from the Minnesota Department of Health

Safe Drinking Water for the Next Generation:

Ensuring Our Future

A summary of

Drinking Water Protection Activities

in Minnesota for 2000

Issued May 2001
Minnesota Department of Health
Division of Environmental Health

MINNESOTA MDH DEPARTMENT OF HEALTH

Safe Drinking for the Next Generation:
Ensuring Our Future

A Summary of Drinking Water Protection Activities in Minnesota for 2000

Issued May 2001

For more information, contact:

Drinking Water Protection Section
Division of Environmental Health
Minnesota Department of Health
121 East Seventh Place—P. O. Box 64975
St. Paul, Minnesota 55164-0975
http://www.health.state.mn.us

651/215-0770 (voice)
651/215-0775 (fax)

This report is available on the World Wide Web at
http://www.health.state.mn.us/divs/eh/dwp/pws/dwpreport00.html

Reports from previous years (through 1995) are at
http://www.health.state.mn.us/divs/eh/consinfo.html#Drinking

Introduction

Ensuring the safety of our drinking water is one of the most fundamental—and most critical—responsibilities of modern public health. In fact, safe drinking water has been a key ingredient in some of the greatest public health achievements of the last half-century, including the dramatic reductions in disease and improvements in longevity that we now tend to take for granted. Along with other basic public health measures like immunization, drinking water protection has played a crucial role in building a safer and healthier society.

We need to remain vigilant if we are to protect those past gains. The Minnesota Department of Health (MDH) is strongly committed to safeguarding the quality of our drinking water, and as part of that commitment, we routinely monitor all of our state's public water supply systems for a broad range of chemical, radiological, and biological contaminants.

MDH believes that educating the public about water quality issues is an important element of drinking water protection. Since 1995, we have been releasing annual summary reports like this one to help us achieve that goal. Like previous reports in the series, this year's report covers test results and actions taken during the preceding calendar year.

The main body of the report provides information about Minnesota's community water supply systems—that is, systems that provide people with drinking water in their places of residence. The section on Emerging Issues contains a number of topics that relate to the future, including an update on Source Water Protection activities, a key component in the mission to keep our water safe to drink. Standards set for drinking water are done with a strong margin of safety built in and are constantly being reviewed, a process that sometimes results in the revisions of certain standards. This section addresses a few of the standards that have been undergoing such revisions. These changes can sometimes pose financial challenges for public water suppliers. The Drinking Water Revolving Fund (DWRF) helps water systems to upgrade their facilities to meet stricter standards or to replace aging infrastructure to ensure continued compliance with existing standards. A summary of recent DWRF activities is addressed in this section.

Protecting our drinking water requires the involvement and awareness of everyone, not just those employed in the drinking water profession. To promote greater awareness and education, the Minnesota Department of Health has been involved in an educational initiative to get curriculum on drinking water into Minnesota classrooms through the establishment of Drinking Water Institutes for teachers. Information on these Institutes is in the Emerging Issues section beginning on page 12.

We hope this information will provide the people of Minnesota with a clearer picture of what's being done to protect the quality of their drinking water, and what our monitoring efforts have revealed about the success of those efforts. We believe that the picture is a positive one, and we hope this report will build Minnesotans' confidence in the both the safety and the quality of their drinking water.

Executive Summary

The Minnesota Department of Health (MDH) is responsible for enforcing the federal Safe Drinking Water Act—and safeguarding the quality of drinking water—in our state. That includes responsibility for regulating approximately 8,300 *public water supply systems* statewide. This figure includes 955 *community* systems, which provide drinking water to people in their places of residence. These community systems include 710 *municipal* systems, serving towns or cities.

The Major Elements of Drinking Water Protection

Minnesota's drinking water protection strategy includes three major elements:

- ***Prevention*** measures are used to protect the quality of drinking water at the source—by controlling potential sources of pollution, regulating land use, and reviewing plans and providing advice on construction of water treatment and distribution facilities, and inspecting these facilities on a regular basis.

- ***Treatment*** measures—including routine disinfection—are used to make the water palatable and safe to drink.

- ***Monitoring*** of water supplies for potentially harmful contaminants—on a routine basis—is the critical element of the state's enforcement responsibilities under the Safe Drinking Water Act.

The Monitoring Process

Minnesota's community water supply systems are monitored for the following types of *contaminants:*

- **Pesticides and industrial contaminants.** Each system may be tested regularly for for more than 100 pesticides and industrial contaminants—including both synthetic organic chemicals (SOCs) and volatile organic chemicals (VOCs). The list of chemicals to be tested for—and the testing schedule—may vary from one system to another. Testing requirements depend on factors such as whether a particular chemical is likely to be present in the local environment—and how vulnerable the system is to contamination. If a system exceeds the applicable federal or state drinking water standard for a particular chemical, it must notify the people who use the water and take appropriate steps to correct the problem.

