

MAINE STATE LEGISLATURE

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PUBLIC DRINKING WATER IN MAINE

A Report from the Maine CDC Drinking Water Program



Annual Report 2017



Maine Center for
Disease Control and Prevention

An Office of the
Department of Health and Human Services

Paul R. LePage, Governor

Ricker Hamilton, Commissioner

Introduction

Dear Reader:

I am pleased to introduce the annual report of Public Drinking Water in Maine. This report is intended to provide you with an overview of public water system compliance, public drinking water quality, and the State of Maine Drinking Water Program's efforts in ensuring safe drinking water.

Safe and reliable supplies of drinking water are essential for public health protection, as well as the economic viability of communities. Maine is fortunate to have an abundance of clean water available for public water systems to collect, treat, store, and distribute.

The Drinking Water Program, which is part of the Maine Center for Disease Control and Prevention, within the Department of Health and Human Services, is responsible for ensuring that public water systems are in compliance with federal and state regulations related to safe drinking water. The Department of Health and Human Services has been providing public health protection through drinking water regulations since the early 1900s when typhoid and cholera outbreaks were common due to the consumption of contaminated drinking water. In 1976, the Drinking Water Program began administering the federal Safe Drinking Water Act.

Since then, public water systems have been required to meet an increasing number of rules and regulations related to safe drinking water. When water systems are in compliance with these regulations the water they serve is determined to be "safe."

I express my appreciation to the women and men across Maine who diligently work to ensure that high quality, affordable public drinking water is supplied to consumers in Maine. I hope you find this report informative and helpful.

Yours for safe drinking water,

Mike



Michael Plaziak
Acting Program Manager
Maine CDC Drinking Water Program

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About the Drinking Water Program

Primacy

The Maine CDC Drinking Water Program carries out the Federal Safe Drinking Water Act, which is administered through the National Primary Drinking Water Regulations. Maine was granted primacy by the United States Environmental Protection Agency.

Maine Legislative Authorization

The Maine Legislature enacted Maine's Water for Human Consumption Act to authorize Maine to administer both State rules and Federal safe drinking water regulations. This law grants the Drinking Water Program oversight of all operational aspects of public water systems in Maine that impact drinking water service and public health.

Mission Statement

The Drinking Water Program works to ensure safe drinking water and protect public health in Maine by administering and enforcing drinking water and subsurface wastewater regulations and providing educational, technical, and financial assistance.

Organization

Drinking Water Program is organized into three teams: Engineering and Water Resources, Data Management and Program Support, and Public Water System Inspection. Each team plays a crucial role in ensuring that Maine's public water systems provide safe, reliable drinking water to their customers.

The Role of Drinking Water in Public Health Protection

The United States has one of the safest public drinking water supplies in the world. Over 286 million Americans consume tap water from community public water systems. The U.S. Environmental Protection Agency regulates drinking water quality in public water systems and sets maximum concentration levels for pollutants in water.

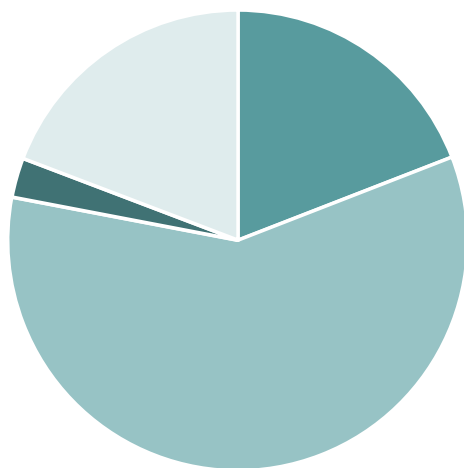
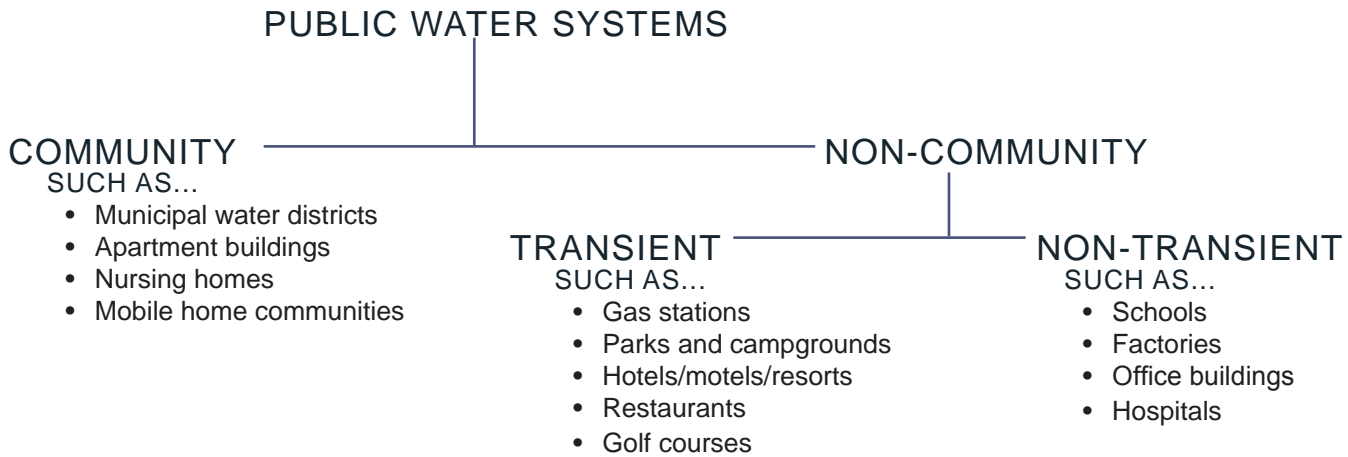
Drinking water sources are susceptible to pollution and sometimes require appropriate treatment to remove disease-causing contaminants. Contamination of drinking water supplies can occur in the source water and the distribution system. Sources of water contamination include naturally-occurring chemicals and minerals (e.g., arsenic, radon, uranium), local land use practices (e.g., fertilizers and pesticides), manufacturing processes, and sewer overflows or wastewater releases.

