogwdw.

Internships

Continued from Page 7

the work crews and did lab work and maintenance at the facility. He returned for a second summer; he was newly married, he and his wife were in college, things were tight, and then they discovered they were expecting a baby. Imagine his surprise when his co-workers threw a baby shower for the couple! Brian said the crew continues to keep track of him and his family.

Brian is now a supervisor at the Defense Finance Accounting Service at the Loring Commerce Center. Looking back, he says he appreciates the life lesson of self-discipline and work ethic the workers at Caribou taught him. "Thanks to them … I have developed the habit of getting up early and being first on the job," he said.

At the Bangor Water District, Jacob Spinney, a sophomore political-science major at UMaine, has worked summers in the District's hydrant-flushing program. Jacob says these types of positions are a good way to learn job skills.

Andy Begin, engineer and State Revolving Loan Fund Coordinator at the Maine Drinking Water Program, worked as an intern with Wes Haskell at the Old Town Water District while attending UMaine. After graduating as a civil engineer, Andy worked first at Earth Tech and then at Wright-Pierce Engineers. He felt the internship's hands-on approach to learning was invaluable.

The experience is also rewarding for those who work with the interns. The employees at GSBSD who worked with Sabryna say there's nothing like having someone interested and even excited to learn what you consider as routine work. And sharing your knowledge is a wonderful way to give back to the community. "It's just amazing the reward I personally receive from working with my interns," said Mary Jane Dillingham.

The first two steps in selecting a career are to find something that interests you and learn more about it. What better way than through an internship? Contact your local water supplier to see what opportunities may be available.

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Water utility customers across the state are reminded to use water wisely during the hot summer days. While water is a renewable resource, sufficient precipitation to refill reservoirs and wells is a necessity to ensure adequate supplies. Every supply, be it a surface supply such as a lake or a pond, or a groundwater supply in the form of a well, has a safe yield. This safe yield is the amount of water that can safely be withdrawn from a supply without any adverse impacts on the quantity and quality of the supply. When a supply exceeds its safe yield on an on-going basis, that supply is considered to be at risk.

Here are some tips for helping the local environment by conserving water — and at the same time helping reduce your water bill:

Outdoor Usage

• Use water wisely and only if necessary

• Water lawns and landscaping before 9 a.m. or after 6 p.m. to reduce evaporation.

• Use a broom, not a hose, to clean decks, driveways and walkways.

• When mowing, set the mower blade to at least 3 inches; a higher cut leads to deeper roots, fewer broadleaf weeds and less moisture loss. Fertilizers and herbicides only increase the need for water on the grass.

For the Gardener:

Go native. Select Maine native and drought-tolerant ground covers, shrubs and trees for landscaping. They will survive better during dry spells and require less fertilizer and pest control.

Design deliberately. Layer plants to make shade for those which need it, grouping plants that need water while placing drought-tolerant species elsewhere.

Mulch it. Mulch retains soil moisture, controls weeds and improves the garden's appearance.

Water wisely. Water gardens less often but deeply, focusing on the root zones. Using a drip irrigation system or soaker hose and watering in the early morning minimizes evaporation.

Pass on grass. A one-third acre lawn uses up to 170,000 gallons of water per summer, according to the National Audubon Society. Consider planting a groundcover instead or replacing unused lawn with stones or bricks – helping to keep water in the garden and out of the roadway. Brown grass in the summer is not really such a bad thing –once cool weather returns, the grass will again turn green.

Compost. Composting organic matter into the soil helps it retain moisture.

Recycle water. Recycled household wastewater – from your dishwasher, bathtub and sinks – can be used to water plants. Set out a rain barrel near your gutter downspouts for an outdoor supply to have at hand.

Indoor Usage

• Avoid leaving the water running when brushing teeth, shaving or washing your face and hands.

• Run the dishwasher and washing machine only with a full load and use energy saving cycles if available.

• Fix any leaky faucets since even a small leak can waste 15 gallons of water a day.

• Keep a jug of cold drinking water in the refrigerator rather than running the water until it is cold.

• Even out your water usage – don't do all the laundry in one day and space out family showers.

The Thomas Hill Standpipe, Bangor

Although Maine's public water systems are not currently experiencing any significant problems in meeting the drinking water needs of their customers, everyone is encouraged to implement and continue efficient usage habits.

For more information on how you can conserve water, contact your local public water utility. They are the most knowledgeable source of information about your local water supply and what you can do to help preserve this most precious resource.

The Cost of Water: Why isn't it FREE?

By John B. Storer, P.E.
AUBURN WATER & SEWERAGE DISTRICTS

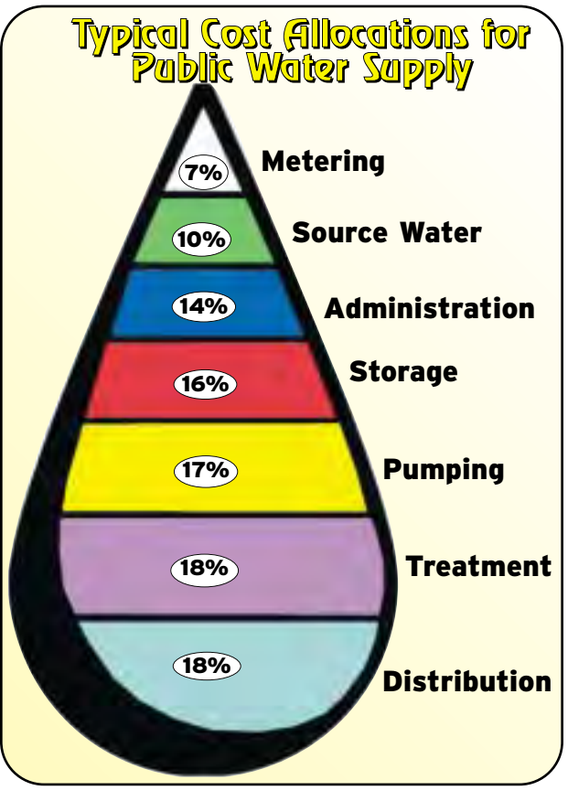
Money doesn't grow on trees, but water does fall from the sky. So why does it cost so much? Whether you're on a private well, connected to public water, or a bottled-water drinker, they each cost money.