- **Bacterial contamination.** Larger community systems are tested monthly—and smaller systems are tested quarterly—for contamination by *coliform bacteria.* The coliform test is used as a general indicator of water quality in the system, in terms of potential microbial contamination.

  Standard procedures are followed whenever potential bacterial contamination is detected. Systems are disinfected, flushed, and retested to ensure that any contamination problems are eliminated. All of the residents served by the system are also informed of the situation. In some cases, boil water notices are issued, advising residents to boil their water before using it for drinking or cooking.

- **Nitrate.** Each system must be tested annually for nitrate. Nitrate occurs naturally in the environment, but elevated nitrate levels in drinking water are usually associated with the use of fertilizer, or the breakdown of human and animal waste. It is a health concern primarily for infants under the age of six months. If the federal standard for nitrate is exceeded, an advisory is issued regarding consumption of the water by infants. The advisory remains in effect until steps can be taken to correct the nitrate problem.

- **Inorganic Chemicals and Radioactive Elements.** Each system is typically tested once every three years—or as often as once a year, in some cases—for a list of 13 additional inorganic chemicals, and a number of radioactive elements. Both inorganic chemicals and radioactive elements may be naturally present in the water. If the water exceeds health standards for either type of contaminant, people who use the water are informed, and steps are taken to correct the problem.

- **Lead and Copper.** For the last several years, community water supply systems have participated in efforts to reduce lead and copper contamination in drinking water. Lead and copper are not typically present in the water when it leaves the treatment plant. Lead and copper differ from other contaminants in that they are rarely present in source waters. Rather, they enter the water through contact with plumbing components, usually in individual homes. If more than 10 percent of the homes in a community exceed the federal "action level" for lead or copper based on the results of community-wide monitoring—the local water supply system must do additional testing and take steps to reduce levels. Systems that exceed the action level for lead must also perform a regular program of public education.

Note: Any time a drinking water standard is violated, the affected water system must take correction actions that include notifying its residents of the violation. In addition to this type of notification, all community water systems issue an annual **Water Quality Report** (sometime referred to as a **Consumer Confidence Report**) that lists the source of the system's drinking water as well as a list of all regulated contaminants that were *detected,* even in trace amounts well below the legal standard, during the previous calendar year.

A Current Profile of

Minnesota's Drinking Water Protection Program

Since 1974, the U.S. Environmental Protection Agency has been responsible for regulating the nation's public water supply systems, under the provisions of the federal Safe Drinking Water Act. However, almost all states—including Minnesota—have now assumed responsibility for enforcing the act within their own borders. Minnesota became one of the first states to achieve *primacy*—and begin regulating public water supply systems at the state level—in 1977.

The definition of "public water supply system," for purposes of the Safe Drinking Water Act, is a broad one. To be considered "public," a water supply system must have its own water source and provide water to 25 or more people or have 15 or more service connections.

Minnesota currently has 8,300 public water supply systems—more than all but six other states. Of those systems, 955 are *community* systems—that is, systems which provided water to people in their homes or places of residence. Most of these community systems use *groundwater* from underground sources, tapped by water wells, as their source of water. However, 23 of these systems—including the municipal systems that serve the state's largest cities—use *surface water,* drawn from lakes or rivers.

Only 710 of the state's community systems are municipal systems, serving towns or cities. The rest of the community systems provide water to people in a variety of residential locations, including manufactured home parks, apartment buildings, housing subdivisions, colleges, hospitals and correctional facilities.

The remainder of the state's public water supply systems are *noncommunity* systems. Some of these noncommunity systems provide water to an ever-changing "transient" population, at places such as restaurants, resorts, and highway rest stops. Other noncommunity systems may provide water to relatively stable population groups, in non-residential locations such as schools, places of employment, and day-care facilities.

The Major Elements of Drinking Water Protection

Three basic strategies are used to safeguard the quality of our drinking water:

- **Prevention.** Preventing contamination of the source water used by public water supply systems—lakes, rivers and water wells—is an important component of drinking water protection. This aspect of drinking water protection includes measures like regulating land use, regulating the construction of water treatment facilities, and controlling potential sources of pollution.

- **Treatment.** Most community water supply systems use some form of treatment, so the water will be palatable and safe to drink. Many systems—but not all—require routine disinfection as a safeguard against potential problems with bacterial contamination. Groundwater systems are less likely to require disinfection, because contaminants tend to be filtered out of the water as it moves downward through the earth, from the surface to the underground sources tapped by water wells.

- **Monitoring.** Monitoring is the critical element of compliance activities under the Safe Drinking Water Act (SDWA). Under provisions of the act, public water supply systems are required to sample treated—or "finished"—water on a regular basis, and submit the samples to MDH. The samples are tested for a broad range of potential contaminants. If unacceptable levels of contaminants are found, the water supply owner or operator is legally responsible for informing the people who use the water, and taking steps to eliminate potential health hazards.