The presence of contaminants in water can lead to adverse health effects, including gastrointestinal illness, reproductive problems, neurological disorders, and cancer. Infants, young children, pregnant women, older populations, and those with compromised immune systems may be especially susceptible to illness from some contaminants.

Public Water Systems in Maine

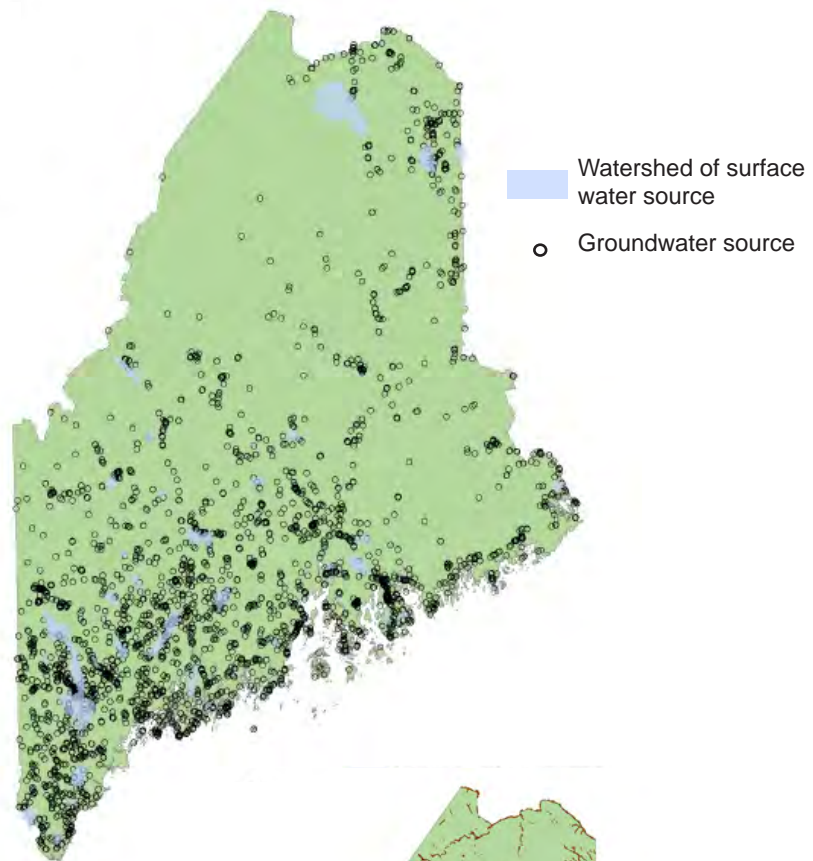
What is a Public Water System?

Public water systems provide water for human consumption through pipes and other constructed conveyances (distribution system) to at least 15 service connections, or serve a minimum average of 25 people for at least 60 days per year. Public water systems are divided into two categories: Community and Non-Community. Non-Community systems are identified as either Transient or Non-Transient.



- COMMUNITY**
371 water systems serving over 673,000 people
- NON-TRANSIENT, NON-COMMUNITY**
373 water systems serving approximately 64,000 people
- TRANSIENT, NON-COMMUNITY**
1,143 water systems serving over 186,000 people
- BOTTLE WATER/VENDING MACHINES**
54 water systems (populations served is not available for this type of system)

Maine has nearly **1,900** public water systems that use **surface** or **groundwater**.



Maine Surface Waters

Maine has **4,537** square miles of surface waters, making up approximately 13% of the State's total area (US Geologic Survey). This includes over **6,000** lakes and ponds and over **32,000** miles of rivers and streams. Maine has **59** surface waters that serve as the source of drinking water for Mainers.



Significant Sand and Gravel Aquifers in Maine

Aquifers are geologic formations that are capable of yielding a usable amount of groundwater to a well. "Significant" sand and gravel aquifers refer to those that are likely to provide drinking water supplies (as defined by the Maine State Legislature). Maine has **1,300** square miles of mapped sand and gravel aquifers.

Public Water System Responsibilities

While the Drinking Water Program serves as the regulatory body for public drinking water systems in Maine, the systems themselves are responsible for ensuring their ability to provide safe drinking water. These responsibilities include routine operations and maintenance, regular sampling of post-treatment drinking water, and reporting data to both the Drinking Water Program and the consumers they serve.

Operations and Maintenance

Regardless of size and complexity, no public water system can be fully automated. All systems require human oversight and every piece of equipment requires some level of maintenance. Some water systems must employ licensed water operators with qualifications that match the complexity of the water system equipment. To ensure all public water systems serve safe drinking water to the public, sanitary surveys are performed every three to five years. Sanitary surveys are routine inspections conducted by the Drinking Water Program’s public water system inspectors. See more on sanitary surveys on page 8.

Routine Sampling

Depending on the type of public water system and water source, water quality testing is required for a variety of contaminants on a routine basis. Specific sampling requirements for public water systems may differ based on site specific characteristics and water quality results. Table 1 details a general sampling summary by system type. (See page 23 for a complete list of regulated contaminants.)

Table 1. Routine sampling schedules for public water systems.

		Total Coliform Bacteria	Nitrates	Inorganics	Volatile Organics*	Synthetic Organics*	Lead & Copper	Radio-nuclides	Disinfection Byproducts
T		Quarterly or Monthly	Annually	Determined by Sampling History					
NTNC	Surface Water			Annually	Based on Risk and Results History (Annually - Every 6 years)	Based on Risk and Results History (Quarterly - Every 3 Years)	Based on Population and Results History (6 months - 3 years)	Not Applicable	Quarterly
	Groundwater			Every 3 Years					Based on Population: > 500 - Annually; < 500 - Every 3 Years
C	Surface Water			Annually	Based on Risk and Results History (Annually - Every 6 years)	Based on Risk and Results History (Quarterly - Every 3 Years)	Based on Population and Results History (6 months - 3 years)	Determined by History (Quarterly - 9 years)	Quarterly
	Groundwater	Every 3 Years	Based on Population: > 500 - Annually; < 500 - Every 3 Years						

T = Transient, Non-Community NTNC = Non-Transient, Non-Community C = Community

* Waivers available to allow decreased sampling frequency

Reporting to the Maine Drinking Water Program

Sample Results

Public water systems send water samples to certified laboratories for analysis, and these laboratories report the sample results to the Drinking Water Program within the time-frame set by the system's specific requirement. Although the certified laboratory reports sample results directly to the Drinking Water Program, the public water system is ultimately responsible for ensuring that water quality results are submitted on time and correctly reported.

