DEPARTMENT OF HEALTH

Minnesota Drinking Water 2017 Annual Report for 2016

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Minnesota Drinking Water 2017
Annual Report for 2016

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Executive Summary

The Minnesota Department of Health (MDH) has been issuing an annual report on the current state of public drinking water supply and quality since 1995. In addition to reporting the results of testing of public water systems from the previous year, the report focuses on topics of current concern. In recent years, news headlines have been marked by alarming examples where safe and sufficient water has been affected by failures in infrastructure, chemical spills into water supplies, degrading water quality in water sources, and land-use issues. Could these threats occur in Minnesota? This year's report examines that question.

Recent drinking water crises include:

- Flint, Michigan: A perfect storm of many missteps exposes many children in disadvantaged neighborhoods to lead in drinking water.
- Charleston, West Virginia: A leaking tank containing a chemical unregulated by the Safe Drinking Water Act makes the capitol city's water undrinkable and causes economic upheaval.
- Toledo, Ohio: The city is forced to issue a "Do Not Drink" warning to 500,000 residents due to a harmful algal bloom with toxins that overwhelmed the treatment plant.
- Des Moines, Iowa: Rising nitrate levels in the rivers that supply the city are costing residents millions of dollars to make the water safe for drinking.

The Drinking Water Protection (DWP) Section in MDH coordinates statewide efforts to protect drinking water supply and quality by implementing the federal Safe Drinking Water Act (SDWA). Minnesota's drinking water protection strategy includes three major elements: prevention, treatment, and monitoring. The $17 million annual budget for the DWP Section supports 105 staff statewide and comes from a public water supply service connection fee, federal grants and set-asides, and the state Clean Water Fund. In 2016, 99.4% of community drinking water systems in Minnesota delivered water that met all applicable health-based requirements. DWP Section activities include:

- Managing the Drinking Water Revolving Fund ($49 million disbursed in 2016) to support public water treatment systems
- Reviewing plans (754 in 2016) for infrastructure improvement and installation
- Monitoring the treated water of 7,000 public water supply systems for pesticides and industrial contaminants, bacteriological contaminants, nitrate/nitrite, arsenic, radioactive elements, inorganic compounds (including lead and copper), and disinfection by-products
- Providing technical assistance to public water supply operators across the state

Minnesota's long record of excellent compliance with the federal Safe Drinking Water Act is noteworthy, but continued diligence and substantial resources are essential to continuing that success. We face challenges including aging treatment plants and watermains, pollution of drinking water sources from our past and present industrial and land use activities, and managing threats from contaminants like lead and others that are not regulated under the SDWA. We can't take drinking water for granted or assume that other states' experiences cannot happen here. Instead, we need to learn from their experiences, provide the necessary resources, and take action today to ensure safe drinking water tomorrow.

Introduction

"Could it happen here?"

That is the question Minnesotans may ask as they see water problems elsewhere in the United States.

- Flint, Michigan has dominated the news for more than a year because of lead contamination of the city's water and possible long-term health consequences for residents.
- A chemical spill in West Virginia two years ago left up to 300,000 residents without safe water.
- Harmful algal blooms in Lake Erie caused Toledo, Ohio, to order its 500,000 residents to not drink the water.
- Unsafe levels of nitrate in the rivers from which Des Moines, Iowa, draws its water led the city to sue three upstream agricultural drainage districts.

How is Minnesota's drinking water?

So far, Minnesota's leadership in compliance with the federal Safe Drinking Water Act (SDWA), its proactive approaches to heading off problems, its partnerships with other agencies and organizations, and its use of a variety of prevention, treatment, and monitoring strategies have helped us avoid catastrophic drinking water problems like those discussed above.

"Could it happen here?" is the theme of this year's annual report. The report provides a picture of what is being done to protect drinking water along with information about threats.

To date, the investments made in drinking water quality in Minnesota have paid off. Investment in protecting rivers, lakes, and groundwater that are the sources of our drinking water is more efficient and cost-effective than providing expensive treatment to remove contaminants after the fact. Pipes and pumps are examples of the infrastructure that must be maintained to supply drinking water. Emergency planning to be able to quickly respond to situations such as chemical spills and other problems is ever more important. Investment in testing the water is necessary to ensure that water coming out of people's taps is safe to drink.

Not only is safe water essential for people's health, it is also important for the economic development and fate of a community. This is particularly true for rural communities in Minnesota. Minnesota has met the challenge for more than 100 years, and its citizens have been blessed with an abundant supply of water that is safe to drink.

Can we avoid and respond successfully to issues that have plagued others in our country?

Yes, but only if we remain vigilant and continue the investments needed to provide our people with our most important natural resource: safe drinking water.

Unsafe Water: Could It Happen Here?

Year after year Minnesota consistently excels in drinking water quality, but continued vigilance and innovation are essential to address familiar and emerging threats.

Lead in Drinking Water

Lead is a well-known contaminant that has harmful, largely irreversible health effects - especially for children. While lead in drinking water is a concern, the biggest threat to children in Minnesota continues to be the nearly one million homes in the state that contain lead paint.

Water can be a smaller, but still important, source of lead. There is no safe level of exposure to lead. Minimizing the public's exposure to lead in drinking water is a balance of providing public education, understanding the variety of sources, and upgrading obsolete infrastructure.

In 2014 the city of Flint, Michigan switched its water source from Lake Huron to the Flint River. A number of factors caused the water that reached people's homes to be corrosive, causing lead in the distribution pipes and plumbing to dissolve into the water. The result was significantly higher levels of lead in the water with rising blood lead levels seen in infants and toddlers.

Minnesota has avoided major lead contamination problems through a number of requirements and a thorough review process. In Minnesota, review and approval from MDH is required before a water system can switch to a different source of water. With larger systems, MDH engineers review the plans for treating the water and also examine methods that ensure the water does not absorb materials such as lead and copper from pipes in the distribution system.

Public water systems must also sample water in people's homes periodically. If more than 10 percent of the samples are above the federal action level of 15 parts per billion, the system must take corrective actions to help reduce lead levels as well as provide information and ongoing public education to its customers. MDH considers this information important for all citizens, whether or not they are customers of a water system in exceedance of the action level.

What about the drinking water in schools and childcare centers?

MDH recommends that schools check for lead by testing each tap or fixture that provides drinking water or water for food preparation every five years or after any plumbing changes. Since 1988 MDH has provided technical assistance and guidance for use by all public and private schools, preschools, nursery schools, and childcare centers in Minnesota.

Infrastructure maintenance is vital for preventing lead contamination as well as other aspects of keeping drinking water safe. It is not cheap. A 2011 survey by the U.S. Environmental Protection Agency[1] indicated that $384.2 billion is needed to maintain the country's water infrastructure. Of that amount, $7.4 billion will be needed for Minnesota drinking water treatment plants over the next 20 years. More than half of this amount is needed for distribution pipes, and more than $1 billion for treatment facilities. Any new construction that may be required in the future for additional treatment infrastructure is not included in this estimate.

The state's Drinking Water Revolving Loan Fund helps address these needs with below-market-rate loans for capital projects needed to maintain compliance with the federal Safe Drinking Water Act. Since the program's inception in 1998, the state has funded more than $810 million in projects through this program. (More details on the Drinking Water Revolving Fund are on page 20 of this report.)

Schools across the state that receive their water from a municipality have been testing fixtures for both lead and copper, and, if needed, flushing faucets on a regular basis. Schools in South Washington County, for example, found high lead levels in 95 out of 1,737 fixtures (such as drinking fountains) and have followed flushing measures recommended by MDH. Minneapolis has about 40 buildings using flushing methods and are evaluating if replacing pipes or fixtures will eliminate the need for flushing. Schools are prioritizing renovations and determining the most cost effective methods to ensure that their students are not being harmed by lead and/or copper in water.

Under law passed by the Minnesota Legislature in 2017, all public schools will be required to test their drinking water for lead and make the information available to the public.