  Under the provisions of the SDWA, the individual water supply system is responsible for taking water samples and submitting them to MDH for testing. To lessen the burden on water supply operators, most of the required samples are collected by field staff from MDH. Minnesota's water supply operators have one of the best records in the nation regarding compliance with these sampling and testing requirements.

Note: *The monitoring requirements and test results described in this report apply primarily to community water supply systems.*

Monitoring: What We Test For—and Why

Minnesota's community water supplies are tested for a number of different types of contaminants. The reasons for testing—and how often the testing is done—depends on the type of contaminant and other factors. The type of contaminant also determines what actions will be taken, if unacceptable levels are found in the water.

The major types of contaminants we test for include:

Pesticides and Industrial Contaminants. Minnesota's community water supply systems are routinely tested for more than 100 different pesticides and industrial contaminants—including synthetic organic compounds (SOCs) and volatile organic compounds (VOCs). Systems may be tested anywhere from four times a year to once every six years, depending on the specific chemical and the vulnerability of the system to contamination (see ***Assessing Vulnerability to Contamination,*** on page 8). Some systems may not need to do any testing for a particular contaminant. A formal *use waiver* is sometimes granted, specifically exempting a water supply system from testing for a particular contaminant, if that chemical or pesticide is not commonly used in the immediate area.

The U.S. Environmental Protection Agency (EPA) has developed legal standards known as *maximum contaminant levels (or MCLs)* for 60 of the more than 100 chemicals on the list. *Advisory* standards have been developed for the other 58 chemicals on the list, and those are used in the same way as the MCLs in assessing test results.

Any time a community water supply exceeds the applicable standard for one of these contaminants, the water supply operator must immediately take steps to notify the people who use the water—with the assistance of MDH. Appropriate steps are then taken to reduce the contamination to acceptable levels.

In some cases, the MCL or advisory standard is calculated to prevent immediate or short term health effects. More often, however, these standards are designed to reduce the long-term risk of developing cancer or other chronic health conditions. They are calculated very conservatively. If the concern is long-term health effects, the standards are calculated to keep the risk of illness at levels most people would regard as negligible—even if they drink the water every day, over an entire 70-year lifetime.

Bacterial Contamination. Community water supply systems serving more than 1,000 people are tested one or more times per month for *coliform bacteria.* Smaller systems are tested four times a year. The coliform test is used as a general indicator of water quality in the system, in terms of potential microbial contamination. If the coliform test is negative, it is an indication that the system is adequately protected against contamination from other types of disease-causing organisms. However, if any detectable amount of coliform is found in the water, it is assumed that the system may be compromised, and steps are taken to protect the people who use the water. Standard procedures are followed whenever potential bacterial contamination is detected. Systems are disinfected, flushed, and retested to ensure than any contamination problems are eliminated. All of the residents served by the system are informed of the situation. In some cases, boil water notices are issued, advising residents to boil their water before using it for drinking or cooking.

Bacterial contamination problems are most commonly found in smaller water supply systems. Most of these smaller systems use groundwater, and many do not routinely disinfect the water as part of the treatment process.

Nitrate/Nitrite. Community water supply systems in Minnesota are tested once a year for *nitrate*—a chemical which may occur naturally in the environment, but can also enter the water from sources like fertilizer run-off, decaying plant and animal wastes, or sewage. Nitrate is a health *concern primarily for infants under the age of six months.* The infant's digestive system can convert the nitrate to *nitrite,* which can interfere with the ability of the infant's blood to carry oxygen. The result is a serious illness know as *methemoglobinemia,* or "blue baby syndrome." Methemoglobinemia can be fatal if nitrate levels in the water are high enough, and the illness isn't treated properly.

The current standard (MCL) for nitrate in drinking water is 10 parts per million (ppm). If a water supply system exceeds the standard, the people who use the water are notified and advised not to use the water for mixing infant formula, or other uses that might result in consumption of the water by infants under six months. The advisory is kept in place until steps can be taken to reduce nitrate levels in the water. Possible remedial measures include treating the water to remove the nitrate, or drilling a new water well.

Older children and adults are generally not at risk from drinking nitrate-contaminated water. In fact, the average adult consumes about 20-25 milligrams per day in food—primarily from vegetables. Because of changes that occur after six months of age, the digestive tract no longer converts nitrate into nitrite. However, some adults—including people with low stomach acidity and people with certain blood disorders—may still be at risk for nitrate induced methemoglobinemia.

Inorganic Chemicals. Community water systems in Minnesota are also tested for a list of 13 *other inorganic chemicals,* in addition to nitrate. The testing is usually done once every three years, but may be done as often as once a year, or as seldom as once every nine years. The list includes *antimony, arsenic, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium, sulfate,* and *thallium.* In some cases, these chemicals may be naturally present in the groundwater. If a water supply system were to exceed the federal MCL for one of these chemicals, the people who use the water would be notified, and appropriate steps would be taken to reduce levels of these chemicals in the water.