Monthly Operating Reports

All public water systems that add chemical(s) to their water systems for treatment are required to send monthly operating reports to the Drinking Water Program by the tenth day of the month following the month in which samples were collected.



Reporting to Consumers

Consumer Confidence Reports

Every year, community water systems are required to develop and distribute a Consumer Confidence Report. These reports detail the previous year's water quality information and must be shared with consumers and the Drinking Water Program by July 1 every year. Public water systems are also required to provide evidence to the Drinking Water Program that Consumer Confidence Reports were delivered to consumers.

Public Notification

The Public Notification Rule requires public water systems to notify consumers when a violation occurs. Scope and delivery method of public notices vary, depending on the type of violation.

Maine's Community Water Systems Meet Federal Standards

2017 Community Water Systems Performance Data

Under the Government Performance and Results Act for Drinking Water, the EPA collects data related to reported health-based violations of drinking water standards. As illustrated in the table below, Maine has met standards based on the 2017 EPA National Target for safe drinking water.

	Community Systems ¹	Community Population ²	Community "Person Months" ³
2016 US EPA National Target	90%	92%	95%
2017 Actual US EPA Region 1⁴ Results*	96.2%	98.4%	99.2%
2017 Maine Results*	95.5%	98.6%	98.8%

*Based on 2017 3rd quarter data.

¹ Community Systems: Community water systems meeting all health-based standards.

² Community Populations: Population served by community water systems that meet all health-based standards.

³ Community "Person Months": *Person months* refers to the time during which a community water system provides drinking water that meets all applicable health-based standards, calculated by multiplying the community's population by 12 months.

⁴ EPA Region 1 encompasses the six New England states (Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island) and ten Tribal nations residing within that geographic area.



Support for Maine's Public Water Systems

Site Visits to Public Water Systems

The Drinking Water Program's public water system inspectors provide on-site advice and assistance to public water systems regarding operation, maintenance, treatment, quality control, testing waivers, and testing requirements. The Drinking Water Program also partners with Maine Rural Water Association to provide water systems with free, on-site technical assistance. Technical assistance is available to help systems with reviewing the operation of a treatment process, collecting samples, filling out reports, regulatory compliance, leak detection and line location, and development of emergency response plans and vulnerability assessments.

	2010	2011	2012	2013	2014	2015	2016	2017
Number of Site Visits Completed	562	640	718	794	640	631	587	405

Sanitary Surveys: 2008-2017

Public water system inspectors conduct routine sanitary surveys for each public water system. A sanitary survey is a review of a water system to identify any deficiencies and make recommendations for improvements. The sanitary survey also offers a chance for public water system operators to ask questions and learn about their requirements and responsibilities.

Community water systems and bottled water facilities are inspected every three years, while non-transient, non-community water systems and transient water systems are inspected every five years.

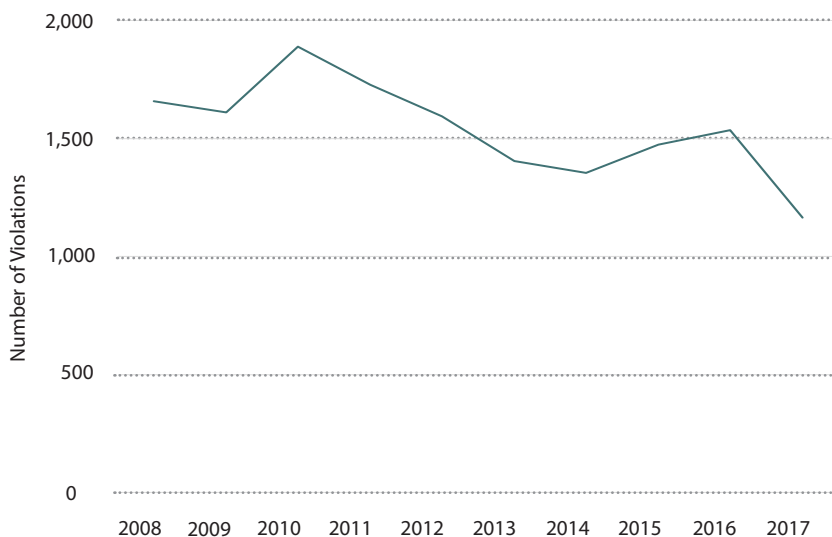
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Number of Sanitary Surveys Completed	434	395	467	409	493	481	464	446	301	450

Measures

Measuring the Success of Maine's Public Water Systems

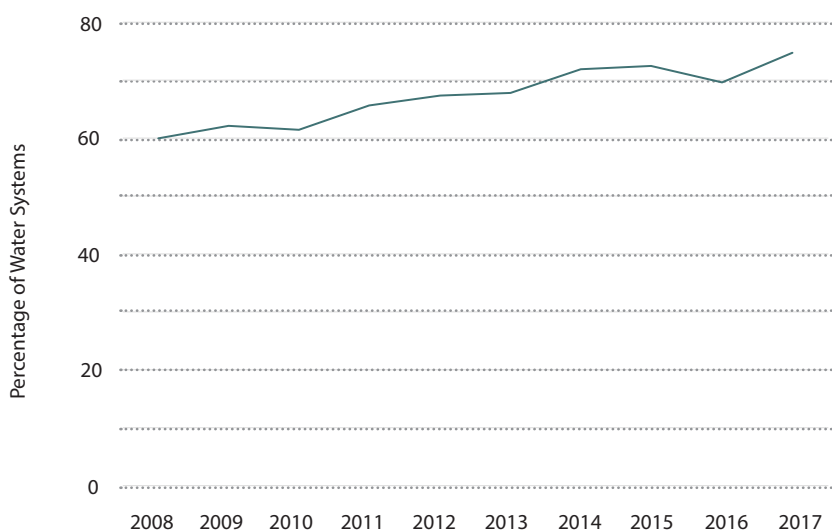
Comparing rates of public water system compliance from year to year is one method of measuring the success of public water systems in supplying safe drinking water. Violations are issued to public water systems when a system does not meet all the regulations mandated by the Safe Drinking Water Act.