Based on 2007 data from the Maine Public Utilities Commission, the average quarterly bill for all public water systems in Maine is $58.91, including a 1,200-cubic-foot water allowance. This is just slightly more than a half-cent for each gallon of water delivered. One dollar gets you more than 150 gallons.

Central Maine Power says "Flip a switch and we're there." Your local water supplier could respond in kind: "Turn on your faucet and we're there." While you could run to the river and dip in a bucket, the water your public system is safe, tested, disinfected, delivered under pressure, and ready for use in your home. Consider that a typical 20-ounce bottle of spring water might cost about $1.29 at your local store — that's about $8.25 per gallon, and doesn't include home delivery.

To help explain some of the costs associated with public water, let's follow the journey of your water as it makes it way to your tap.

1. Source-water protection. This is where clean water begins. Whether the supply is surface water (lake, river, or stream) or groundwater (well), your utility has a designated watershed-protection area to ensure contaminants don't reach the supply. Often, this requires the utility to purchase land surrounding the source. This might range from just a few acres to provide a 300-foot buffer around a well to several thousand acres to help protect an entire lake. Security measures are also employed, including patrols, fencing, and video cameras.



2. Treatment. Treatment may range from simple disinfection for a well to full filtration with chemical additions for a surface-water supply. Disinfection is the most important step, with Maine utilities primarily relying on chlorine or filtration for inactivation of pathogens. Most systems also have to adjust their waters for corrosion control, which may involve pH adjustment or the addition of a corrosion inhibitor. Some public systems must also fluoridate the water.

3. Pumping. This pressurizes the water so it's available for use at your tap. Pumps require a significant amount of electricity; for many systems, this cost might be 10 to 20 percent of their total operating costs.

4. Distribution. A network of

See WATER COST, Page 16

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KIDS! COLOR THIS PAGE ABOUT WATER!

WATER JOKES!

What did the sink say to the water faucet?
You're a real drip!

Chief Running Water had two sons. What were their names?
Hot and Cold!

Why did the kid dump a bucket of water off the school roof?
He wanted to make a big splash in front of his class!

Is it dangerous to swim on a full stomach?
Yes, it's better to swim in water!

Where do mermaids go to see movies?
The dive-in!

Why did the dolphin cross the beach?
To get to the other side!

Why did the tap dancer retire?
He kept falling in the sink!

What part of a fish weighs the most?
The scales!

Where do boats go when they're sick?
To the dock!

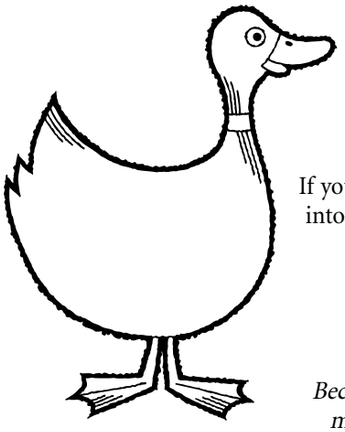
How does the ocean say hello to the sand?
It waves!

What's full of holes but still holds water?
A sponge!

What did the sink say to the stove?
"Man, am I drained!"

What did the jogger say to the faucet?
"Want to go running?"

Why did the horse get wet?
Because he got caught in the reins!



Why do ducks watch the news?
To get the feather forecast!

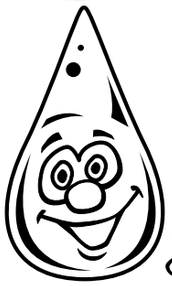
If you drop a white hat into the Red Sea, what does it become?
Wet!

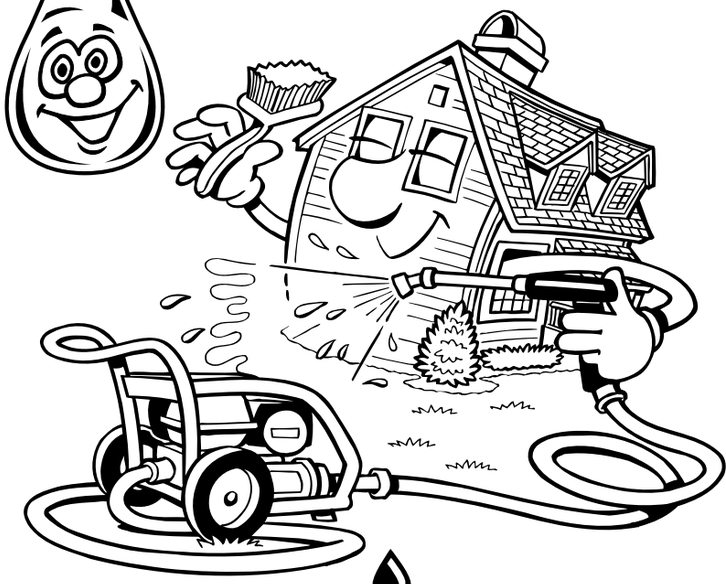
Why do fish swim in salt water?
Because pepper water makes them sneeze!

Why don't ghosts like water?
It dampens their spirits!

Where can you find an ocean without water?
On a map!

Father: How are your grades, son?
Son: Underwater, Dad.
Father: Underwater? What do you mean?
Son: They're below C level!





Teachers, get your students WET!

Project WET - Water Education for Teachers - provides teachers with materials to educate students about water

By Lynne Richard
MAINE PROJECT WET COORDINATOR

Maine Project WET (Water Education for Teachers) is an interdisciplinary water science and education program for formal and non-formal educators of K-12 students.

How does Project WET work?

Project WET is a network of state coordinators who provide educators with the materials and skills they need to teach about water through professional development workshops. Project WET has been used successfully by more than 30,000 teachers during the past 15 years and recently expanded to the international stage, having been adopted by teachers in more than 28 countries. Portland Water District, whose water-education programs reach more than 2,000 students each year, is the primary sponsor of Project WET in Maine. Other sponsors include the University of Maine's Mitchell Center and Poland Springs Bottling Company. More information can be found at Portland Water District's Web site at www.PWD.org.