Radioactive Elements. Community water systems in Minnesota are also usually tested once every three years—or as often as once a year, in some cases—for a list of *radioactive elements.* These radioactive elements—*or radiochemicals*—may be present in the water from natural sources. If a system were to exceed the federal MCL for one of these radioactive elements, the people who use the water would be notified, and steps would be taken to correct the problem.

Lead and Copper. Some public water supply systems in Minnesota are required to test their water, on a regular basis, for lead and copper. All public systems in the state took part in an initial round of lead and copper testing that ended in 1994. The water was tested in a number of homes within each system, to determine if they exceeded the federal "action level" of 15 parts per billion for lead or 1,300 parts per billion for copper. If a system exceeded the action level for lead or copper—in more than 10 percent of the locations tested—the system was required to take corrective action and do further testing. Current testing requirements are based partly on the results of that initial round of testing, and the success of subsequent efforts to reduce risk of lead contamination in systems that have previously exceeded the action level.

Lead in drinking water is not an environmental contamination problem in the conventional sense. Water is almost never contaminated with lead at the source, or when it first enters the distribution system. However, water can absorb lead from plumbing components used in individual homes. Possible sources of lead in the system include lead pipe, lead plumbing solder and brass fixtures. Lead exposure is a potentially serious health concern, especially for young children. However, the water must usually be in contact with lead plumbing components for an extended period of time—usually by standing in the system overnight—before it can absorb potentially hazardous levels of lead. Consumers can usually protect themselves simply by turning on the faucet and letting the water run for 30 seconds—or until it runs cold—before using it for drinking or cooking.

While most people are subject to lead exposure from a number of possible sources—and drinking water typically accounts for a relatively small proportion of a person's total lead exposure—it is also one of the easiest sources of lead exposure to control and eliminate. Some Minnesota water supply systems are addressing the lead issue by treating their water, so it will be less likely to absorb lead from plumbing.

Assessing Vulnerability to Contamination

Monitoring requirements for individual water supply systems depend partly on how vulnerable the system is to contamination. MDH does vulnerability assessments of water supply systems, taking into account a number of factors. If the system uses groundwater, the way in which the wells are constructed can serve to increase or decrease the risk of contamination. In some systems, natural geologic barriers may serve to protect the source water from contamination. Systems with a past history of contamination problems may be at higher risk.

Compared to surface water systems, groundwater systems tend to be less vulnerable to certain types of contamination. Water tends to be naturally filtered as it moves downward through the earth, making its way from the surface to the underground aquifers tapped by water wells. That process tends to remove certain kinds of contaminants, including bacteria and parasites like *Cryptosporidium*. For that reason, many groundwater systems do not routinely include disinfection as part of their normal water treatment procedures.

Monitoring Test Results
for calendar year 2000

Pesticides and Industrial Contaminants

During 2000, MDH conducted 20,561 tests for pesticides and industrial contaminants in community water systems. No systems exceeded drinking water standards for these contaminants.

Bacterial Contamination

Twenty-four community systems—including 17 municipal systems—tested positive for bacterial contamination in 2000. All but 3 of the affected systems served fewer than 1,000 people.

The municipal systems that had confirmed coliform bacteria contamination in 2000 were Borup (population 91, Norman County), Browns Valley (pop. 758, Traverse County), Cold Spring (pop. 3,000, Stearns County), Ellsworth (pop. 561, Nobles County), Good Thunder (pop. 589, Blue Earth County), Hinckley (pop. 1,203, Pine County), LaPrairie (pop. 180, Itasca County), Marble (pop. 600, Itasca County), Minnesota Lake (pop. 676, Blue Earth County), Northome (pop. 312, Koochiching County), Parkers Prairie (pop. 956, Otter Tail County), Rockville (pop. 628, Stearns County), St. Joseph (pop. 4,406, Stearns County), St. Martin (pop. 317, Stearns County), Shafer (pop. 387, Chisago County), Stewart (pop. 566, McLeod County), and Trommald (pop. 99, Crow Wing County).

Standard procedures were followed in all of these cases. Systems were disinfected, flushed, and retested to ensure that any contamination problems had been eliminated. All of the residents served by the affected systems were also informed of the situation. In one case, a boil water notice was issued, advising residents to boil their water before using it for drinking or cooking.

Nitrate/Nitrite

Two municipal systems continued to exceed the nitrate standard in 2000. The affected systems are Edgerton (pop. 1,123, Pipestone County) and Lewiston (pop. 1,405, Winona County). Both systems had one well that produced a level of nitrate over the maximum contaminant level of 10 parts per million. Residents were notified to not give the water to infants who are six months or younger. Both cities are exploring options for reducing the nitrate levels under a compliance agreement with MDH.