This report illustrates a number of measures to describe the state of public drinking water in Maine over the past ten years. As is evident in the data presented here, public water systems in Maine have been steadily improving and we hope to continue this trend into the future.



Total Number of Violations Incurred by Year

Total number of violations issued to public water systems over the past decade. There has been a decreasing trend over the past decade, with a high of 1,889 violations in 2010 and a low of 1,164 violations issued in 2017.



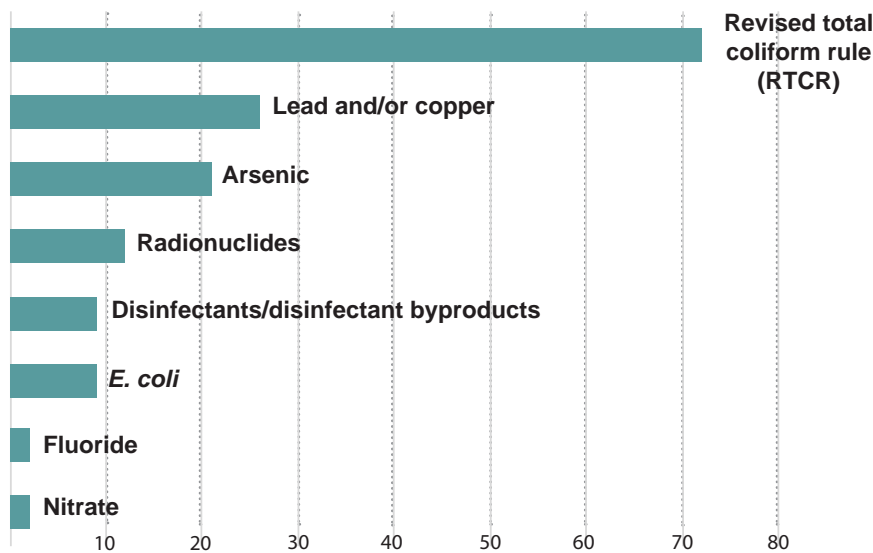
Public Water Systems in Compliance

Percentage of water systems in compliance (receiving no violations) over the past decade. Overall, the percentage of systems without any violations has steadily increased over the past ten years, an important gain for public health and safety.

Health-based and non-health-based violations

Health-based violations are issued when water sample results show the presence of contaminant(s) at numbers above a **maximum contaminant level** or when a **treatment technique** requirement is not met. The maximum contaminant level is set by the Environmental Protection Agency and is based on human health and safety standards. The treatment techniques are specified processes intended to reduce the level of a contaminant.

Non-health-based violations are violations that are not directly related to human health and safety. These types of violations typically arise when public water systems neglect to report test results to the Drinking Water Program, fail to test drinking water for a regulated contaminant, and/or fail to notify their customers of violations of the federal Safe Drinking Water Act.



Health-Based Violations Issued in 2017 for Regulated Contaminants

Violations are issued when a sample result from a public water system exceeds a drinking water standard for a regulated contaminant. In 2017, violations issued under the revised total coliform rule (RTCR) were the most common health-based violations, representing 47% of the total violations (n=72) for the year.

DEFINITIONS

MAXIMUM CONTAMINANT LEVEL (MCL)

A maximum contaminant level is the highest level of a contaminant that is allowed in drinking water. These levels are set as close as feasible to the *maximum contaminant level goal* or MCLG. The MCLG is the level of a contaminant in drinking water below which there is no known or expected health risk. When the MCL level is set for a contaminant, public health, available technology, and cost are all taken into consideration.

TREATMENT TECHNIQUE (TT)

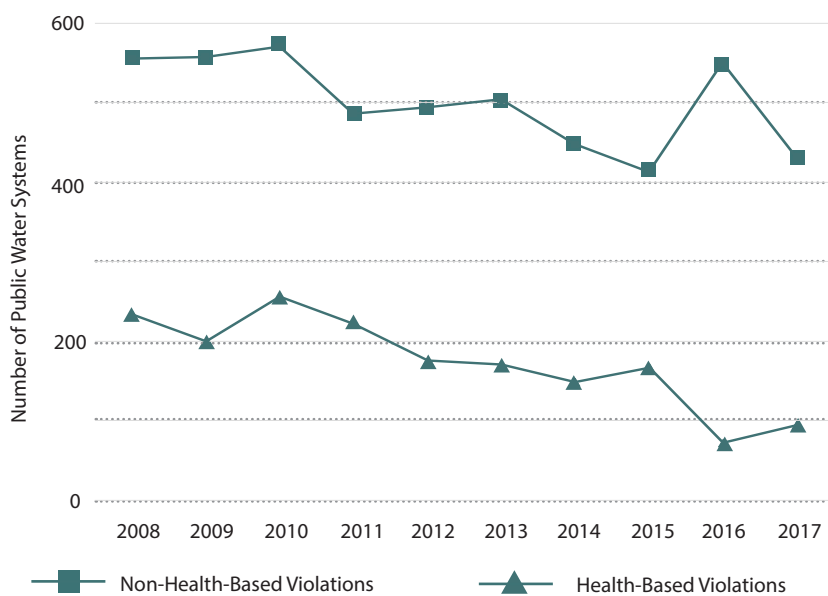
Treatment techniques are water treatment processes that reduce the level of contamination in drinking water. For certain contaminants, the EPA establishes treatment techniques instead of an MCL. Some treatment techniques are water treatment processes, such as those established for viruses, bacteria, and turbidity under the Surface Water Treatment Rule. Other treatment techniques involve public education requirements, as in the case of the Lead and Copper Rule.