[1] https://www.epa.gov/sites/production/files/2015-07/documents/epa816r13006.pdf

Contaminant Spills

Protecting our drinking water starts by protecting the rivers, lakes, and groundwater that are our sources of drinking water. Threats to water supplies come from many places, including our current and past land uses, business and industrial activities, use of pharmaceuticals and personal care products, and even naturally occurring substances in the ground.

Accidents and chemical spills on a widespread scale are rarer but have results that can be devastating. Only two years ago, a spill occurred in West Virginia. Crude 4-methylcyclohexanemethanol, an organic chemical, was released from an industrial facility into the Elk River upstream from a drinking-water intake for a utility serving the capital area of Charleston. Up to 300,000 residents in nine counties were left without safe drinking water for days or weeks.

More than 50 years ago, a notable industrial accident in Minnesota caused the spill of more than 3 million gallons of oil into the Mississippi and Minnesota rivers. The spill created renewed action on controlling water pollution, and led to the creation of the Minnesota Pollution Control Agency (MPCA). A half-century later, there are more safeguards in place to prevent disasters such as this.

The MPCA has many programs to protect Minnesotans from pollution, including a program dealing with storage tanks for toxic materials.

The MDH Source Water Protection Unit works with communities on wellhead protection plans, which may contain a management strategy for responding to spills and other emergencies. The strategies include notification of local emergency responders, highway departments, and others to provide information about protecting the Drinking Water Supply Management Area (the land where precipitation flows across and down to supply a well) from contamination.

What would happen, particularly in the Twin Cities, if a major spill occurred in the Mississippi River north of the Twin Cities? Or if it happened in central Minnesota, upstream of where the city of St. Cloud draws its water? All three cities have surface water intake protection plans, and all have plans in place to close their intakes in the event of an upstream spill while relying on storage until the contamination plume has passed. In addition, St. Paul has wells that can be put into service if needed.

St. Cloud dealt with this situation in 2004 following the release of manure in an area that affected a river that enters the Mississippi River upstream of the intake for the St. Cloud water system. Thanks to their spill response planning, the city was able to anticipate when the plume would reach its area and was able to close its intakes until the plume had passed.

So far when spills have occurred, Minnesota public water systems have been able to implement existing plans to avoid repercussions from contamination entering their drinking water. These plans and emergency response actions enable Minnesota to maintain safe drinking water, even in the case of a serious contamination spill. However, these plans must be kept up-to-date and must be familiar and available to responders to help protect drinking water sources.

Cottage Grove has been a leader in developing and promoting spill response plans. As it developed its wellhead protection plan, the city recognized certain vulnerabilities, which included the geology of the area and Cottage Grove's proximity to rail lines and freeways. Jennifer Levitt, the community development director and city engineer, said they used a source water protection grant from MDH to develop a response to a potential spill, which includes shutting down one of the municipal wells within the capture zone and implementing a containment plan. The contingencies include working with partners, educating first responders, and developing an emergency contact list. Levitt has presented the Cottage Grove plan at workshops for water professionals and encourages other agencies to train staff to prepare and be aware of vulnerabilities. She stresses the communication that is needed among partners, media, and the public if a situation arises and believes social media will be a valuable tool in this communication.

Harmful Algal Blooms in Drinking Water

Harmful algal blooms (HABs), occur when algae – simple plants that live in water – grow out of control and produce harmful effects on humans, wildlife, and ecosystems. Contaminants called cyanotoxins can be produced by cyanobacteria during HABs. People or pets who drink or swim in water with dangerous levels of HAB contamination may experience stomach illness, skin irritation, allergic responses and damage to the liver and nervous system.

While HABs can occur naturally, the frequency of outbreaks is increasing in part because human activities create favorable conditions for the blooms. Circumstances that favor HABs include increased plant nutrients such as phosphorous that can come from runoff of fertilizers and discharges from waste treatment plants; water temperature; light; and precipitation.

One of the most disruptive HAB events in the United States was in 2014 when the city of Toledo, Ohio, issued a "Do Not Drink" advisory to its 500,000 residents. The HAB in Lake Erie, the city's drinking water source, had produced unusually high levels of contamination, which the city's treatment plant couldn't handle. The following year, the Ohio River experienced a 600-mile-long HAB outbreak, affecting multiple public water systems.

To the best of our knowledge, Minnesota has not had any incidents of drinking water exceeding safe levels of HAB contaminants even though some lakes used for drinking water have periodic HABs. Public water supply systems that use surface waters as a source must use treatment systems that can be effective at removing HAB contaminants up to a point; it is when those levels are too high that they become a problem, as in Toledo. Also, 75 percent of Minnesotans drink groundwater, which is at a low risk of HAB contamination because algae needs light to grow. However, groundwater could become contaminated if it has a natural connection with surface water like rivers or lakes.

Treatment for tap water obviously does not protect domestic animals and wildlife that drink water directly from rivers and lakes. There have been 12 lakes with confirmed or suspected dog deaths from 2004 to 2017. MDH is working with MPCA to stay informed of HABs in Minnesota because of the risks to health and to understand if the incidence of HABs is rising in Minnesota, as elsewhere. MPCA and MDH share information about reports of suspected HABs and associated illnesses of people and pets, gathered from the public. HABs also make water unsafe for recreation. The U.S. EPA is working on advisory levels for safe swimming, but currently the state of Minnesota simply warns, "When in Doubt – Stay Out."

Intermittent sampling shows that HAB contamination has been found in every coastal state.[2] and 30 percent of lakes nationwide.[3] In a regional study of Missouri, Iowa, southern Minnesota, and eastern Kansas, contamination was found in 78 percent of lakes.[4] In a Minnesota Pollution Control study, 43 percent of the state's lakes had detections.[5]

The EPA currently does not regulate the HAB contaminants – cyanotoxins and cyanobacteria. The EPA provides guidance on when to issue a health advisory for drinking water but has no authority over enforcement. The EPA has proposed that 10 HAB contaminants be monitored from 2018 to 2020 under the Unregulated Contaminant Monitoring Rule to determine if and how they should be regulated in the future.

MDH has taken steps to protect Minnesotans even though HAB contamination is unregulated. MDH:

- developed a health guidance value of 0.1 parts per billion for microcystin - LR, one of the most harmful HAB contaminants.
- provides technical assistance to public water systems on how to deal with the unregulated HAB contamination.
- conducts investigations with state and local partners to sample drinking water at the source (untreated) and at the tap (treated) for surface water and groundwater in the case of HAB events.
- works with public water systems on plans to protect their drinking water source and is increasing its protection program for surface water systems (plans often helping landowners reduce and manage nutrients, with education and outreach, conservation programs, and grants).
- encourages citizens to report blooms to the Minnesota Pollution Control Agency and to call MDH with health questions or to report health effects.
- participates in an interagency workgroup addressing HABs.

It is difficult to measure the magnitude of the HAB problem in the United States and Minnesota because most information comes from anecdotal events and sporadic water sampling. Figure 1 shows areas of the state with high phosphorus pollutant levels in surface waters along with high concentrations of microcystins. The high concentrations of microcystins generally represents areas of likely HAB outbreaks. Since phosphorus (as well as nitrate) is a nutrient used by plants for growth, high levels in lakes and rivers can contribute to algae blooms, including HABs. Routine surveillance would provide a more robust picture of the situation and allow MDH to better target source water protection efforts and to understand the factors and conditions in that lead to HABs.

[2] National Ocean Service, Harmful Algal Blooms, http://oceanservice.noaa.gov/hazards/hab/

[3] National Lakes Assessment, https://www.epa.gov/sites/production/files/2013-11/documents/nla_newlowres_fullrpt.pdf

[4] Cyanotoxins in Midwestern Lakes and Reservoirs, https://ks.water.usgs.gov/pubs/presentations/posterpresent/USGS-Microbiology-100108-Cyanotoxin_poster.pdf

[5] Summary of microcystin-concentrations in Minnesota lakes

While preventing conditions that promote algal blooms is the most protective approach to public health, MDH and its partners will need to remain vigilant to help protect people from HABs that develop. There is still much to learn and much work to be done to prevent HABs from occurring.