No additional community water systems exceeded the nitrite standard in 2000; however, one municipal system is still dealing with a nitrite exceedance that was first detected in 1998. The system, Clara City (pop. 1,307, Chippewa County), is exploring options for reducing nitrite levels in its water and has advised its residents to not let infants consume the water until the problem can be corrected.

Radioactive Elements

Gross Alpha Emitters

Fifteen community water systems—including 10 municipal systems—were exceeding the standard for gross alpha emitters in 2000. The affected municipal systems are Butterfield (pop. 578, Watonwan County), Dennison (pop. 152, Goodhue County), Hinckley (pop. 1,203, Pine County), LaCrescent (pop. 4,733, Houston County), Lucan (pop. 262, Redwood County), Medford (pop. 800, Steele County), Norwood (pop. 1,219, Carver County), Red Wing (pop. 15,770, Goodhue County), Savage (pop. 14,502, Scott County), Watson (pop. 211, Chippewa County). No restrictions were placed on water consumption although residents were notified of the situation. Residents were told that this is not an emergency situation, advised to consult their doctors if they have any special concerns. The systems will study alternatives to correct the problem.

Radium 226 & 228

Fifteen community water systems—including 11 municipal systems—were exceeding the standard for radium 226 & 228 in 2000. The affected municipal systems are Arlington (population 1,897, Sibley County), Butterfield (pop. 578, Watonwan County), Goodview (pop. 3,000, Winona County), Harris (pop. 400, Chisago County), Hinckley (pop. 1,203, Pine County), LaCrescent (pop. 4,557, Houston County), Lucan (pop. 262, Redwood County), North Mankato (pop. 11,764, Nicollet County), Norwood (pop. 1,219, Carver County), Red Wing (pop. 15,770, Goodhue County), and Savage (pop. 14,502, Scott County). No restrictions were placed on water consumption although residents were notified of the situation. Residents were told that this is not an emergency situation and were advised to consult their doctors if they have any special concerns.

In 2000, the EPA formally reaffirmed a standard of 5 picoCuries/liter (pCi/l) for combined radium 226 and 228. MDH will work with the affected systems to study alternatives to correct the problem.

Lead and Copper

Minnesota's community water supplies are continuing with efforts, begun during the early part of the 1990s, to reduce lead and copper levels in their drinking water.

These systems started their lead/copper testing program in 1992 and 1993. The testing is done by taking first-draw water samples from a number of consumers' taps in the system. If more than 10 percent of the samples exceed the federal action level of 15 parts per billion (ppb) for lead or 1,300 ppb for copper, the entire system is considered to be "in exceedance." Communities that exceed the action level(s) are required to do additional testing, and take steps to reduce the absorption of lead/copper into the water from the water distribution system and/or household plumbing. Systems that exceeded the lead action level have also been required to perform an ongoing public-education program.

When these systems were first tested in the early 1990s, 87 exceeded the action level for lead, and 142 exceeded the action level for copper. Of the 87 systems with lead exceedances, 11 systems still exceed the action level and will be continuing their public education program until they comply with the action level for lead. Among the 142 systems with copper exceedances, 50 systems still exceed the action level, although the tap copper levels in these communities have already been significantly reduced.

Results of recent testing reveal the following:

Large Systems (serving 50,000 or more people). Over the past few years, the number of systems serving more than 50,000 people has increased from 5 in 1992 to the current number of 12. Initial testing revealed unacceptable lead level in two systems and three systems with unacceptable copper levels. All five systems have instituted corrosion control measures, which reduce the ability of water to absorb lead and copper from plumbing. Follow-up testing shows significant reduction in lead/copper levels for all five systems, and all are back in compliance. Two systems still exceed the copper action level and are required to maintained optimal corrosion control treatment specified by the state to ensure the copper levels at consumers' taps continues to be minimized.

Medium-Sized Systems (serving 3,300 to 50,000 people). When the state's 128 medium-sized systems were initially tested in 1992, 21 were found to exceed the action level for lead. Seventeen of these systems have retested and were found to be in compliance. The Minnesota Department of Health has required the other four systems to comply with some specific water quality parameter values relating to optimal corrosion control treatment, hoping to bring these systems into compliance through the effort of treatment optimization.

Of 26 systems that exceeded the action level for copper, 17 have successfully retested. The remaining nine systems have been specified with water quality parameter values to optimize the treatment to further lower the copper levels.

Smaller Systems (serving fewer than 3,300 people). Sixty-four of the state's 818 smaller systems exceeded the action level for lead when they were initially tested in 1993. All 64 systems have gone through many rounds of retesting with six systems still exceeding the action level for lead.

Of 113 systems that initially exceeded the action level for copper, all of them have completed follow-up testing with thirty-nine of them still exceeding the action level for copper.