Measures



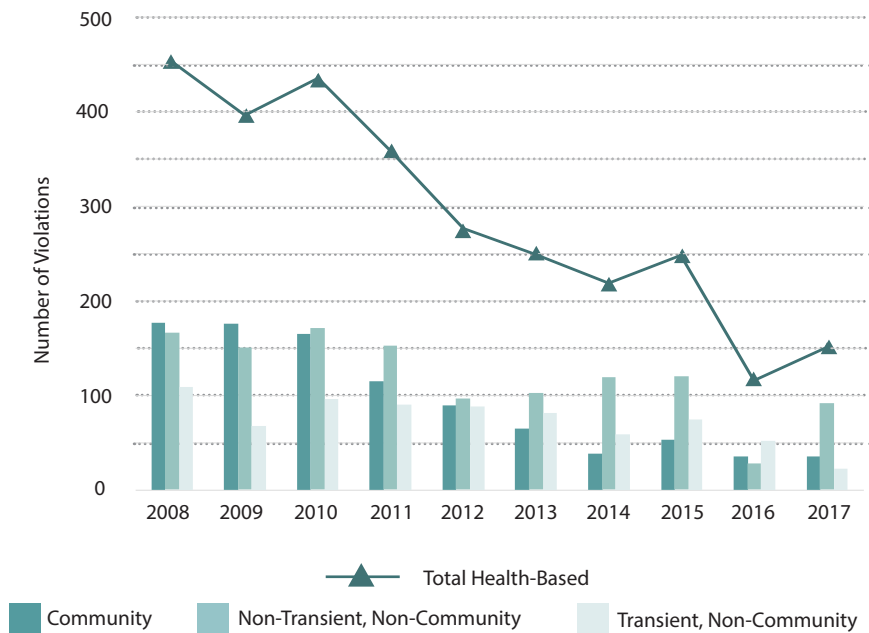
Total Violations Issued to Public Water Systems

Total violations over the past decade. Non-health-based violations reached an all time low of 1,011 in 2017.



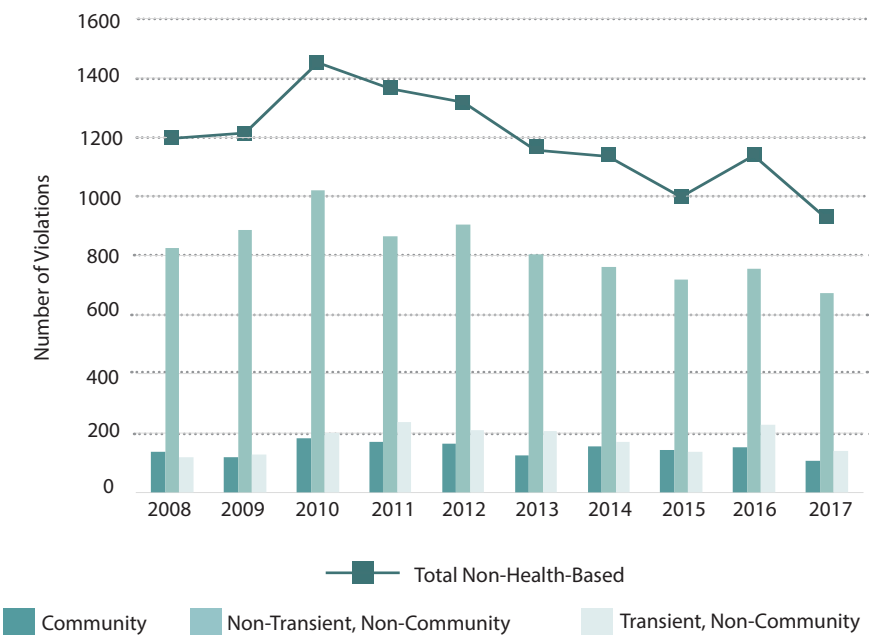
Total Number of Public Water Systems Receiving Violations

Total number of public water systems receiving violations over the past decade.



Health-Based Violations Issued to Public Water Systems

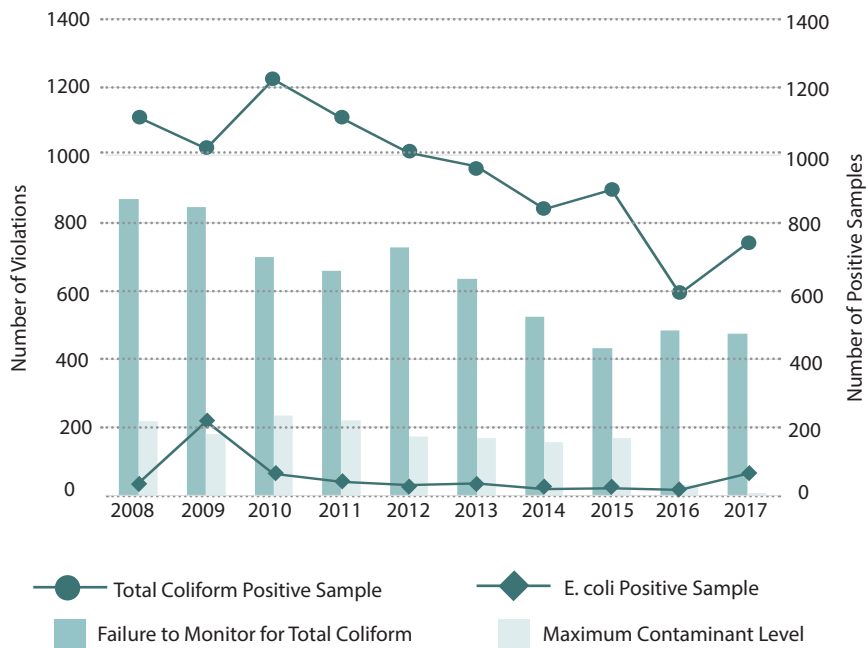
Ten years of total health-based violations by public water system type.