Trained educators use the Project WET Curriculum and Activity Guide, a collection of over 90 interdisciplinary activities that deal with water-related topics, to educate students about water. The Project WET Curriculum and Activity Guide is available to teachers and facilitators throughout the country who attend Project WET training workshops.

Project WET Curriculum and Activity Guide lessons incorporate a variety of formats, such as large and small group learning, whole-body activities, laboratory investigations, discussion of local and global topics, and community service projects. The guide also features cross-reference and planning charts, a glossary, and background material on activity development and field-testing.

The goal of Project WET is to facilitate and promote the awareness, appreciation, knowledge, and stewardship of water

Project WET Plus

In response to requests from coordinators, teachers, and students, Project WET has developed several programs, publications, and instruction kits that complement the Project WET Curriculum and Activity Guide. They include:

- Healthy Water, Healthy People
- Native Waters
- Kids in Discovery Series
- WOW! The Wonders of Wetlands
- Discover a Watershed Series
- Conserve Water
- Ground Water

Project WET supports the No Child Left Behind Act; curricula materials cover diverse topics and disciplines and are designed with a commitment to state, provincial and national education standards. Materials designed to promote critical thinking and problem solving skills are developed, field tested and reviewed by hundreds of educators and resource managers nationwide. Project WET provides high-quality professional development for teachers and non-formal educators through workshops designed around scientifically sound subject matter, practices that have been proven to be effective and a long-term network of support.

The mission of Project WET is to reach children, parents, educators, and communities of the world with water education.

The goal of Project WET is to facilitate and promote the awareness, appreciation, knowledge, and stewardship of water resources through the development and dissemination of classroom-ready teaching aids and through the establishment of state and internationally sponsored Project WET programs.

Project WET Core Beliefs:

- Water moves through living and nonliving systems and binds them together in a complex web of life.
- Water of sufficient quality and quantity is important for all water users (energy producers, farmers and ranchers, fish and wildlife, manufacturers, recreationists, rural and urban dwellers).
- Sustainable water management is crucial for providing tomorrow's children with social and economic stability in a healthy environment.
- Awareness of, and respect for, water resources can encourage a personal, lifelong commitment of responsibility and positive community participation.

For more information about Project WET, visit the Portland Water District at www.PWD.org or the Project WET Web site at www.ProjectWET.org.

A Few Things You Should Know About Water

Some facts about the properties and chemistry of water:

- Water is made up of two molecules of hydrogen and one molecule of oxygen.
- Water can be a solid (ice), liquid (water), or gas (vapor or steam).
- Water boils at 212 degrees Fahrenheit (32 degrees Celsius).
- Water freezes at 32 degrees Fahrenheit (0 degrees Celsius).
- Water expands as it freezes. Ice floats because it is less dense than the water.
- Water is the most common substance of Earth.
- Water is moved to and from the Earth by the hydrologic cycle.
- The hydrologic cycle has 3 steps:

Step #1: Condensation: Water vapor in the air condenses from a gas to a liquid, forming clouds up in the sky.

Step #2: Precipitation: The water falls back to Earth from the sky as rain, snow, sleet, or hail. Some of the water runs into rivers, lakes, and oceans. It is absorbed by the soil or it seeps into underground formations called aquifers.

Step #3: Evaporation: The sun heats the land and the water surfaces, causing water to rise into the air as vapor, where the process begins all over again.

- Water regulates the temperature of the Earth and the human body.
- Less than 1 percent of the Earth's water is available for drinking.
- Nearly 97 percent of the Earth's water is salt water.
- About 75 percent of a living tree is water.
- A person can survive about a month without food, but only 5 to 7 days without water.

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PROTECTING YOUR PRIVATE WELL

Compiled by John B. Storer, P.E.
AUBURN WATER & SEWERAGE DISTRICTS

Safe drinking water is essential in maintaining good health for both people and pets. In Maine more than 2,200 public water systems provide drinking water to over half of Maine's population. That means the remaining population relies on private wells for their source of supply. While public water systems undergo rigorous testing to ensure water quality, private, individual wells are the responsibility of the homeowner. Here are some suggestions to ensure water quality of private wells.

Testing

If you have a new well, you should consider testing for pesticides, organic chemicals, and heavy metals before you use it for the first time. With an existing well you should have your water tested periodically. The Environmental Protection Agency (EPA) recommends that private wells be tested every year for total coliform bacteria, nitrates, total dissolved solids, and pH levels. Always use a state certified laboratory that conducts drinking water tests. The tests can be expensive so it's worthwhile if you can try to identify some potential problems.

Common Threats to Your Well

Some basic human activities can pose a threat to your groundwater. Three key areas immediately jump out and can be monitored and controlled on a local level. They are:

Bacteria and Nitrates: These pollutants are found in human and animal wastes. Septic tanks or failed leach systems can pose threats, along with pet waste or farm animals.

Safe drinking water is essential in maintaining good health for both people and pets.

Fertilizers and Pesticides: Be aware of the products you use for the care of your lawn and garden.

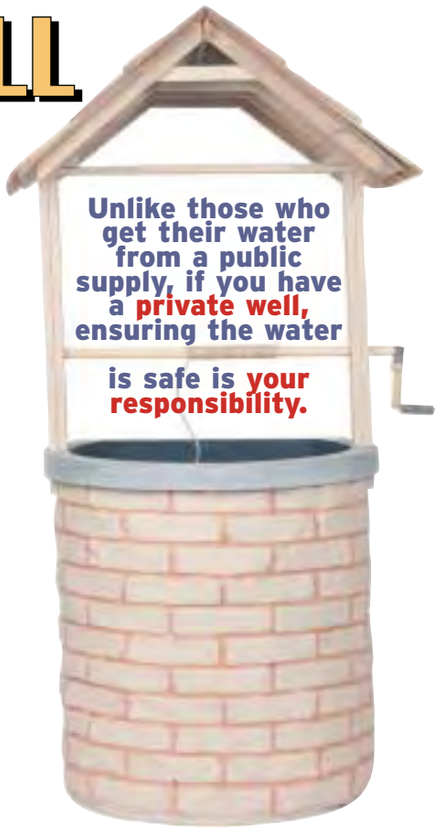
Household Wastes and Pharmaceuticals: Think before you flush! Your septic system is not designed to receive solvents, certain cleaners, paint thinners, motor oil, etc. Only human waste should be flushed. An emerging threat is one posed by the disposal of old medicines or prescriptions.