The Minnesota Department of Health will complete the corrosion control treatment evaluations for the small systems in 2001, and it will specify specific water quality parameter values relating to corrosion control treatment to systems that are determined to have not optimized their corrosion control treatment, in hopes of bringing these systems into compliance through the effort of treatment optimization.

Other Inorganic Chemicals

No community water systems exceeded the standards for inorganic chemicals in 2000.

Emerging Issues

Youth Education Initiative

Drinking water may be our world's most important resource. Through recorded history, civilizations have risen and fallen depending on the availability of an adequate supply of water that is safe to drink. Water is just as important today as it was thousands of years ago. As we look at the problems—both health-related and economic—in many third-world nations, the lack of a safe supply of drinking water is often a major factor. Water's importance is not confined to Earth. Because water in liquid form is essential to all known forms of life, the search for the origins of life, and for life on other worlds, has centered largely around the search for water. Water was the first word learned by Helen Keller. It was the last word spoken by Ulysses Grant.

However, today, water is a resource that is often taken for granted. People turn on the tap while giving little thought to where their water comes from or what has been done to water to ensure its safety. While such an attitude may indicate that, overall, people have a high degree of confidence in the water supplied to them, the Minnesota Department of Health (MDH) believes that it is in everyone's best interest to have a greater awareness and understanding of drinking water. We think it is important for people to realize that safe drinking water does not happen by accident, that getting a reliable and safe supply of drinking water delivered to their taps is the result of a lot of effort on behalf of many people in the drinking water profession. Even more crucial is the understanding that all of us, not just those in the drinking water profession, play a key role in ensuring the safety of water in the future.

Over the last three years, the Minnesota Department of Health, in conjunction with the Education Committee of the Minnesota Section of American Water Works Association (Minnesota AWWA), has been actively involved in an initiative that may eventually mean that we will have an ongoing group of high school graduates in Minnesota who are well-versed on the subject of drinking water by virtue of having had this as a key part of their education at several different grade levels.

MDH and Minnesota AWWA will attempt to achieve this goal by conducting a series of Drinking Water Institutes for Minnesota teachers. Teachers will learn about drinking water and also have an opportunity to write curriculum for their class. The Institutes will be two or three days in addition to a follow-up session that will occurs a month or two after the Institute. At the follow-up session, teachers will present the curriculum they have written.

MDH and Minnesota AWWA will work with the Science Museum of Minnesota in conducting these Institutes, and teachers will receive college credit for attending them and writing curriculum on drinking water. Teachers will also have the opportunity to work with water professionals from their particular communities and to arrange a tour for their classes of their community's drinking water treatment facilities.

The Drinking Water Institutes will have two primary components—content and methods of instruction (pedagogy). Professionals from the water industry will present the content, covering topics such as sources of water, treatment, and distribution. The Science Museum of Minnesota will handle the pedagogical aspects of the Institutes, working with teachers on how to pass on the information to the students in an inquiry-based method. Focusing on instruction methods will greatly increase the chances that the content translates into curriculum that will end up in classrooms.

The first two Drinking Water Institutes have been scheduled for the summer of 2001. The first one—which will focus on treatment—will take place in Eden Prairie in late June. The other—which will cover groundwater—will occur in Monticello in August. The latter Institute will be conducted with the participation of the American Ground Water Trust. Both of these Institutes will be targeted toward middle-school teachers, although future Institutes will include teachers of other grade levels from kindergarten through 12th grade.

MDH and Minnesota AWWA will assess the feedback and results of these Institutes at the end of the summer and make a decision regarding how many Drinking Water Institutes to schedule for the summer of 2002.

Source Water Protection

Source water protection refers to three programs—wellhead protection, source water assessments, and surface water intake protection plans—underway at the Minnesota Department of Health that are directed toward protecting the quality of public drinking water. Much of this effort starts with requirements from the federal Safe Drinking Water Act that were refined to reflect the needs and concerns of Minnesotans.

Wellhead Protection—The goal of wellhead protection is to prevent contaminants from entering public water supply wells at levels that are harmful to people. For noncommunity transient systems (parks, restaurants, campgrounds, resorts, etc.), an inner wellhead protection zone is defined using a 200-foot radius around the well. This area is managed to protect well users from sources of disease-causing organisms and the direct release of other contaminants into the area immediately around the well. The state wellhead protection rule (Minnesota Rules Chapter 4720) requires that by June 2003, an inner wellhead management zone be established for all noncommunity transient wells and that potential contaminant sources be managed within it.