Non-Health-Based Violations Issued to Public Water Systems

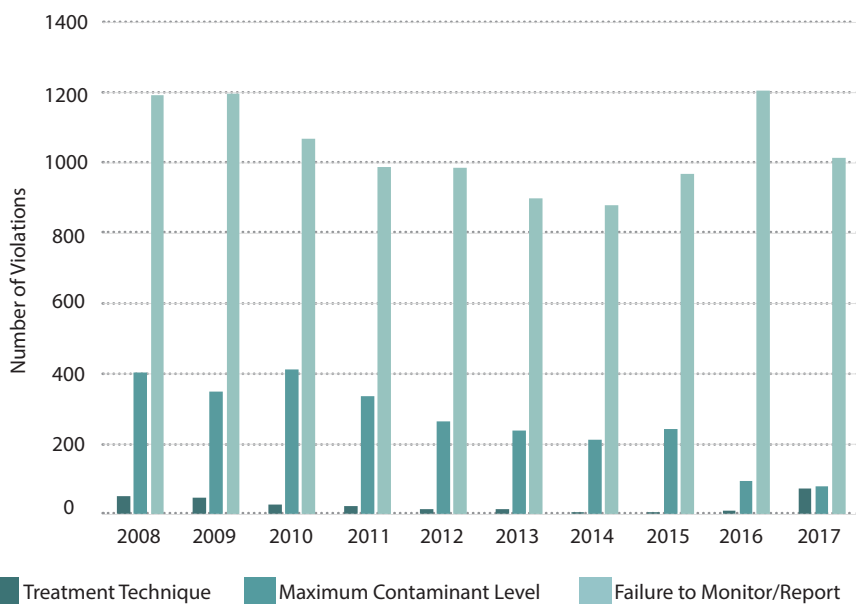
Ten years of total non-health-based violations by public water system type. While non-transient, non-community water and community water systems routinely keep violation numbers near or fewer than 200 per year, transient-non-community water systems tend to receive more non-health-based violations.

Measures



Compliance Measures Related to Health-Based Violations of the Total Coliform Rule

Compliance measures related to the health-based violations of the Total Coliform Rule. This figure shows data for failure to monitor and total maximum contaminant level (MCL) violations of the Total Coliform Rule as well as the total number of positive coliform bacteria samples and total number of positive *E. coli* samples.



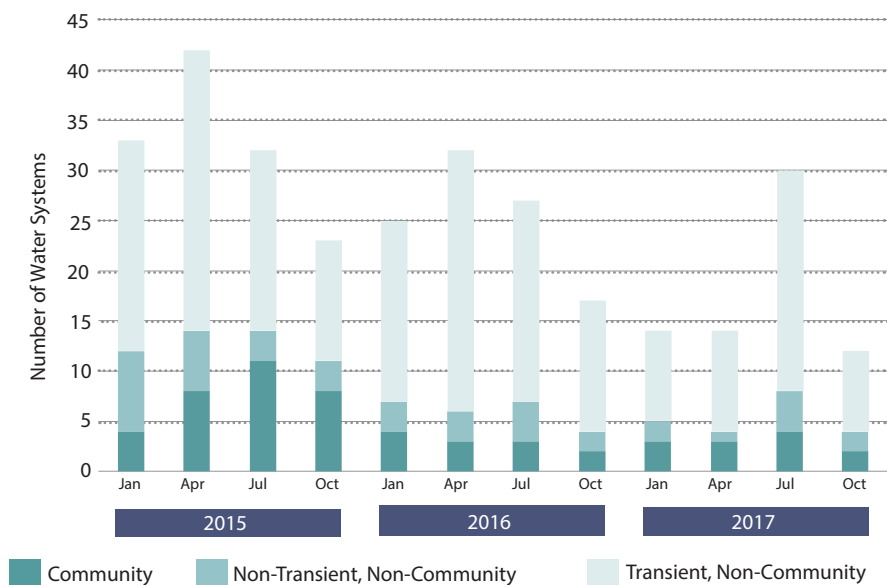
Total Number of Violations by Violation Type

Public water systems may receive violations in the form of: maximum contaminant level (MCL) (see page 10), treatment technique (see page 10), or failure to monitor/failure to report violations. As is evident in the data, failure to monitor or report violations occur much more frequently. Failure to monitor violations arise when a public water system either does not test for a contaminant it is required to test for, or does not report results to the Drinking Water Program.

Enforcement: Serious Violators

Enforcement of public water systems occurs when a public water system violates federal or State drinking water regulations and does not address the non-compliance issue in a timely manner. The U.S. Environmental Protection Agency’s Enforcement Targeting Tool is a method for determining which public water systems require enforcement actions. The tool extracts data from each primacy agency in the country, including the Maine CDC Drinking Water Program, in order to identify public water systems with violations that do not appear to have been resolved or addressed. It uses a set formula based on violation type, length of violation, type of public water system, and population served.

Using this formula, public water systems are prioritized for enforcement action in an effort to facilitate a return to compliance. Any public water system scoring 11 points or higher is considered ‘priority’ status. The Drinking Water Program must address or resolve priority status systems within 60 days of the Environmental Protection Agency’s quarterly Enforcement Targeting Tool report. Each quarter, the Drinking Water Program researches the accuracy of all of Maine’s priority-status public water systems on the Enforcement Targeting Tool list and reports progress or status of each system to the Environmental Protection Agency.



EPA’s Enforcement Targeting Tool

Number of public water systems in Maine by system type listed on the EPA's Enforcement Targeting Tool. These systems have a "priority" status due to repeated compliance issues and generally must be addressed with an enforcement action.

Keeping Maine's Drinking Water Safe

The Drinking Water Program's Core Message

The Drinking Water Program promotes a core message of four principles designed to ensure that public water systems provide safe drinking water to their customers. The core message encourages water systems to continually work to identify, reduce, and eliminate risks and vulnerabilities to their water systems. The Drinking Water Program works to convey this message to all of Maine's public water systems on a daily basis through every interaction – whether a phone call, site visit, training session, or article in our quarterly newsletter, the *Service Connection*.

The four principles of the Drinking Water Program's core message direct public water systems toward the overarching goal of ensuring safe drinking water for all their consumers.



Source Protection

According to the US EPA, *treating* contaminated groundwater supplies is on average 30-40 times costlier than *preventing* contamination.¹

The Importance of Drinking Water Source Protection

The ideal drinking water source is in a remote, forested natural area with no nearby sources of pollution. However, most water sources are located near more densely populated areas, increasing the vulnerability of the source to contamination. Contamination, whether from harmful chemicals or biological organisms, often comes from activities on the land close to a drinking water source. The Safe Drinking Water Act requires all public water systems to produce safe water through a *multiple-barrier* approach. Source protection is the first and most important component of these barriers. If pollutants never reach a drinking water source, the risk for human consumption is greatly diminished – even if other barriers fail. Additionally, treating a contaminated drinking water is typically much more costly than protecting a drinking water source area.