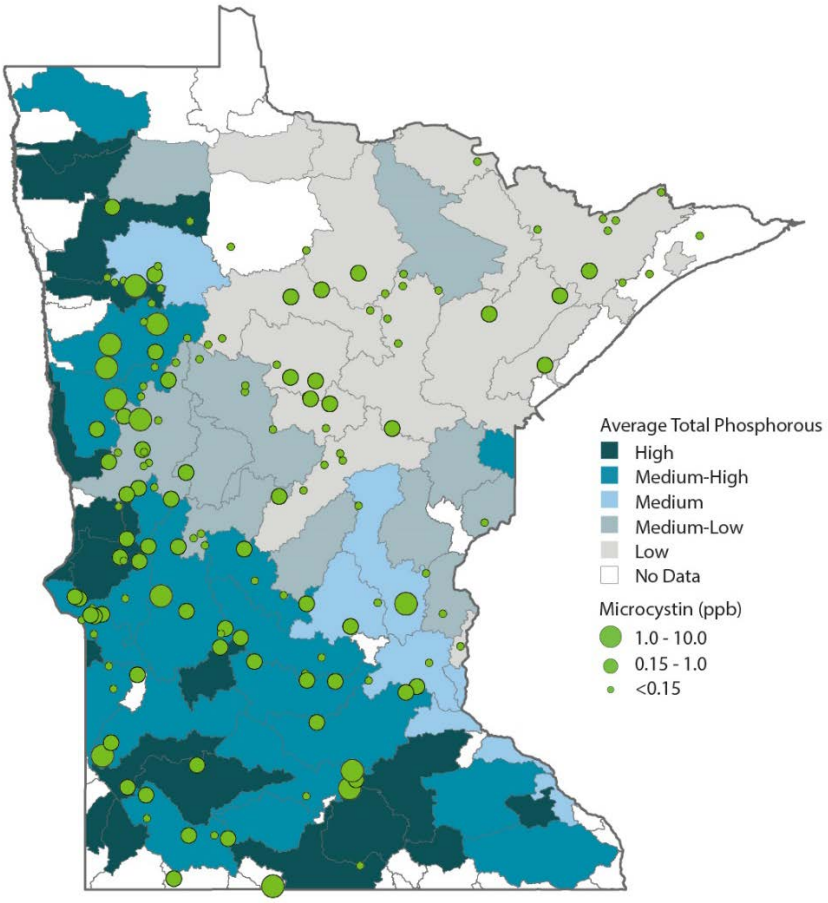


Figure 1. Microcystin Levels in a Sample of Minnesota Lakes and Phosphorous Pollutant Levels by Watershed.[6,7]

Algal blooms formed in Little Rock Lake in Benton County in 2007 and 2011. Authorities were concerned that the nearby shallow private groundwater wells serving residents could be contaminated from the lake. MDH testing revealed that the lake far exceeded safe levels of HAB contamination (50,000 times the EPA advisory level for adults), but that nearby groundwater wells did not show any contamination. It is difficult to know if levels remained safe the entire duration of the algal blooms.

[6] https://www.pca.state.mn.us/sites/default/files/wq-s1-66.pdf
[7] https://www.pca.state.mn.us/sites/default/files/wq-ws1-07.pdf

Nitrate in Drinking Water

For years, battles over water rights have been fought elsewhere, primarily in the western United States. That began to change in 2015 when the drinking water utility in Des Moines, Iowa, sued agricultural drainage districts for polluting the Des Moines and Raccoon Rivers, sources of drinking water for the city. The Des Moines Water Works reported damages of $1.5 million annually to remove nitrate to meet safe drinking water standards

In March 2017 - after two years of rising tensions between the water utility and drainage districts - the federal courts dismissed the case. The courts determined that the drainage districts had not unconstitutionally violated the Clean Water Act because they lack enforcement power. The deciding judge acknowledged that the damages were real but that the problem was a policy issue, not a legal issue.

Historically the Clean Water Act has not regulated the water quality of agricultural drainage. How the federal government and states decide to develop policy in the future to address agricultural pollution could affect the 34,000 Minnesota farms using tile or artificial drainage on 11 million acres of land (about half of all farms and farmland in the state).[8]

Decades ago, Minnesota regulators thought that the type of problems Iowa is facing could not happen here. Over the years, land use has changed in ways across the state that can increase pollution. For example, some pine forests are being converted to agricultural uses in the north-central sands region, and across the state more land has been tiled for drainage. Increasing extreme weather events like droughts, floods, and heavy rains have exacerbated the problem and driven some of the land use changes.

The presence of nitrate in drinking water is of concern for a number of reasons. There is a risk of methemoglobinemia (blue baby syndrome) for infants at concentrations above 10 milligrams per liter (mg/L), which can be fatal. Nitrate concentrations above 3 mg/L can be an indication that sources of nitrate contamination from human activity are affecting groundwater and/or surface water. Sources can include agricultural production, sewage treatment systems, and fertilizer and manure storage. Nitrate may also serve as the "canary in the coal mine" that warns that other contaminants may also be present.

[8] USDA, 2012 Census of Agriculture, https://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_1_State_Level/Minnesota/st27_1_049_050.pdf

Monitoring results for nitrate from public and private water supplies in groundwater show increasing trends in some parts of the state. Monitoring programs are described briefly below.

A review of monitoring results for 2014 – 2015 from Minnesota's public water supply wells across the state finds that 537 of 10,519 (5.11 percent) had nitrate levels above 3 mg/L. These include wells for both communities and for businesses, schools, and organizations that provide water to the public.

The Minnesota Department of Agriculture's Township Testing Program[9] provides testing for nitrate to homeowners who have wells in vulnerable areas of the state where groundwater used for drinking water can be affected by agricultural production. If nitrate is detected above a certain level, homeowners are also offered testing for pesticides.[10] Results of testing for nitrate so far indicate that 9.5 percent of 20,042 private wells tested exceed 10 mg/L and 22 percent are above 3 mg/L,[11] a level at which preventative measures should be considered.

The MDH requires testing of groundwater for nitrate, bacteria, and arsenic whenever a new well is constructed. Figure 2 shows a slight increase in new wells with nitrate greater than 10 mg/L since 2004.

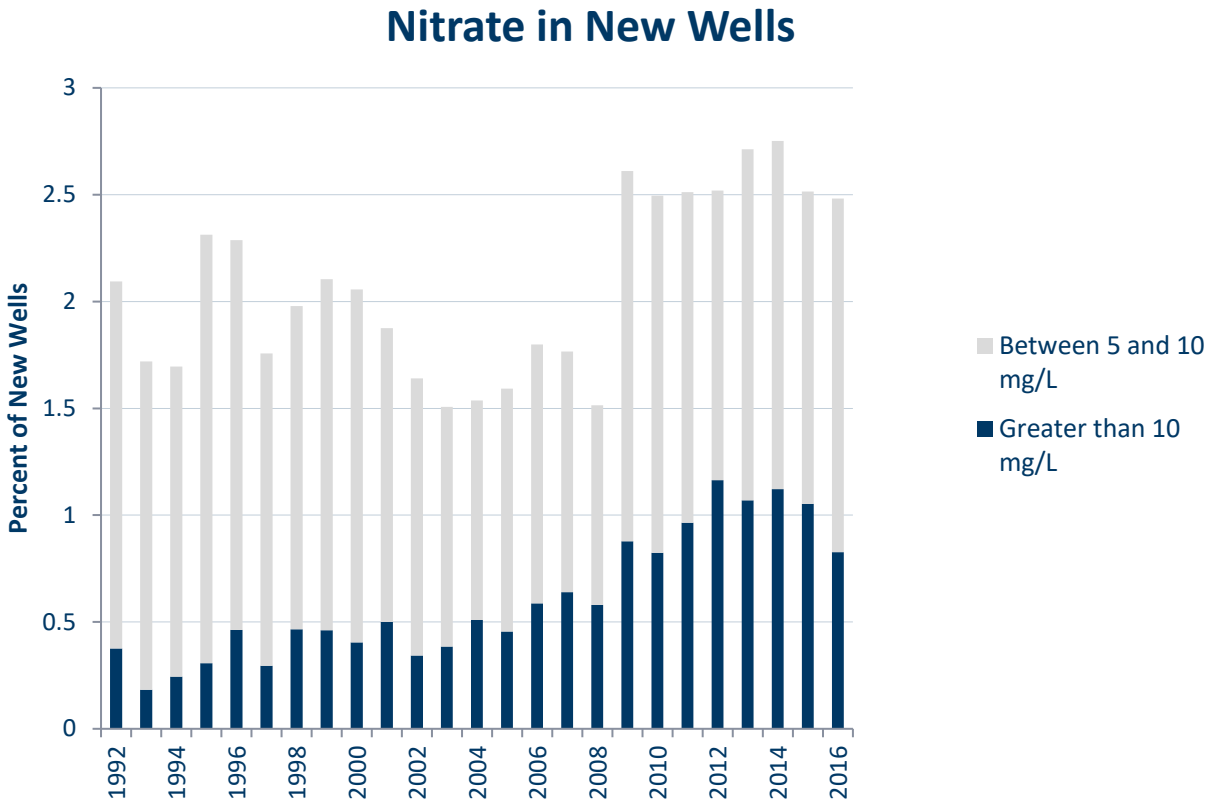


Figure 2.