How to Protect Your Well

There are some common threats to your well supply that can be minimized with a few basic steps. EPA suggests protecting your water supply by carefully managing activities near the water source. For households using a domestic well, this includes keeping contaminants away from sinkholes and the well itself. Keep hazardous chemicals out of septic systems.

- Periodically inspect exposed parts of the well for problems such as cracked, corroded, or damaged well casing; broken or missing well cap; settling and cracking of surface seals.
- Slope the area around the well to drain surface runoff away from the well.
- Install a well cap or sanitary seal to prevent unauthorized use of, or entry into, the well.
- Have the well tested once a year for coliform bacteria, nitrates, and other constituents of concern.
- Keep accurate records of any well maintenance, such as disinfection or sediment removal, that may require the use of chemicals in the well.
- Hire a certified well driller for any new well construction, modification, or abandonment and closure.
- Avoid mixing or using pesticides, fertilizers, herbicides, degreasers, fuels, and other pollutants near the well.

See PRIVATE WELLS, Page 16



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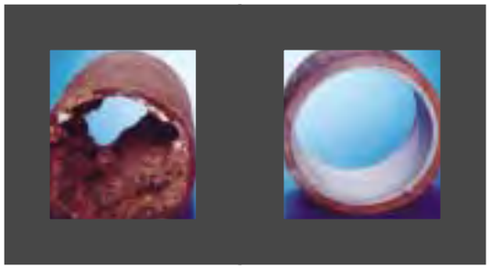

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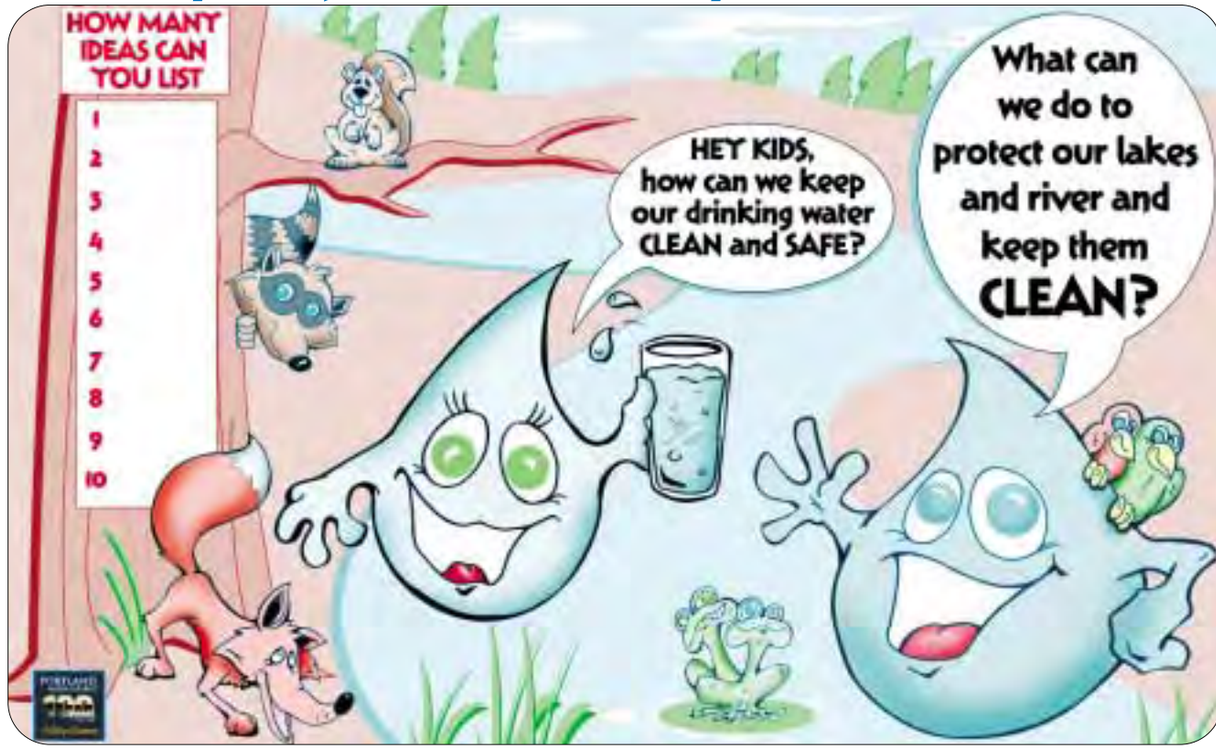
HEY, KIDS... Mr. Clean Drinking Water says, "Talk with your parents about your ideas!"



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Water use and the new culture of efficiency

Ryan Lynch
YORK WATER DISTRICT

In many parts of the world, and with increasing frequency in dry regions of the U.S., public water suppliers face growing challenges to provide the water needed to sustain population and economic growth. Alongside this, consumers are increasingly better-informed, eager to reduce their environmental impact, and are listening more closely, asking more questions, and expecting more information. This increased consciousness mandates doing more with less and being more environmentally, socially, and economically responsible. This translates to a new culture of life efficiency.

Public water suppliers have long attempted to foster attitudes toward increasing water-use efficiency. In recent years there have been more frequent media attention to promoting awareness of many public-water supply issues. The path to water-use efficiency is clear: Changes must be made in the long-held inefficient cultural attitude towards its use. The major hurdle is how to increase the value of water and turn this into continuous action.

American Inefficiencies

Despite having some of the safest, most reliable, and least expensive drinking water in the world, Americans are among the least efficient users. While daily home water use here has decreased slowly over the past decade, other parts of the world have made greater strides in water-use efficiency. (Note that "use" is very different from "consumption." Less than 1 percent of the drinking water produced by public suppliers is drunk; the rest is used for convenience and sanitary reasons.)

According to the American Water Works Association, the average American uses around 100 gallons of water per day. The average Mainer is significantly more efficient, using just under 60 gallons per day; other New England states average over 70. But Wisconsin, Ohio, and Puerto Rico consumers average under 50 gallons per day, and residents of the U.S. Virgin Islands use just over 20 gallons per day. In England and Germany, typical consumption falls below 40 gallons per day. Clearly, Mainers can be more efficient water users.