A capture zone or wellhead protection area is scientifically determined for wells serving community systems (municipalities, mobile home parks, subdivisions, etc.) and noncommunity nontransient systems (schools, factories, government buildings, etc.). Criteria for delineating a wellhead protection area are specified under the state wellhead protection rule. Community and noncommunity nontransient public water suppliers are required to develop and implement a plan for addressing potential contamination sources that are located within the wellhead protection area. The vulnerability of community and noncommunity nontransient wells has been determined by MDH and is being used to phase public water supply systems into the wellhead protection program. Staff in the Source Water Protection Unit assist public water suppliers with designating their wellhead protection areas and for preparing and implementing wellhead protection plans. MDH has set a goal to have all community and noncommunity nontransient water suppliers that use wells in the wellhead protection program by 2006.

Source Water Assessments—The 1996 amendments to the federal Safe Drinking Water Act require states to prepare an assessment for each public water supply system that contains 1) designation of the area that supplies water to the system; 2) the contaminants that are of concern to users of the system; and 3) the location of potential contaminant sources to the extent this is practical. The assessments must be completed by May 2003 and address all public water suppliers, including those that use surface water. The results of source water assessment must be made available to the public. Of the approximately 8,900 public water supply systems in Minnesota, 86 use surface water; the rest collectively use approximately 10,000 wells.

Surface Water Intake Protection Plans—This is the newest component of source water protection and is just beginning to take form. There are no state or federal rules requiring public water suppliers using surface water to develop and implement surface water intake protection plans. However, over concerns that they may not be able to treat all contaminants that could enter surface water, public water systems are expressing interest in developing such protection plans. MDH is working with public water suppliers, watershed groups, and others to determine what everyone's roles and responsibilities should be and to determine the process for having protection plans recognized by local, state, and federal governments. For example, MDH is working with the cities of Minneapolis, St. Cloud, and St. Paul to prepare source water protection plans for their surface water intakes.

Standard Review and Revisions

In the next few years, Minnesota water supplies will have to deal with a change in standard for arsenic and radionuclides, as well as an anticipated rule for radon.

Arsenic

A revision to the Arsenic Rule was finalized in January 2001 with the federal standard of 50 parts per billion (ppb) being lowered to 10 ppb. On March 22, 2001, new EPA Administrator Christie Whitman announced that the arsenic standard of 10 ppb would be withdrawn while EPA seeks an independent review of the science behind the standard as well as the estimates of costs to communities to comply with the stricter MCL of 10 ppb. EPA officials have stated that they intend for the new rule to be completed by February 2002 and that its provisions will become effective in 2006, the same year in which the MCL of 10 ppb was to have taken effect. If the MCL in the new rule were to be set at 10 ppb, as many as 80 community water supplies in Minnesota could be affected by it.

The reduction in the maximum contaminant level has been anticipated for several years. Water supplies in Minnesota that have measurable levels of arsenic in their water have been studying alternatives, preparing for the possibility of having to add treatment processes or replace existing wells to comply with the new, more stringent standard.

Arsenic occurs naturally in the environment and, as a component of underground rock and soil, can work its way into groundwater. Adverse health effects associated with long-term exposure to elevated levels include an increased risk of bladder and skin cancer, as well as problems associated with the circulatory system and the nervous system. Residents of community water systems can find out the arsenic levels, if any, in their drinking water by reading the Water Quality Report (sometimes referred to as the Consumer Confidence Report) that is issued each year by their water utility.

Radionuclides

A revision to the Radionuclides Rule was finalized in December 2000 with a federal standard of 5 picocuries per liter (pCi/L) for combined radium 226 and radium 228, 15 pCi/L for gross alpha emitters, and 45 pCi/L for uranium. The most significant revision affected the sampling point used for compliance. The former rule required samples to be taken from a representative point on the distribution system, while the revised rule requires samples to be taken from each entry point to the distribution system. It is anticipated that many supplies will be unable to meet the standard at these sampling points.

Several public water systems currently exceed the existing standard and, while anticipating the revised rule, have been working to meet the standard. These systems have been studying alternatives, including the addition of treatment or the replacement of existing wells to comply with the revised standard.

Radionuclides are naturally occurring contaminants that are found in groundwater throughout central and southern Minnesota. Long-term exposure to elevated levels of these contaminants may result in an increased risk of cancer.

Radon

The Radon Rule was proposed in November 1999 with a federal standard of 300 pCi/L and an alternative standard of 4,000 pCi/L being proposed. It is anticipated that the rule will be finalized this year. For those states that adopt a multi-media mitigation program—compels citizens, homeowners, schools, and communities to reduce radon exposure from indoor air—a standard of 4,000 pCi/L would apply. For those states that do not adopt the multi-media mitigation program, the 300 pCi/L standard would apply.

In anticipation of this rule, the Minnesota Department of Health has surveyed water systems and determined that approximately one-third of the community water systems may exceed the standard of 300 pCi/L, while approximately one percent may exceed the standard of 4,000 pCi/L.

Radon occurs naturally in both indoor air and ground water, as a decay product of uranium in the soil. Exposure to radon may occur from soil gases that enter the home or with the use of groundwater that releases radon into the air (showering, washing dishes, cooking, etc.) as well as ingestion of water containing radon. Exposure to radon in air is the second-leading cause of lung cancer in the United States.