[9] Minnesota Department of Agriculture, Township Testing Program, http://www.mda.state.mn.us/protecting/cleanwaterfund/gwdwprotection/townshiptesting.aspx

[10] Minnesota Department of Agriculture, Private Well Pesticide Sampling Project, http://www.mda.state.mn.us/protecting/cleanwaterfund/gwdwprotection/pwps.aspx

[11] Minnesota Department of Agriculture, Township Testing Program Update, http://www.mda.state.mn.us/protecting/cleanwaterfund/gwdwprotection/~/media/Files/chemicals/nfmp/ttpupdate201702.pdf

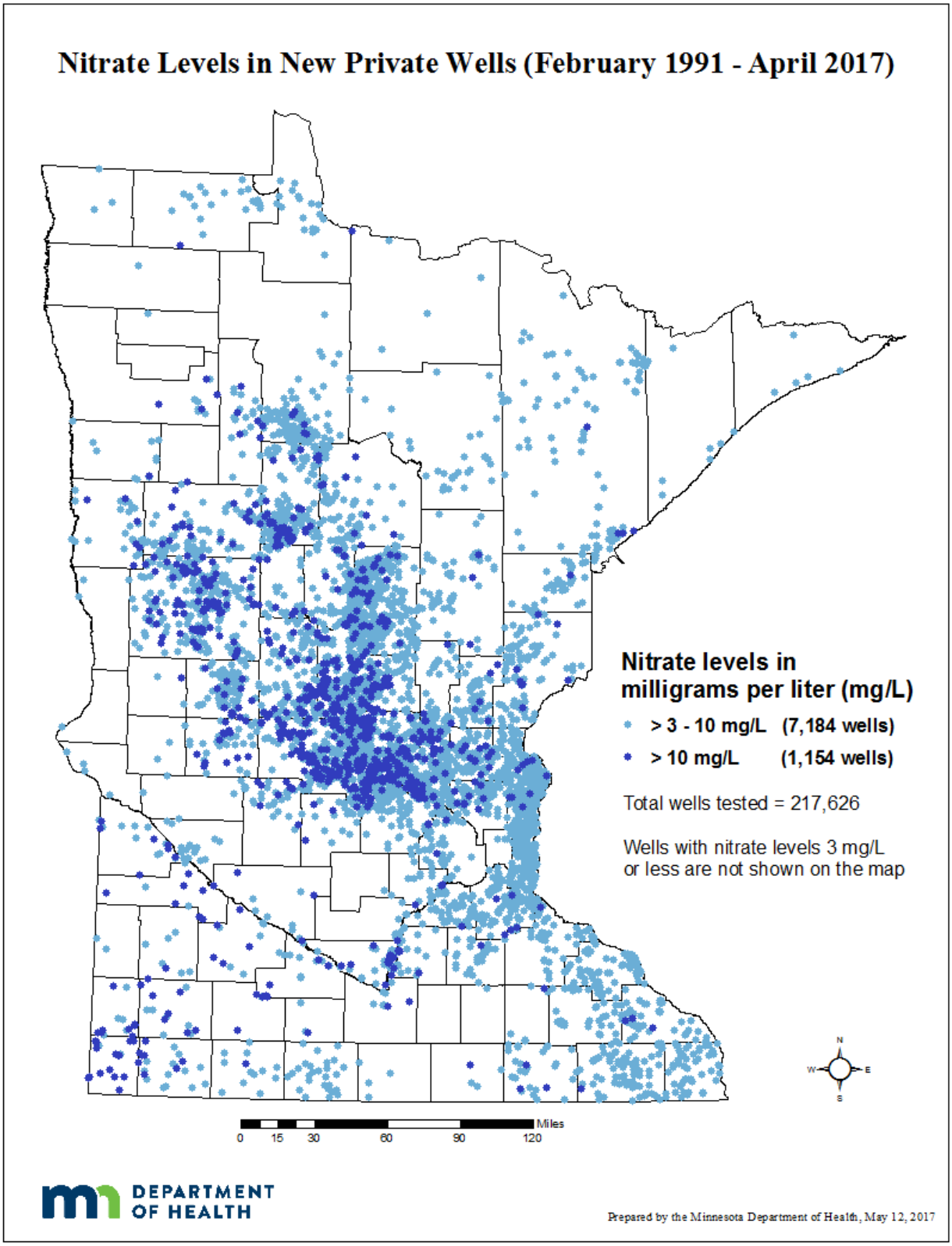


Figure 3

Figure 3 illustrates the location of private wells constructed since 1991 with nitrate concentrations above 3 mg/L and above 10 mg/L at the time of construction.

Various Minnesota communities that drink from groundwater wells have exceeded the safe drinking water standard for nitrate in recent years (Table 1), and others are approaching unsafe levels. The number of community water systems that treat for nitrate has increased from 6 systems serving 15,000 people in 2008 to 8 systems serving 50,000 people in 2014. One additional system blends water from a low nitrate well to meet the drinking water standard. If community water systems that either sealed a well or removed a well from use are included, the number of affected systems increases to 16 in 2016. These numbers are based on approved plans, inspections, and district engineers' reports and therefore may be underestimates.

Community water systems can use a number of strategies besides treatment to manage nitrate levels before a violation of the drinking water standard occurs. For example, systems can take a high nitrate well and reclassify it to only be used in case of emergency, remove the well from service, or seal the well so that it cannot be used again. While these strategies may appear to be more economical than adding a treatment process, there are still costs associated with each strategy - locating a new well site, drilling a new well, or treating for a different contaminant.

In May 2016, Fairmont became the first Minnesota community using surface water (Budd Lake) to experience a disruption in its system due to elevated nitrate levels in the lake. The system notified residents and used its backup well to dilute the nitrate. It now meets the drinking water standard. However, a report by the Minnesota Pollution Control Agency on "Nitrogen in Minnesota Surface Waters".[12] shows increasing trends in some water bodies.

Table 1: Community water systems with nitrate exceedances and costs of remediation

Community PWS with source groundwater above 10 mg/L (1/1/2011 to current)	Population (2016)	Past and Potential Future Actions	Estimated Capital Cost per Household (2016 dollars)
Adrian	1211	Wells sealed and treatment plant built.	$3,400
Brookhaven Development, Louisville Township, Scott County	45	Potential future new well.	$3,400
Chandler	270	Potential future hookup to LPRWS*.	Unknown
Clear Lake	525	Treatment plant to be replaced.	$7,900
Cold Spring	4,053	Potential new wells.	$1,100
Edgerton	1,171	Treatment plant built.	$3,500
Ellsworth	456	Well sealed and treatment plant built.	$3,600
Hastings	22,335	Treatment plant built.	$430
Leota	209	Interconnect to LPRWS* installed.	Unknown
Lincoln-Pipestone Rural Water System (LPRWS)	13,010	Potential blending wells and treatment plant improvements.	$180
Park Rapids	3,808	Wells sealed, new well constructed, and treatment plant built.	$3,100
Randall	650	future potential treatment plant	$7,400
Rock County Rural Water System	2,256	Transmission main built to blend wells.	$46
Saint Peter	11,758	Treatment plant built.	$1,700
Sundsruds Court, Todd Township, Wadena County	40	Treatment installed.	$450

[12] Minnesota Polution Control Agency, Report on nitrogen in surface water https://www.pca.state.mn.us/featured/report-nitrogen-surface-water

Many of the public water systems facing nitrate contamination are small and rural, and it is challenging for them to meet the financial, regulatory, and managerial requirements of water pollution. As shown in Table 1, the individual household cost of addressing nitrate in drinking water can vary dramatically depending on the fix needed and the size of the community. Large systems serving many customers often can provide treatment at a lower cost per gallon than small communities or private businesses or homeowners with wells. The cost of safe drinking water is not the same across the state, and often the sources of contamination are outside water suppliers' control.