The biggest hurdle to increasing the value of water so that water efficiency is continuously promoted is to do so without creating economic pressure or a high cost of water. Unfortunately, economic pressure is actually the most effective driver for increasing long-term efficiency in most areas. As with commodities like oil, gasoline, and electricity, increased consumer cost awareness can result in widespread improved efficiency, since consumers can benefit financially from usage reduction.

Significant efficiencies can be generated from economic incentives. For example, as a result of the recent economic downturn, an incentive was created to reduce electricity usage. This resulted in re-evaluating the need to add more electricity-generating facilities, instead becoming more efficient with existing facilities. Also, as part of the economic stimulus, an energy-conservation initiative is being discussed as an important opportunity that applies to water use and many other commodities. With a usage reduction, power companies can use existing power facilities longer, and thus more efficiently, with lower costs; the saved money will go to much-needed infrastructure improvements.

But water rates in the U.S. are generally not high enough for consumers to significantly reduce usage, because they don't typically reflect the true service costs as they do elsewhere. In most nations, water costs are more than double ours (in some, nearly quadruple). Our water costs are low because water is considered a basic social and public-health right.

This low cost has supported little in the way of water infrastructure replacements. If water service reflected true costs, an incentive might be created to use water more wisely; but this typically only happens when the water source is running dry and significant investment is required.

Environmental and Social Factors

Environmental pressures can also drive water-use efficiency because improving efficiency is often environmentally responsible, but this support can fluctuate wildly depending on related environmental-issue severity and the current political climate.

One social driver that has helped enormously over the past decade is the pressure on manufacturers to produce efficient products, such as the Energy Star program for electrical appliances. For water, toilets and washing machines are much more efficient than 10 years ago, and probably why there has been a significant reduction in home water usage over the past decade. This is no surprise; over 80 percent of home-use water is in the bathroom and laundry. By updating old fixtures and appliances in the bath and laundry, it's estimated that a homeowner can reduce water use by over 30 percent.

By continuing to make informed, small changes in daily life, Mainers can reduce their impact and become more efficient water users.

To address commercial-product water-use efficiency, the Environmental Protection Agency has recently unveiled the new Water Sense program. Similar to the Energy Star program, it guides consumers to the most water-efficient products, which are independently certified to perform as well or better than less-efficient counterparts and are about 20 percent more water-efficient. Look for the EPA Water Sense label for high-water-use products.

Well-supported social drivers can be relatively effective means of promoting efficiency. Over the past decade most public-water suppliers have sought to increase the social value of water through educational and awareness campaigns. The media has highlighted many water-supplier issues through environmental and social awareness including Drinking Water Week, bottle vs. tap quality, water-supply rights, droughts, water emergencies, environmental impacts, sustainability, conservation and efficiency, and climate change, to name a few.

Conservation Through Awareness

Water suppliers most often seek to promote conservation and water-use efficiency through education and awareness, water rate structuring, municipal and state ordinances, and financial incentives including basic giveaway fixtures and rebates for water-efficient products. The water industry has also increasingly provided more information to the public to allow customers to make better-informed decisions. Increasingly, more suppliers are making individual water-user data available online so that a consumer can see and assess their own usage patterns. Water suppliers are also moving to conservation or efficiency rate structuring with increasing frequency, which increases the cost of water as more is used, thereby promoting efficiency.

Most recently, public water suppliers are looking to invest in developing conservation and water-use efficiency programs to help improve water efficiency from source to tap in place of expanding water supplies. This fresh direction is slowly becoming a more accepted alternative to pursuing new or augmented sources of supply projects. There is the realization that, as with the electricity industry, new or expanded water sources may not be the best answer especially since conservation and water use-efficiency programs have the potential to be less capital-intensive. These programs work best if integrated into the long-term planning process so different public water suppliers may choose to adopt various strategies, because appropriate measures will vary with size and capability of each water supplier.

Water is undervalued in the U.S., but as in other parts of the world this attitude is changing due to economic, environmental, and, especially, social drivers. These pressures are helping to change the inefficient cultural attitude toward water use, but much more can be done.

As water cost continues to increase worldwide, a powerful economic incentive will develop to drive increases in water-use efficiency. By continuing to make informed, small changes in daily life, Mainers can reduce their impact and become more efficient water users. Meanwhile, Maine water suppliers will continue to discuss and implement better ways to promote water-use efficiency through conservation and programs while striving to further reduce their own water losses and improve overall efficiency.

Tomorrow's water suppliers and users will undoubtedly possess an increased understanding and mastery of water-use efficiency tools and products. By continuing to make educated water-use choices now, water users can create an efficient environment for the future. Efficiency starts today and will ensure a better tomorrow.

Water Cost

Continued from Page 11

buried pipes distributes it to all the public connections and your home. Fire hydrants are good indicators of where public water service is available; they're installed to provide a firefighting water source.

5. Storage. Storage tanks ensure reliable water service. Tanks help meet high flow demands such as fires, or to have a reserve in case of an emergency such as an extended power outage. (A well-designed system should still be able to provide water service during an outage.)

6. Metering. Metering is the primary measure for determining customer costs. Typically, water systems will have a flat rate for service, including a minimum water allowance. The meter records usage and customers are billed based on consumption. Most municipalities also pay a set fee for the available use of fire hydrants.

7. Administration. This can be broken down into the category of the office staff that processes the bills, manages the system, ensures the water is safe, etc.

Private Wells

Continued from Page 14

• Do not dispose of wastes in dry wells or in abandoned wells.

• Do not cut off the well casing below the land surface.

• Pump and inspect septic systems as often as recommended by your local health department.

• Never dispose of harsh chemicals, solvents, petroleum products, or pesticides in a septic system or dry well.

Please refer to our article on proper septic system maintenance for additional information to protect you and your family.

John Storer compiled this information from EPA and other resources.