Drinking Water Revolving Fund

The Drinking Water Revolving Fund (DWRF) provides a pro-active approach for financing improvements to public water systems. Federal grants and matching state money is lent to communities to bring systems into compliance with drinking water standards and to upgrade aging systems so they don't fall out of compliance. In some cases, below-market-rate loans allow communities to accomplish more than bare minimum improvements so they can achieve cost-effective, long-term solutions.

The DWRF, which came into existence in 1997, was patterned after the revolving fund loan program already in existence for wastewater projects. The first loan was made in the summer of 1998, and since then more than $100 million has been lent to 69 systems throughout the state for 97 different water system improvement projects. Money from loan repayments is used to finance new projects, which allows the fund to revolve in perpetuity.

Typical projects are new or rehabilitated wells, treatment plants, storage towers, and watermains. Examples of several projects include:

- A water treatment plant in Sauk Centre that features an outside sand infiltration basin for discharging backwash water.

- A new well and an aeration/filtration facility to remove iron in Comfrey. The new plant also provides phosphate treatment to help the city reduce lead and copper problems.

- An expansion of the water filtration plant in Dassel. New filters were installed into an addition to the plant while the old filter bay was converted into a detention tank.

- A treatment plant, wells, towers, and water mains for the formation of the Green Lake Water and Sewer District, which was created by the consolidation of water systems serving the cities of Spicer and New London as well as homes along the shoreline of Green Lake.

- A central treatment plant in Litchfield that replaces four small, aging treatment facilities that had been scattered throughout town.

Often the Drinking Water Revolving Fund allows water systems to make upgrades to their treatment facilities that are necessary as a result of revisions to existing federal standards. An example of this pertains to the recent revision to the Radionuclide Rule (noted in the section preceding this one). Sixteen Minnesota systems have water that will not meet the new standards set under the revised rules. Additional state sampling is expected to reveal up to twice as many additional systems that likewise will not be in compliance. Federal drinking water standards are also expected to change for arsenic. As many as 80 systems in Minnesota may find themselves unable to meet the new standard set for arsenic without expensive improvements to their facilities.

The solutions for allowing these systems to stay in compliance with the revised rules will vary on a community-by-community basis. New wells and treatment systems may be necessary. Regardless of the response that a water system chooses, however, DWRF loans will help these communities make these capital improvements possible.

Conclusion

Monitoring test results for 2000 tend to reinforce the conclusions of previous years: The quality of Minnesota's drinking water is very high. Even as our monitoring activities have expanded, we have rarely found any detectable contamination. Contaminant levels that exceed applicable health standards have been rarer still. Although we need to remain vigilant, Minnesotans can continue to have confidence in their drinking water.

MDH remains committed to protecting the high quality of our drinking water. The safety of our drinking water should never be taken for granted—but Minnesotans can be assured that their local water supply system is making every effort to ensure that their water is safe. And they can also be assured that the Minnesota Department of Health—and the broader public health community—are working to ensure that their confidence is well placed.

Appendix

Summary of Safe Drinking Water Monitoring Results for Minnesota

Includes Results for Both Community and Non-Community
Public Water Supply Systems in Minnesota for 2000

The following is a summary of drinking water monitoring test results for all public water supply systems in Minnesota for calendar year 2000. Public water supply systems include all systems that serve 25 or more people on a regular basis, or that have 15 or more service connections. There are approximately 8,300 such systems in Minnesota, including:

- *955* **community** *systems, which provide water to consumers in their places of residence, including 710* **municipal** *systems.*

- *approximately 7,300* **noncommunity** *systems, which provide drinking water in settings like factories, schools, restaurants, and highway rest stops.*

Minnesota issued the following violations in calendar year 2000; in some cases, the violations were issued to water systems that were already in exceedance of the particular standard:

- 8 noncommunity systems with a violation of the maximum contaminant level (MCL) for nitrate.

- 1 community system with a violation of the MCL for nitrite.

- 24 community systems with a violation of the MCL for total coliform.

- 245 noncommunity systems with a violation of the MCL for total coliform.

- 3 community systems with a violation of the MCL for combined radium.

- 5 community systems with a violation of the MCL for gross alpha emitters.

- 1 noncommunity system with a treatment technique violation for the Surface Water Treatment Rule.

- 11 community systems with a violation of the Consumer Confidence Rule.

A report which lists all violations of the Safe Drinking Water Act in Minnesota for calendar year 2000 is available from the Drinking Water Protection Section, Minnesota Department of Health, Box 64975, St. Paul, MN 55164-0975.

Individual water systems produce an annual report listing contaminants that were detected, even in trace amounts, during the previous calendar year. Please contact the individual water system if you would like a copy of this report.