Minnesota also has many "noncommunity" public water supply systems that are dealing with nitrate contamination. These are places where people work, gather, or play, which have their own drinking water systems and are not served by a community system. Several hundred of Minnesota's 6,000 noncommunity systems have groundwater sources affected by nitrate, and the financial impact of fixing the problem can be a financial strain for the business or organization, often costing thousands of dollars. Six noncommunity systems exceeded the standard for nitrate of 10 mg/L in 2016, requiring the systems' owners to take corrective action.

MDH currently works with public water systems to protect their water supply from pollution. Public water systems often work in partnership with other groups to encourage nutrient management and land conservation. Voluntary adoption of best management practices and land-use choices can make real change across Minnesota. However, water quality trends indicate that more drastic change is likely needed as agricultural pollution has become the "leading source of water quality impacts on surveyed rivers and streams, the second largest source of impairments to wetlands, the third largest source for lakes, and a major contributor to contamination of surveyed estuaries and ground water" according to the Environmental Protection Agency.

[For more on this topic, see the "Nitrate/Source Water Protection" section, on page 7, of the 2014 annual report at www.health.state.mn.us/divs/eh/water/com/dwar/report2014.pdf.]

Minnesota's Commitment to Ensuring Safe Water

Protecting water sources, treating the water, and testing the water after it is treated are all safeguards that assure an adequate supply of water that is safe to drink.

The Clean Water, Land, and Legacy amendment to the State's constitution in 2008 is a clear call from the citizens to protect Minnesota's sources of drinking water. Funding from this amendment helps communities build and/or improve drinking water infrastructure that complies with standards in the Safe Drinking Water Act. It provides much needed support to smaller communities who work hard to ensure their citizens are provided safe and affordable drinking water, which is a core public health function.

Governor Dayton also convened a water quality summit early in February 2016 and followed up with another in early 2017. "Clean, safe water is something we must insist upon," said Dayton, adding that what is needed is "not more laws and regulations. They are last resorts. What we really need is to establish the ethic of clean water practices. I urge you and I ask you to spend the day establishing our ethic-—that clean water practices are every Minnesotan's responsibility. Anything less is unacceptable. It is achievable if all of us do our part."

Protecting and supplying safe water depends on many organizations and individuals. While MDH administers and enforces the provisions of the federal SDWA on behalf of the EPA, we rely on our partners in areas ranging from government to industry to non-profit organizations to take active roles in the series of safeguards used to protect drinking water across the state.

These partners include everyone, including individual citizens. Everyone plays a part in ensuring safe water. As always, our aim with this report is to provide Minnesotans with a clearer picture of what is done to protect the quality of their drinking water and the success of the efforts to do so.

MDH Drinking Water Protection Activities and Resources

Overall Goal

Although it would be ideal to have all public water supplies provide water that meets all federal standards 100 percent of the time, the effects of storms, accidents, failing infrastructure or equipment and other upsets make that virtually impossible to achieve. Public water supply systems work hard to be prepared and anticipate problems. As a regulatory measure shared with the EPA, the Minnesota Department of Health (MDH) has a goal of 97 percent of the state's population that is served by a community water system receives drinking water that meets federal standards. In recent years, the goal has been exceeded with the results consistently above 99 percent.

2013	2014	2015	2016
99.2 %	99.3 %	99.2 %	99.4 %

Funding

The annual budget of MDH's drinking water program is approximately $17.2 million (Figure 2). Funding comes from a variety of federal and state sources. The three primary sources are:

- Public Water Supply Service Connection Fee: In 1992 the Minnesota Legislature established the service connection fee, which directs each municipal water system to collect an annual fee (currently $6.36) for each connection. These funds are sent to MDH to cover the costs of testing the nearly 6,800 public water systems in the state as well as to conduct inspections, develop protection plans, and provide technical assistance to these systems, which helps ensure that safe water is being provided to people in Minnesota.
- U. S. Environmental Protection Agency (EPA) grants and set-asides: The EPA provides direct funding through grants to states and allows states to use a portion of the funds provided for Drinking Water State Revolving Fund (DWRF) programs to administer the requirements of the Safe Drinking Water Act and provide for source water protection.
- Clean Water Fund: On November 4, 2008, Minnesota voters approved the Clean Water, Land, and Legacy Amendment (Minnesota Constitution, Article 11, Section 15) to the constitution to protect drinking water sources; to protect, enhance, and restore wetlands, prairies, forests, and fish, game, and wildlife habitat; to preserve arts and cultural heritage; to support parks and trails; and to protect, enhance, and restore lakes, rivers, streams, and groundwater. The amendment specifies that at least 5 percent of the Clean Water Fund be dedicated to drinking water protection. MDH's initiatives supported by the Clean Water Fund primarily focus on source water protection.

State Fiscal Year 2016-2017 Drinking Water Budget: $17.1 Million

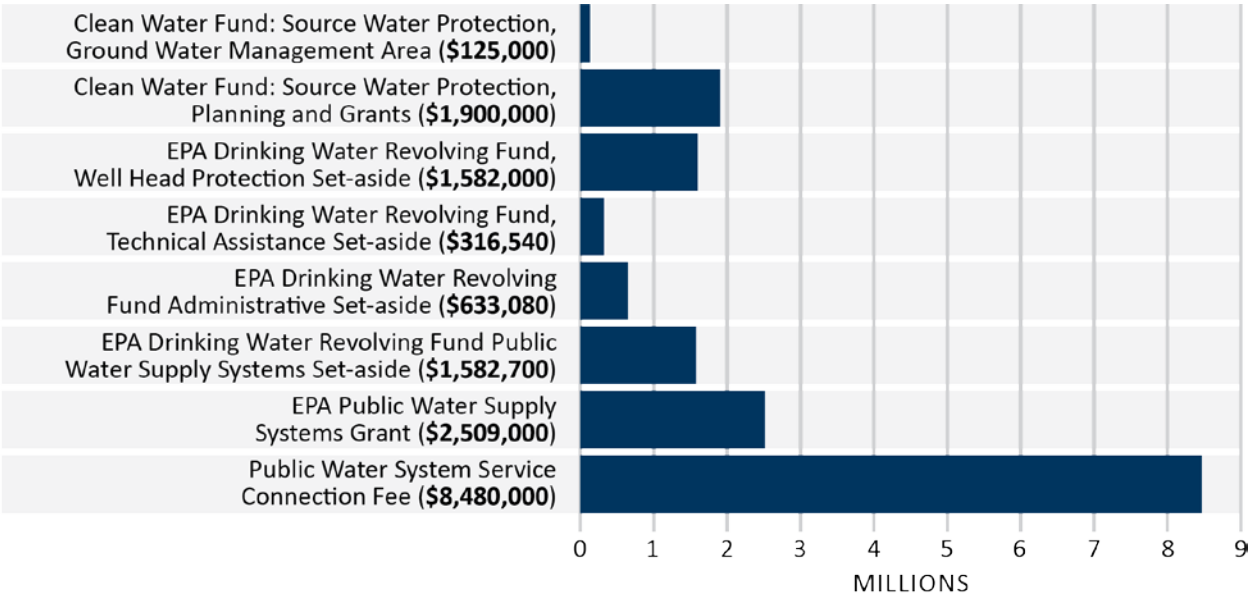


Figure 2: Sources of funding for Drinking Water Protection Section during State fiscal year 2016-17.