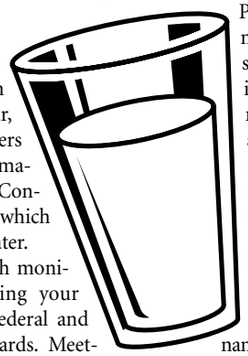
Items to Test for

The EPA developed the following chart to help spot water-quality problems:

Conditions/Nearby Activities	Test for
Recurring gastrointestinal illness	*Coliform bacteria*
Lead in household plumbing	*pH, lead, copper*
Radon-rich indoor air	*Radon*
Corrosion of pipes, plumbing	*Corrosion, pH, lead*
Nearby areas of intensive agriculture	*Nitrate, pesticides, coliform bacteria*
Odor of gasoline or fuel oil	*Volatile organic compounds*
Objectionable taste or smell	*Hydrogen sulfide, corrosion, metals*
Stained plumbing fixtures or laundry	*Iron, manganese, copper*
Salty taste, or a heavily salted road nearby	*Chloride, total dissolved solids, sodium*
Scaly residues, soaps don't lather	*Hardness*
Rapid wear of water treatment equipment	*pH, corrosion*
Water softener needed to treat hardness	*Manganese, iron*
Water appears cloudy, frothy, or colored	*Color, detergents*
Dump, junkyard, landfill, gas station nearby	*Volatile organic compounds, total dis solved solids, pH, sulfate, chloride, metals*

What's in YOUR water?

By Kathy Moriarty, General Manager
BANGOR WATER DISTRICT



What's in your water? Your local water utility can provide answers. Each year, Maine's public water suppliers mail their customers a summary of tests, known as the Consumer Confidence Report, which were performed on your water.

Utilities are charged with monitoring and regularly testing your water to ensure it meets federal and state drinking-water standards. Meeting all water-quality requirements is the responsibility of each utility's certified water-treatment plant operators who are licensed by the state of Maine. (Prior to 1974, there were no enforceable standards regarding drinking-water testing.)

Water utilities must test for over 120 contaminants with known health effects. The Safe Drinking Water Act directs the Environmental Protection Agency and Maine Department of Health and Human Services to set standards establishing limits on various contaminants. Drinking water may reasonably be expected to contain at least small amounts of some contaminants; the presence of contaminants does not necessarily indicate a health risk.

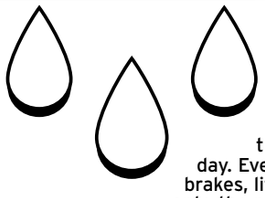
Pharmaceuticals found in certain drinking-water supplies have recently received media coverage. Although water utilities must test for many contaminants with known health effects, there are no testing requirements for pharmaceuticals, such as antibiotics, antidepressants, anti-inflammatory medicines, and pain relievers.

It's important to understand how pharmaceuticals enter a water supply. Many people take prescription and over-the-counter drugs on a regular basis for a variety of reasons. Often, not all of the medicine is absorbed by the body and is excreted as waste; flushing or dumping unused medication also contributes pharmaceuticals to wastewater. Trace amounts of these pharmaceuticals may remain in wastewater even after it is treated and returned to the environment. Treated wastewater may eventually enter a water source, and, in the process, introduce trace amounts of pharmaceuticals to the drinking-water supply.

Protecting the source of drinking water is the first step of many in providing safe drinking water. Maine water utilities use varying approaches to provide this protection, such as restricting activities in well fields, posting watershed areas, and monitoring lakeshore development. As a result, the possibility of pharmaceuticals entering your water supply is unlikely.

More information about contaminants and potential health effects is available from EPA's Safe Drinking Water hotline at (800) 426-4791, and Maine's Drinking Water Program at (207) 287-2070.

What's in Your STORMWATER?



Did you know that storm drains mostly empty into the nearest river, lake, or bay? That's okay for rainwater, but unfortunately storm drains collect much more than rain.

Droplets of antifreeze, transmission fluid, brake fluid, gas, and oil fall from thousands of cars each day. Every time a car uses brakes, little bits of brake liner fall onto the road. Some of our Maine vehicles shed rust as they go.

On nearby sidewalks and properties, fertilizer, soaps, pet waste, house paints, and other substances make their way to the roadside. Winter brings the addition of salt and lots of sand to the mix.

And these are just the "accidental" ingredients to our toxic stormwater soup. Add to the list cigarette butts, litter, and other items dumped down storm drains, and you begin to see the problem.

What can you do? Keep your stormwater to yourself! Use rain barrels, install a rain garden, plant trees and gardens, reduce the use of chemicals, scoop up after your pet, and never knowingly put anything into a storm drain.

Sharing our water resources

Water, Water, Everywhere... and some of it we drink

About half of all Mainers use private drinking-water wells; the other half use water supplied by public water systems.

Of the people supplied by a public water system, 75 percent use water from a lake, pond or stream. The rest use drinking water from wells.

Only about 50 lakes, ponds, and streams in Maine are used as public drinking-water sources.

Maine has more than 2,000 public water systems including large community water districts or departments and small community water systems like apartment complexes, schools, restaurants, and other businesses.

Public water systems regularly test their water to make sure it is safe to drink.

By Beth Pratte,
Education and Outreach Coordinator
MAINE CDC DRINKING WATER PROGRAM

Depending how you count, there are more than 5,000 lakes and ponds in Maine. Add to that another 5,000 rivers and streams, and that's a lot of water. Maine people share these water resources for drinking, recreation, wildlife, factories, and farms. Also, because of the water cycle, we share it with our ancestors and future generations. How's that for recycling?

A watershed is a land area that drains into a lake or river. Maine has 21 major watersheds that cross town, county, state, and international borders. Protecting lakes and rivers from pollution also means protecting the watershed.

Polluted runoff is one of the biggest threats to Maine's waters. Choosing responsible land development is one of the best ways to keep Maine's drinking water safe and healthy.

Most public water systems using surface water sources, like lakes and rivers, are required by federal law to filter their water using expensive water treatment. Maine has more public water systems with filtration waivers than any other state. This is because of many public water systems' hard work to protect Maine's naturally high-quality water from pollution.

Mainers are lucky to have enough clean water for all kinds of uses. If we all do our part to protect our water resources from pollution, future generations will have enough clean water, too.

New Oil-Tank Regulations Protect Drinking Water

Do you need a new oil tank? You should first check if you are near a community public water system well. Starting in July 2009, all new home heating oil tanks within the wellhead protection area or 1,000 feet of a community drinking-water well are required to meet new construction and installation standards.