Keeping Contamination Away

Approval of a new public water system well requires contamination sources, particularly leach fields and underground fuel storage tanks, to be set back a minimum distance from a well. The Maine Rules Related to Drinking Water require all public water system wells to be 300 feet from potential sources of contamination and 1,000 feet from underground fuel storage tanks. When these setback distances cannot be met for unavoidable reasons, such as limited property size or wetlands, the Drinking Water Program administers setback waiver policies that help to mitigate the increased risk created by reduced setbacks. Mitigation may include increased sampling, well construction requirements, or, in some cases, a pre-treated septic process or the installation of drinking water treatment to remove any contaminants from the water supply. The Drinking Water Program's public water system inspectors administer these setback waiver policies whenever a well with reduced setback is proposed for approval.

Source Protection (continued)

Surface Water Treatment Rule Filtration Avoidance

The Surface Water Treatment Rule requires all public water systems with sources from surface water or groundwater under the influence of surface water to disinfect and filter the drinking water they provide to consumers.

Only those systems demonstrating compliance with the stringent water quality criteria set forth in the Rule may qualify for filtration avoidance. Maine has nine community water systems that qualify for, and currently maintain, filtration avoidance:



- Auburn Water District – Lake Auburn
- Bangor Water District – Floods Pond
- Brewer Water Department – Hatcase Pond
- Great Salt Bay Sanitary District – Little Pond
- Lewiston Water and Sewer Division – Lake Auburn
- Mount Desert Water District – Lower Hadlock Pond and Jordan Pond
- Portland Water District – Sebago Lake
- Presque Isle Utility District – Aroostook River (groundwater under the influence of surface water)
- Town of Bar Harbor Water Division – Eagle Lake

Synthetic Organic Compound Waivers

The Drinking Water Program may waive testing for synthetic organic compounds if regulated chemicals were not used in the source protection area. Synthetic organic compounds include substances such as herbicides, pesticides, and other semi-volatile compounds. Any public water system seeking a waiver from synthetic organic compound sampling must provide an approved wellhead or watershed protection plan and be able to demonstrate that land within 2,500 feet of each source is not under threat from synthetic organic compounds. Systems with waivers can save up to \$1,000 per source. All community and non-transient, non-community water systems are provided synthetic organic compound waiver applications on a three-year rotation.

In 2017, **213** water systems were issued waivers for a total of **758** semi-volatile herbicides and pesticides, including **167** community and **46** non-transient, non-community water systems, saving over **\$100,000**.

¹ US EPA Office of Groundwater and Drinking Water (1995), Benefits and cost prevention: Case Studies of Community Wellhead Protection

Keeping Maine's Drinking Water Safe



Sampling

In 2017, 98.6% of the population served by community public water systems received water meeting all health-based drinking water standards.²

The importance of sampling

Public water systems are required to regularly test for drinking water contaminants and report the results to the Drinking Water Program. The Safe Drinking Water Act lists 86 contaminants for which water systems must test. See the Appendix for a complete list of regulated contaminants. Any test results exceeding the standard (maximum contaminant level) may require treatment, replacement of source, or blending with other sources to reduce the contamination level. Testing schedules are based on a frequency that is reasonable to protect public health.

Ensuring safe drinking water

All public water systems must sample their drinking water to ensure that the water is safe to drink. Sampling on a regular schedule will also indicate whether a water system is performing the way it is designed and can help signal if there is a problem with the source, treatment, or distribution system.



² US EPA's Government Performance and Results Act for drinking water



Treatment

Approximately 58% of Maine's nearly 1,900 public water systems have at least one type of water treatment.

The importance of drinking water treatment

Although public water systems come in all shapes and sizes, and no two are exactly the same, all systems share the same goal of providing safe, reliable drinking water to the communities they serve. To meet this goal, many water systems must treat their water to remove potentially harmful contaminants. The types of treatment provided by a specific public water system vary depending on the size of the system, the source (groundwater or surface water), and the quality of the source water. Treatment systems are an important part of delivering safe drinking water but are only successful when the proper chemicals are applied in the correct amounts and all equipment and materials are regularly maintained and monitored. Effective oversight of treatment systems helps to ensure that high-quality drinking water is delivered to the public.



Monitoring treatment systems through monthly operating reports

All public water systems that add chemicals to their water must submit a monthly operating report to the Drinking Water Program. These reports help track the amount of chemical used, daily production of the water system, and the amount of chemical residual present in the distribution system. The Drinking Water Program reviews monthly operating reports to ensure that each public water system's treatment is operating efficiently and effectively to provide proper protection of drinking water.

Keeping Maine's Drinking Water Safe



Maintaining Pipes and Storage Tanks

The 2017 Drinking Water State Revolving Fund provided funds to Maine public water systems to invest over \$21.5 million to maintain their drinking water storage and piping infrastructure.

The importance of maintaining pipes and storage tanks

A water system's distribution system, a network of piping and storage tanks, is an integral part of its ability to provide safe, clean water to consumers. It is important for water systems to regularly inspect their distribution systems as contaminants can enter drinking water through damaged pipes or tanks. Routine inspection and maintenance may also help water systems save money if they are able to find and repair leaks in a timely manner to abate water loss.



Regulatory Highlights

UCMR 4

The Safe Drinking Water Act requires the U.S. Environmental Protection Agency to issue a new list of unregulated contaminants that public water systems must monitor every five years. The fourth Unregulated Contaminant Monitoring Rule (UCMR4) monitoring results, along with the UCMR predecessors, will provide a basis for future regulatory actions to protect public health.

All community and non-transient non-community public water systems serving more than 10,000 people must conduct UCMR4 monitoring. Only systems with surface water or groundwater under the direct influence of surface water are required to monitor cyanotoxins. A random selection of small systems (serving <10,000 people) will monitor for the 30 contaminants under UCMR4. Transient non-community water systems are not required to monitor under UCMR 4.