Minnesota Department of Health Drinking Water Protection Activities

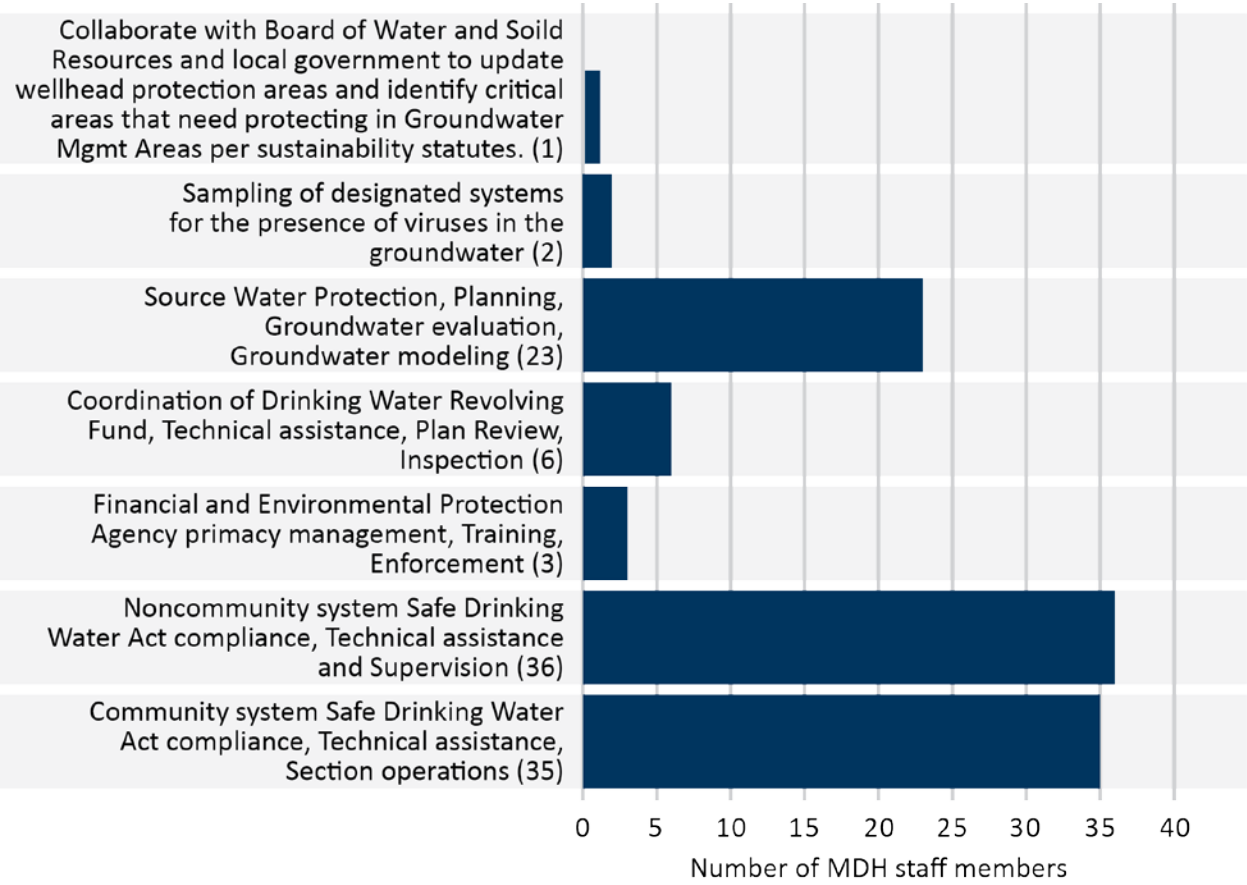


Figure 3: MDH deploys 106 staff strategically to implement the SDWA, assisting in the development and implementation of source water protection plans and encouraging compliance through extensive technical assistance and partnerships.

Drinking Water Revolving Fund

The Drinking Water State Revolving Fund is established by Congress and administered by the EPA to help public water systems obtain financing for improvements necessary to protect public health and maintain compliance with drinking water regulations. MDH, in coordination with the Public Facilities Authority, provides below-market-rate loans to public water systems through its Drinking Water Revolving Fund (DWRF). In fiscal year 2016, DWRF funded 25 projects totaling $48.7 million. For 2017, 145 projects are listed on the Intended Use Plan for a total cost of $326 million.[13].

Since the DWRF program's inception in 1998, a total of $783 million in projects were funded through 2015.

Total DWRF Awards by State Fiscal Year

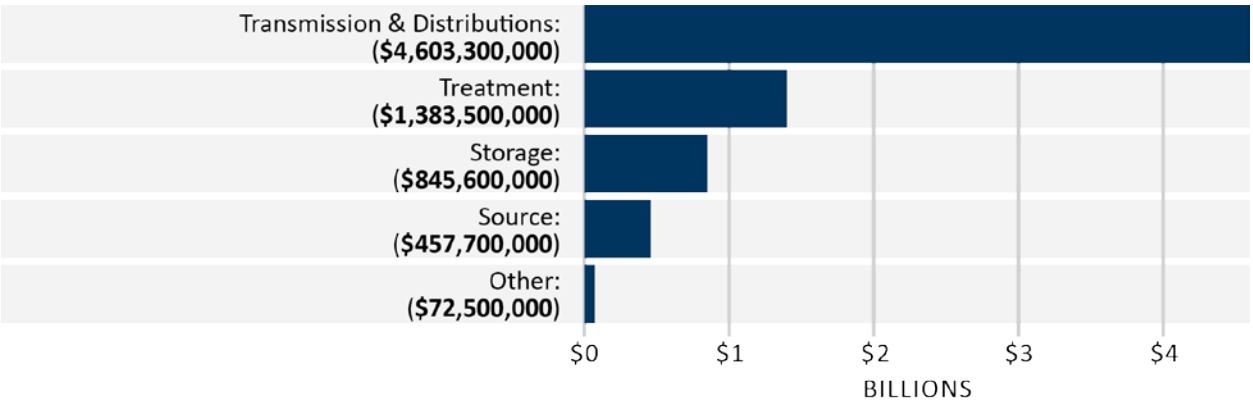
Fiscal Year	Loan	Grant	Loans	Grants
1999	42,400,225	770,833	25	2
2000	40,459,176	925,150	30	2
2001	18,615,146	500,000	16	1
2002	16,957,197	1,118,511	16	3
2003	52,215,504	972,000	27	2
2004	71,872,642	200,646	27	2
2005	36,963,537	1,070,341	16	3
2006	21,043,130	687,178	16	3
2007	87,067,323	1,991,281	21	4
2008	22,785,411	500,000	13	1
2009	24,630,904	1,389,660	15	5
2010	81,600,150	17,685,862	40	26
2011	75,061,256	7,071,583	29	9
2012	41,294,933	8,886,235	15	12
2013	6,016,785	2,885,367	12	6
2014	24,699,561	5,615,997	20	8
2015	60,139,061	7,348,855	19	9
2016	45,808,209	2,856,788	25	4
2017 (to Jan. 20, 2017)	40,481,204	841,389	14	2
Totals	**810,111,354**	**63,317,676**	**396**	**104**

[13] https://mn.gov/deed/assets/Drinking%20Water%20Revolving%20Fund%20Intended%20Use%20Plan_tcm1045-269584.pdf

Infrastructure Needs Survey and Investments in Infrastructure

The EPA conducts an assessment of the nation's drinking water infrastructure needs every four years and uses the findings to allocate funds for the states' Drinking Water State Revolving Fund programs. The most recent assessment results are reported in the 2011 Drinking Water Infrastructure Needs Survey and Assessment.[14] The results of the survey determined that the 20-year drinking water infrastructure need for Minnesota is almost $7.4 billion. The chart shows a cost breakdown of the needs by project type (transmission/distribution, source, treatment, storage, and other).