The Maine Department of Environmental Protection responds to about 200 tank leaks every year, and has spent millions of dollars cleaning up leaks from oil-storage tanks near water sources. When a drinking-water well was contaminated, even more money was spent locating, installing, and connecting replacement wells.

The new law will help prevent oil products from polluting drinking-water sources. As of September 2008, new petroleum aboveground storage, as well as facilities using hazardous materials, will only be allowed in areas away from both public drinking-water sources and private wells. These types of businesses include automobile graveyards and maintenance facilities, dry cleaners using hazardous solvents, metal plating and finishing operations, and commercial hazardous-waste facilities.

For homeowners, your local public water system may be able to help using wellhead protection grant money to upgrade heating oil tanks in their wellhead protection areas. A professionally installed double-wall tank is a good investment to avoid an expensive cleanup.

For more information on the new laws, contact the Maine DEP Bureau of Remediation and Waste Management at (207) 287-2651.

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Protecting Maine's Natural Resources: Managing for Sustainability

By Mark Dubois, Certified Geologist
POLAND SPRING

As a Natural Resource Manager for Poland Spring, it is not surprising that I get asked lots of questions about water. As public awareness increases about water use both locally and globally, it is natural for people to wonder: How much water do we have in Maine? How much water does Poland Spring use?

Like other groundwater users, Poland Spring has been in business for a very long time — since 1845. Like other natural-resource-based industries, we have learned to manage the natural resource we use — water — to produce a value-added Maine product that's sustainable year after year.

Standing on Poland Spring's original site is a grove of huge maple trees planted over 100 years ago by the original spring owners, a symbol of another traditional Maine product. Maple-syrup producers must manage their resource responsibly in order to continue selling their product. There's simply no business if trees are destroyed in the process of maple-syrup production.

Spring-water production in Maine requires the same stewardship, year after year. The springs Poland Spring uses continue to flow, and aquifers receive more water regularly in the form of rain and snow — a process called recharge. The spring source and the aquifer aren't harmed as long as we use this recharge in a managed, sustainable way.

But how do we ensure that spring-water withdrawal is sustainable for the long term? Put simply, our own careful scientific monitoring, public reporting, and local, state, and federal regulation.

Keeping Springs Sustainable

Poland Spring chooses spring sources that can be managed sustainably. Our goal is to ensure that our water sources are healthy, clean, and sustainable. Like the Maine maple-syrup industry, it is foremost in our company's best interest to ensure that our resource is not depleted.

We operate under significant federal, state, and local regulation and oversight. For example, state permitting of spring-water withdrawal commonly requires the monitoring of nearby surface water and natural habitats. This gives us data that helps to ensure that we are meeting our permit requirements and that there is no harm to local wells and watersheds. Because Poland Spring has planned for the future with nine permitted sites across Maine, we can adjust when and where we make spring water withdrawals without negative impact to the environment or our business.

Groundwater in Maine is abundant and renewable. The Maine Geological Survey reports an average annual rainfall of approximately 44 inches, which produces two to five trillion gallons of groundwater recharge in Maine. People, municipalities, and companies combined utilize a small amount of that recharge and do so without harm to the environment. Poland Spring uses less than 1 percent of the total groundwater use reported in Maine annually. But what about the future?

Accounting for Climate Change

I often hear concerns that climate change might change everything when it comes to future water availability in Maine. I understand the worry, which is why, as a hydrogeologist, I look at the data and the analyses of experts to understand what our resources might look like in the years to come.

Over the past 100 years, while climate change forces have been at work, the National Climatic Data Center shows an overall increase in precipitation here in Maine. The International Panel on Climate Change predicts that the Northeast will continue to become wetter.

In order to best manage these changing systems, when we gather spring water from our sites, the resource is monitored and reported to the public. If we see a change in a local water system, then the government regulations that are in place require us to reduce or cease withdrawals to reestablish safeguard levels. We have started to post our monthly and annual monitoring data on our Web site, www.PolandSpringME.com (see the Fryeburg and Denmark web pages specifically for a sample of these public reports).

At Poland Spring, both the maples and the springs are alive and well, ready to produce Maine products and support sustainable jobs. We all depend on water: people, businesses, and the environment. When we all take the time to understand the science, we can work together to manage our shared resource responsibly for generations to come and create good jobs here at home.

Everyone's talking about sustainability.

We've been practicing it for over 160 years.

When it comes to water, we've always been concerned about the future and sustainability. After all, our business depends on it.

That's why, after all these years, we're still using natural spring sources in Maine. It's why our 800 Maine employees are committed to making sure that every one of our water sources will be here and healthy for generations to come.

That's why we carefully evaluate every potential water source and perform detailed studies to make sure a spring can be safely sustained with no harm to wells, ponds or wetlands. Our science is verified by independent experts, and our operations are overseen and regulated at the local, state and federal level by entities such as the Maine Department of Environmental Protection.

Among its many natural resources, Maine is blessed with an abundance of water, but it's a resource none of us can take for granted. We never have, and we never will.

It's why Poland Spring is still here after all these years.

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Forest watershed management promotes clean water

By Chip Love, Consulting Forester
SOUTHERN MAINE
FORESTRY SERVICES

Recently, a member of the Maine Water Utilities Association asked me to say a few words concerning forest watershed management. Southern Maine Forestry Inc. manages both Portland and Auburn Water Districts, which are the largest and second-largest water supplies in Maine. Both Districts began working with foresters on their land acquisitions in the 1930s. The primary objective is to provide the highest water quality possible.

High water quality is usually associated with cool temperatures and high dissolved-oxygen levels. The solubility of oxygen is higher in cool water than in warm water. The decomposition of organic materials can reduce or eliminate the supply of dissolved oxygen. This is why good watershed management focuses on growing good-quality softwoods such as Eastern white pine, red pine, and spruce, and reducing the broadleaf trees. Their cutting cycles are every 10-12 years, targeting the lower-quality, diseased, or damaged trees for removal. This enables the landowner to capture potential mortality, reduce fuel loads, maintain a year-round canopy cover, release regeneration, and promote growth on the better-quality trees. It is a conservative philosophy with an intensive approach. Through the use of whole-tree chipping, the landowner can also accomplish timber stand improvement. This is a weeding and thinning of smaller-diameter stems, which are cut and chipped, and sold as biomass.