CHEMICALS MONITORED UNDER UCMR4

- 10** cyanotoxins (nine cyanotoxins and one cyanotoxin group)
- 8** pesticides plus one pesticide manufacturing byproduct
- 3** brominated haloacetic acid disinfection byproducts groups (HAA5, HAA6Br, and HAA)
- 3** alcohols (1-butanol, 2-methoxyethanol, and 2-propen-1-ol)
- 3** semivolatile organic chemicals (butylated hydroxyanisole, o-toluidine, and quinoline)
- 2** metals (germanium and manganese)

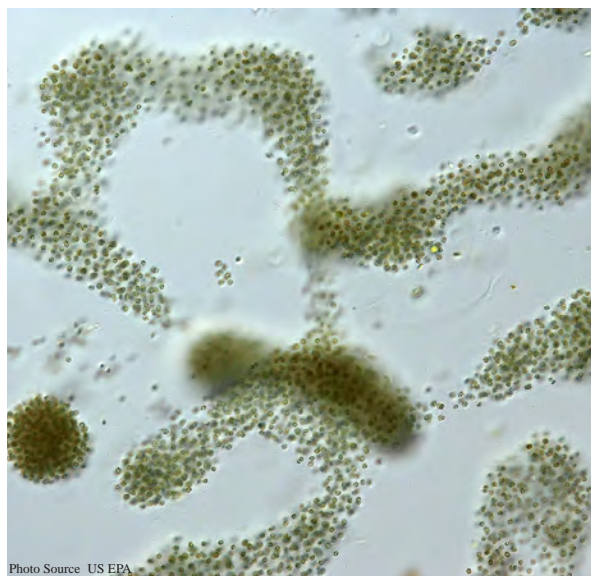


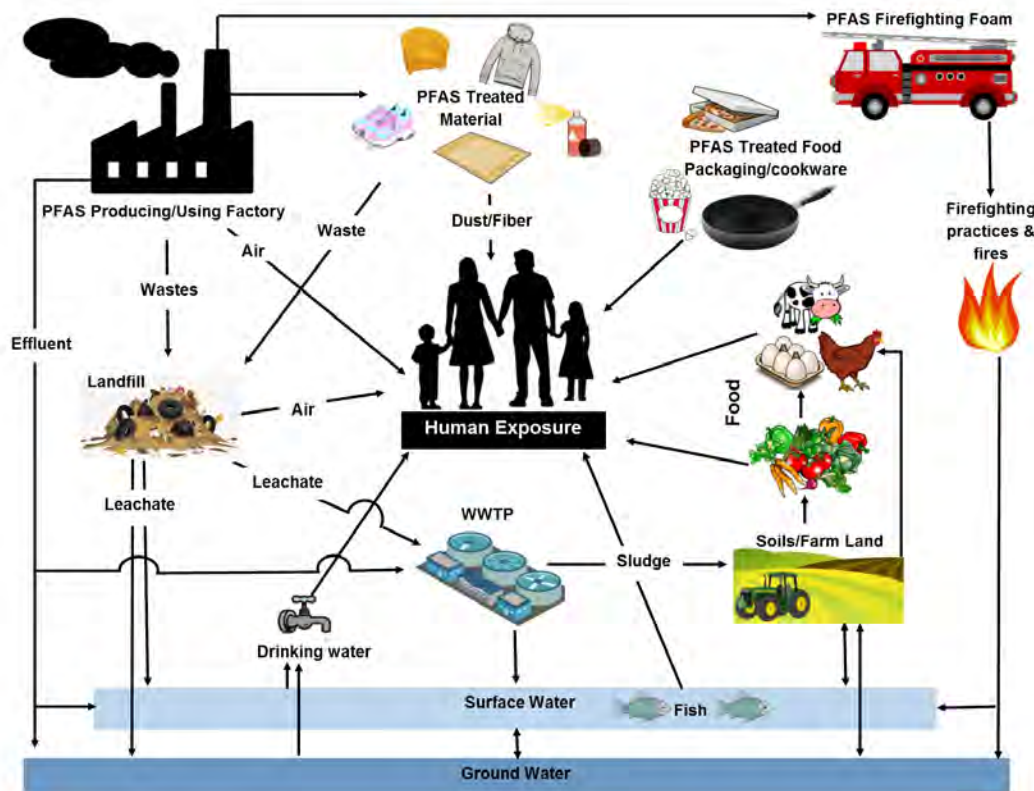
Photo Source US EPA

Cyanobacteria, also known as blue-green algae or harmful algal blooms, can produce toxins, cyanotoxins, that may be harmful to human health.

Regulatory Highlights

PFAS

In November 2017, the Drinking Water Program sampled select community and non-transient, non-community public water systems for per- and polyfluoroalkyl substances (PFAS). PFASs are a class of chemical compounds that have been manufactured since the 1950s and are found in everyday consumer products. They are chemically very stable and do not break down easily in nature or in the human body. Because of new information about the potential health effects of these chemicals, the Environmental Protection Agency (EPA) recently lowered the health advisory level for two PFAS chemicals: PFOA (perfluorooctanic acid) and/or PFOS (perfluorooctane sulfonic acid) to 70 parts per trillion (ppt). Given the prevalence and persistence of these substances, the DWP conducted this sampling round to better understand the potential impacts of the chemicals on Maine's water resources. System selection was primarily based on proximity to potential PFAS sources that were identified by the EPA. Results from the DWP sampling showed elevated levels of PFAS in one of the tested systems. All water systems with a population of 10,000 or greater already test for PFAS under the Unregulated Contaminant Monitoring Rule 3 (UCMR3). UCMR3 testing identified one system with detectable levels of PFAS. In this case, PFAS levels were below the health advisory limit. However, the system chose to take the well offline.



Human Exposure and sources of PFAS
Image: DWP, adapted from Oliaei et al. 2013

Regulated Contaminants

Contaminants in Drinking Water Regulated by the Maine Drinking Water Program

The Safe Drinking Water Act requires public water systems to monitor for 87 chemicals. These include 51 organic chemicals, 16 inorganic chemicals, eight microorganisms, eight disinfectants and disinfectant byproducts, and four radionuclides.