20-Year Drinking Water Infrastructure Needs for Minnesota by Project Type
Total Need - $7.4 Billion



Source: https://www.epa.gov/sites/production/files/2015-07/documents/epa816r13006.pdf

Protecting Public Water Supply Investments in Infrastructure

Plan review and construction inspections are two key strategies for drinking water protection, to help identify potential problems that may allow contaminants to enter drinking water in wells, treatment, storage, and distribution systems (e.g., watermains). These also help protect financial investments in the infrastructure and are a cost effective way to identify problems before construction and operation.

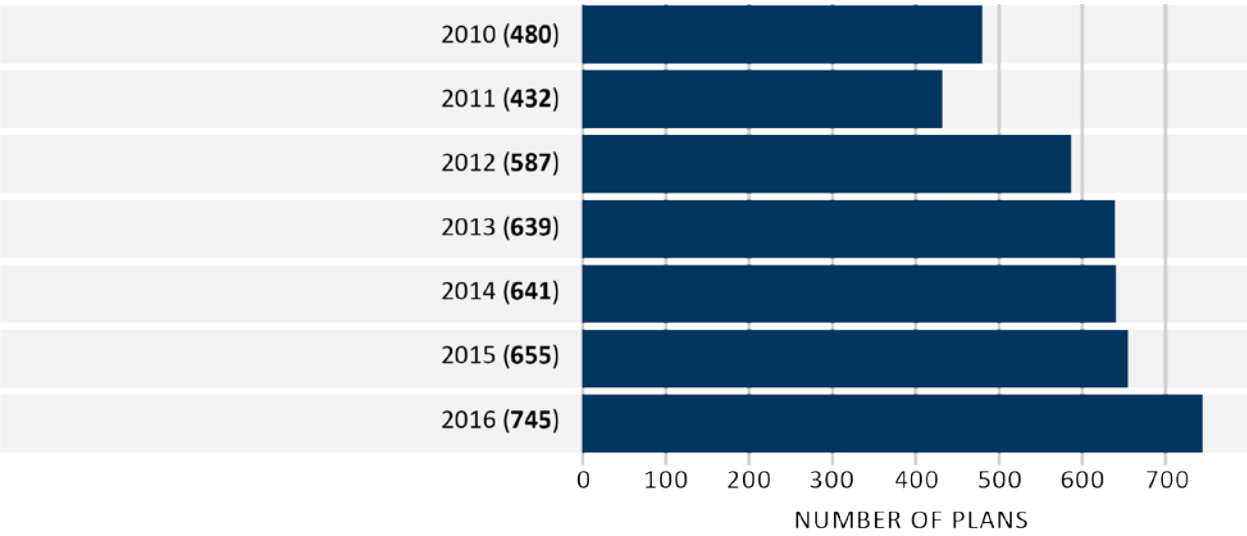
Plan Review

Ensuring proper construction for new and renovated drinking water infrastructure is another way of preventing problems before they happen. MDH reviews plans and specifications for drinking water infrastructure projects, such as treatment plants, watermains, wells, and water towers. This protects public health, avoiding possible cross connections and improper treatment of water, helping consulting engineers and the water systems they advise to comply with construction standards and ultimately the Safe Drinking Water Act. It can also save communities hundreds of thousands of dollars each year by having corrections made in the design phase rather than having to make costly modifications during the construction phase.

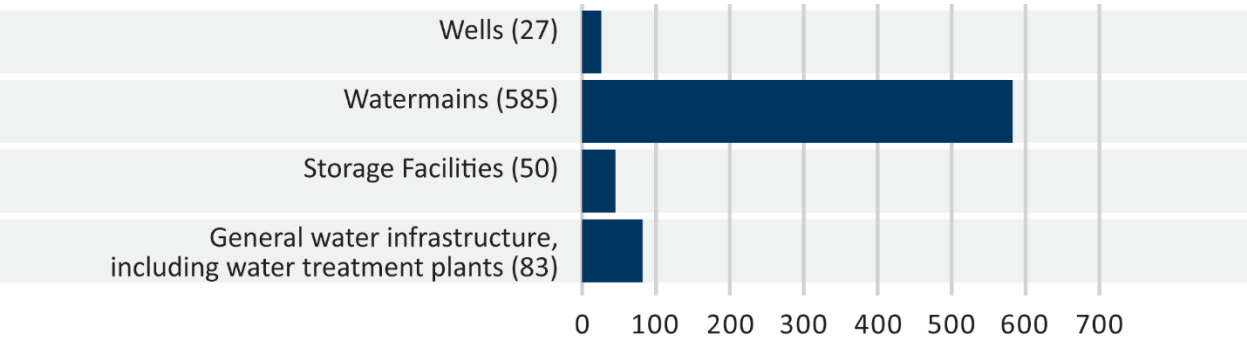
[14] www.epa.gov/sites/production/files/2015-07/documents/epa816r13006.pdf

The number of approved plans have risen steadily in the past few years, indicating growth following a recession.

Approved Community Water System Plans 2010 - 2016



2016 Approved Community Water System Plans



Watermain approvals, a partial indicator of housing starts, increased from 360 in 2010 to 585 in 2016.

Construction Inspections

Since 1998, construction inspections have been completed for all Drinking Water Revolving Fund (DWRF) projects, with the exception of watermains. In 2012, MDH created a new position with the purpose of conducting inspections on non-DWRF funded projects. Based on the size of the project, both interim and final inspections are conducted. A breakdown of the number of construction inspections conducted in 2016 can be seen below.

Construction Inspections Conducted in 2016

	Interim	Final
Drinking Water Revolving Fund	8	3
Non- Drinking Water Revolving Fund	2	9
TOTAL	10	12

Monitoring Results for Calendar Year 2016

This is a summary of monitoring results from 2016. In the case of a violation, a water system takes corrective actions. These actions include public notification to inform affected residents of the situation and if there are any special precautions they should take. In all cases noted here, residents were advised directly by the water system at the time the violation occurred.

All community water systems have also noted any violations in the annual water quality reports (also called Consumer Confidence Reports) they distribute to their residents. Information on a complete summary of monitoring results for 2016 is in the appendix.

Minnesota has 967 community water systems that serve water to people where they live; 731 of these are municipal water systems. The other community water systems include manufactured home parks, housing developments, nursing homes, and prisons.

Minnesota also has approximately 6,000 noncommunity water systems, which serve water in places that are not long-term residences. These can be schools and businesses that have their own water supply (that aren't on city water). They can also be resorts, restaurants, highway rest stops, and state parks.

Those that serve the same group of people every day, such as schools and businesses, are known as nontransient noncommunity systems. Nontransient systems are monitored for the same group of contaminants as community water systems; contaminants that can cause health problems from drinking that water infrequently and those that can cause problems over a lifetime of drinking that water. Those that people may only drink from infrequently are transient noncommunity water systems (for example, highway rest stops). Though more numerous, transient noncommunity systems do not need to be monitored as extensively as nontransient systems since individual people only drink that water infrequently. Transient systems are only monitored for contaminants that can cause immediate illness, coliform bacteria and nitrate.

PESTICIDES AND INDUSTRIAL CONTAMINANTS

During 2016, MDH conducted 42,224 tests for pesticides and industrial contaminants in 967 community water systems. No systems violated drinking water standards for these contaminants.

MDH conducted approximately 21,834 tests for pesticides and industrial contaminants in the 500 nontransient noncommunity water systems in the state. One system violated drinking water standards for carbon tetrachloride and is working with MDH and MPCA to remedy the situation.

BACTERIAL CONTAMINATION

Thirty-one community systems (3.2 percent), including 16 municipal systems (1.7 percent), tested positive for indicators of bacterial contamination in 2016.

All noncommunity water systems—transient and nontransient—are monitored for bacterial contamination. There were 218 samples that tested positive among the nearly 6,000 noncommunity systems, which worked with MDH staff to disinfect their systems and retest the water.

Standard procedures were followed in all of these cases. Systems were disinfected, flushed, and retested to ensure that any contamination problems had been eliminated. The cause of the contamination was corrected. All of the residents served by community water systems were informed of the situation and/or the information has been noted in the annual water quality reports (officially known as Consumer Confidence Reports) that water systems send to residents.