A licensed professional forester designates all skid trails with trees marked for cutting oriented to that trail system. There are benefits from this practice both environmentally and economically. Temporary bridges are used on all predesignated brook crossings, and skid trails are located to minimize soil disturbance and erosion. Timber harvests are scheduled six months to a year in advance so heavy equipment works when the ground is either frozen or dry. Today's logging equipment is large and heavy, and most of the work is done with hydraulic equipment. Modern skidders remove several trees or bunches at one time. Properly locating where they travel is important to minimize soil and residual stand damage. Successful results require a thorough understanding of forestry, soils, wildlife habitat, local and state codes, and a working knowledge of civil and mechanical engineering.

The Economic Benefit

A study by Tom Ebner and Bob Daniels in the fall 2006 issue of Southeastern Forester compared the results of a professionally marked stand versus one that was harvested by an owner/operator. The annual growth after harvest was 26 percent higher in the marked stand than in the owner/operator select stand. Residual stand quality was also higher in the marked stand. In the marked stand, 5.2 percent of the remaining trees were low-grade, compared to 14.2 percent in the unmarked stands. Stumpage value prior to the next thinning was $457 per acre higher in the marked stand. Having your forest professionally managed yields better quality results.

On well-drained, coarse-textured soils with good timber, it is not uncommon to grow about one cord per acre per year, more on better sites. The majority of the planned harvests are removing 10-12 cords per acre, or 20-30 percent of the stand volume. By growing a cord per acre per year and harvesting every 10-12 years, Portland and Auburn Water Districts never exceed growth and the forest is managed in a sustainable manner, protecting the soils and growing better quality more valuable timber. Byproducts of this healthy forest are the increased water quality and improved aesthetics and wildlife habitats. Having their forests marked and trails laid out by foresters provides a tenfold return on the foresters' costs.

Over the long term, landowners who take this approach set themselves up for future success. Increased log demand worldwide, insect problems in British Columbia, the emergence of biofuels, and decreases in exports from Russia are combining to create future wood-product shortages. With the lack of large supplies in Eastern Canada or British Columbia, and with wood from South America growing so fast that it does not make construction-grade lumber, local log supplies will feel upward price pressure.

Increased fuel prices limit distances logs can be trucked before it is no longer cost effective. This will increase demand for sawlogs in the Northeast. Landowners with good quality sawtimber will likely get a higher stumpage price. Those growing low-grade logs and pulpwood will not benefit from these trends. In summary, those who are practicing sustainable forestry and growing good-quality timber will continue to do well. This will benefit the water consumers as well as the watersheds and those who live in them.

Burnt Pond

Trees and Streams

- Maine's forests are important to the health of streams and rivers.
- Trees protect the river and stream banks from erosion. Their roots hold soil in place and their stems and leaves soften the rainfall.
- Brook trout need clean, healthy water to live and are an indicator of clean water.
- Submerged tree roots provide food and shelter for fish and other organisms.
- Tall hemlocks, white pine, and a variety of deciduous trees shade the waters keeping them cool. Brook trout need cooler waters to live and grow.
- Streams that aren't covered in silt are better for many fish including brook trout and the organisms they eat.

Fun Tree Facts

• Not all evergreen trees are conifers and not all conifers are evergreens! Larches and bald cypress trees are conifers that lose their needles every fall.

• Trees grow from the top. Each spring new growth (height) is added from terminal buds that are located in the topmost parts of the tree.

• Evergreen trees are not really EVER green. The needles of coniferous trees don't stay on forever. As the needles become older, they drop off the tree to make room for new needles!

• Today, 98% (98 of every 100) of the trees grown for the holidays are grown on farms.

• One acre of Real Trees on a farm makes enough oxygen for 18 people.

• The Christmas tree for the White House has to be exactly 18 1/2 feet tall and look great with the decorations chosen by the First Lady.

• In October or November, the Head Usher of the White House visits the farm of the National Christmas Tree Association's Grand Champion grower for the year to select the perfect tree.

• Holiday trees were once used by Chimney Sweeps to clean the soot out of dirty chimneys!

• Real Trees help filter dust and smog from the air AND they help stop erosion by holding soil in place!

• REAL TREE growers consider trees to be adults when they produce viable seeds. For some species, a 6-year-old tree can be considered an adult. For others, it take much longer - maybe over 20 years.

• Growers get REAL TREE seeds by harvesting closed cones. After being removed from the tree, the cones are put into a huge dryer. Drying causes the cones to open and the seeds to spill out. After REAL TREE seeds are harvested, they are tested. They are placed in a large vat of water. Those that float are sterile and are not able to grow. Those that sink are sold to be planted.

• Like many scientific names, the word conifer comes from the Latin words conus (cone) and ferre (to bear). The word literally means cone bearing.

• The original name for the Noble fir (Abies nobilis) had to be changed when it was discovered that another tree had been given the same name.

• The Fraser fir was named for John Fraser (1750-1811). Fraser was a Scottish botanist who explored the southern Appalachian Mountains late in the 18th century.

• Conifer needles need just the right amount of sunlight for the tree to produce food. The triangle shape of the tree is an adaptation that allows more needles to "see" the sun.

• As a tree grows older and taller, less sunlight reaches the needles on the lower part of the tree. When this happens, the lower areas shed their needles - and eventually – their branches.

• Moose, Whitetail deer, chickadees, squirrels, nutcrackers, and porcupines all use the Balsam fir (its needles or seeds) for food.

• Ecology, the study of the relationships and interactions between organisms and their environment, is also called bionomics.

• 34 to 36 million REAL TREES are produced each year.

• The top 5 producers of REAL TREES are Oregon, Michigan, Wisconsin, Pennsylvania, California, and North Carolina.

• The study of soil science is called Pedology.

• It takes 500 years or more to make one inch of soil.

• Some scientists suggest that Fraser fir trees and Balsam fir trees were once a single species. It is believed that over the years the two species evolved from one.

• The White pine appears to be more sensitive to pollutants such as ozone, fluorides, and sulfur dioxide than other species.

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