NITRATE/NITRITE

One community system exceeded the standard for nitrate in 2016. The system notified residents and began using its backup well to dilute the nitrate in the source water and now meets the drinking water standard. It also is using source water protection methods to help prevent the problem from happening again.

Six noncommunity systems (transient and nontransient) exceeded the standard for nitrate in 2016. These systems notified the people who used the water, offering bottled water to those with infants while working with MDH staff to remedy the problems.

ARSENIC

Six community water systems, including 4 municipal systems, and 4 nontransient noncommunity water systems, exceeded the standard for arsenic by the end of 2016.

No restrictions were placed on water consumption although residents were notified of the situation. While drinking water for many years at this level is a concern, residents were told the levels were not high enough to be an immediate health risk and were advised to consult with their doctors if they had health questions. Each of these systems has begun the process to meet the maximum contaminant level. Examples of actions systems may take include researching, starting, or completing approved infrastructure or operational changes. MDH will follow-up and work with these systems to bring them into compliance.

RADIOACTIVE ELEMENTS

Radiation occurs naturally in the ground, and some radioactive elements may work their way into drinking water.

RADIUM 226 & 228/GROSS ALPHA EMITTERS

Six municipal water systems exceeded the standard for radium 226 & 228 by the end of 2016; two municipal systems exceeded the standard for gross alpha emitters, which are parts of radioactive elements.

No restrictions were placed on water consumption although residents were notified of the situation. Residents were told that this

was a long-term concern and not high enough levels to be an immediate health risk. They were advised to consult with their doctors if they had any questions. Each of these systems has either started or completed infrastructure changes or is studying alternatives to meet the maximum contaminant level.

Noncommunity water systems are not regulated for radioactive elements.

OTHER INORGANIC CHEMICALS

MDH also monitors for inorganic chemicals, such as barium, chromium, and mercury. No community or noncommunity water systems exceeded the standard for inorganic chemicals in 2016.

DISINFECTION BY-PRODUCTS

Three community water systems exceeded the standard for disinfection by-products in 2016. The systems are resolving the issues and two are back in compliance. No noncommunity water systems exceeded the standard.

LEAD AND COPPER

As a result of the Lead and Copper Rule, implemented by the EPA in 1991, community water systems began sampling for lead and copper in 1992. These contaminants differ from others in that they are rarely present in source water. Rather, lead and copper may appear in water by dissolving from parts of the distribution system, often household plumbing. Monitoring for lead and copper is done in individual homes and on a case-by-case basis. Samples are taken after the water has been idle, resulting in elevated levels. If more than 10 percent of the homes sampled in a community are above the action level (15 parts per billion for lead and 1,300 ppb for copper), the water system will be in exceedance and must take corrective actions and begin an ongoing public education program. The actions include corrosion control measures, such as adjusting water chemistry to make it less corrosive or less likely to absorb lead and/or copper from the plumbing.

Since the initiation of the lead and copper monitoring program in 1992, more than 250 community water systems in Minnesota have exceeded the lead and/or copper action levels. Most systems have returned to compliance after implementing corrective actions; however, approximately 5 to 10 systems end each year with a lead or copper exceedance.

In 2016, six community systems (0.6 percent) exceeded the lead action level, and 23 (2.4 percent) community systems exceeded the copper action level; seven noncommunity systems exceeded the lead action level, and 10 noncommunity systems exceeded the copper action level. These systems are exploring options for returning to compliance and are conducting a public education program. MDH continues to work with these systems and has been doing its own education campaign since the early 1990s with information about lead and copper and simple precautions, such as flushing faucets when the water hasn’t been used for several hours, people can follow to reduce their exposure.

Conclusion

Monitoring test results for 2016 are consistent with previous years in that public water systems in the state and are generally safe and free of harmful contamination. Although we need to remain vigilant, Minnesotans can continue to have confidence in their drinking water.

The Minnesota Department of Health (MDH) remains committed to protecting the high quality of our drinking water. Personal decisions regarding everything from the products we use and how land is managed for industry and agriculture will have a telling effect on the future of our environment and ultimately our drinking water. Professionals in the water industry work every day to protect and maintain our drinking water, but this is a role that extends to every person who uses water - in other words, everyone.

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 MDH - and the broader public health community - are working to ensure that their confidence is well placed.

Planning for the Future

Each of these examples of drinking water contamination provides insights that can assist state and local agencies and citizens to be proactive to help us prepare for the future of our drinking water protection. These threats – from lead, spills, harmful algal blooms, and nitrate contamination – can be met. We'll need to do that with continued diligence and expansion of efforts including:

- source water protection of our ground and surface waters (note: source water protection plans for public water supplies using surface waters are not required, although some have been prepared voluntarily)
- emergency preparedness to respond to spills, storms, events like harmful algal blooms, and other disruptions
- improvements in monitoring, public information and education, and mitigation of hazards from lead in drinking water
- monitoring and surveillance for unregulated contaminants in drinking water,
- increased understanding of the health impacts of drinking water contaminants.
- monitoring and understanding risks to private wells from land use activities and naturally occurring contaminants, and strategies to reduce risks
- continued and increased investment in public drinking water infrastructure to meet treatment needs and repair and replace aging watermains and other facilities, whose failure can lead to contamination of drinking water.

Appendix

Summary of Safe Drinking Water Monitoring Results for Minnesota

The summary includes results for both community and noncommunity public water systems in Minnesota in 2016. Public water supply systems include all systems that serve at least 15 service connections or serve an average of at least 25 people for at least 60 days a year. There are 6,787 such systems in Minnesota, including:

967 community systems, which provide water to consumers in their places of residence, including 731 municipal systems.

5,820 noncommunity systems, which provide drinking water in settings like factories, schools, restaurants, and highway rest stops.

A report that lists all violations of the Safe Drinking Water Act in Minnesota for calendar year 2016 is available from the Drinking Water Protection Section, Minnesota Department of Health, P.O. Box 64975, St. Paul, MN 55164-0975. This is also available at:

http://www.health.state.mn.us/divs/eh/water/com/dwar/summary2016.pdf [PDF]
http://www.health.state.mn.us/divs/eh/water/com/dwar/pwsid2016.pdf [PDF]
http://www.health.state.mn.us/divs/eh/water/com/dwar/contaminant2016.pdf [PDF]

Individual water systems produce an annual report listing contaminants that were detected, even in trace amounts, during the previous calendar year. The individual water system may be contacted for a copy of this report.

We acknowledge the many citizens, professionals, organizations, and agencies that work to protect and restore our water resources and provide safe drinking water to Minnesota citizens. Some areas in Minnesota have aquifers so pristine that at this time they require no treatment to provide safe drinking water. However, our ground and surface waters can be contaminated both by natural processes and by our human activities, and demand for water keeps increasing across Minnesota. It is because of the work of these people as individuals and as members of businesses, organizations, and government agencies that anywhere in Minnesota, citizens can feel confident that the drinking water provided by public water supplies meets all federal drinking water standards.

Our thanks to:

- Minnesota Rural Water Association
- American Water Works Association and its Minnesota Section
- Local government staff including counties, townships, and municipalities
- Nonmunicipal public water system staff and operators
- Landowners
- Business and industry owners
- Food, beverage, and lodging facilities owners and staff
- Manufactured housing development operators
- Schools and churches
- Treatment and correctional Facilities
- Board of Water and Soil Resources
- Minnesota Pollution Control Agency
- Minnesota Department of Natural Resources
- Minnesota Department of Agriculture
- Metropolitan Council
- Environmental Quality Board
- Clean Water Fund
- Public Facilities Authority
- Elkay
- H2O for Life
- U. S. and Minnesota Geological Survey
- Minnesota Ground Water Association
- Minnesota Water Well Association
- Suburban Utility Superintendents Association
- Water Resource Programs at Vermilion Community College,
  St. Cloud Technical and Community College, and the University of Minnesota
- Association of State Drinking Water Administrators
- U. S. Environmental Protection Agency

Safe Drinking Water Is Everyone's Job