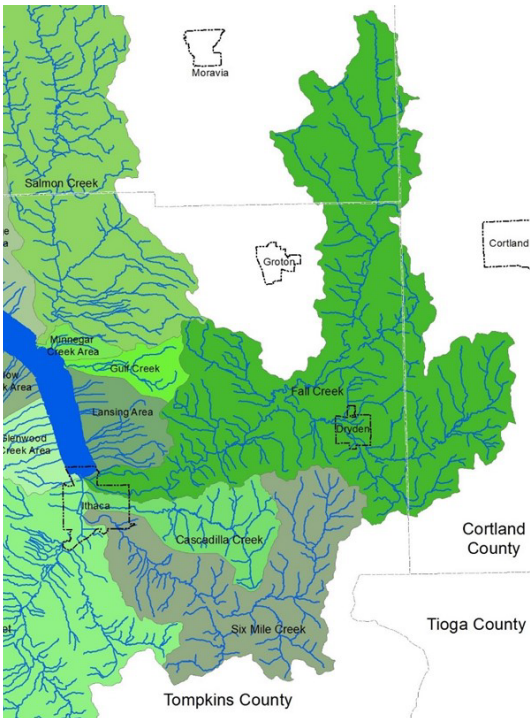
Cornell University

2017 Drinking Water Quality Report



Cornell University is providing this Drinking Water Quality Report to our customers because we want you to be fully informed about your water quality and the need to protect its source. This overview of last year's water quality includes details about where your water comes from, what it contains, and how it compares to State standards. If you have any questions about this report or your drinking water, please contact:

Christopher Lynn Bordlemay Padilla, Water Manager
607.255.1408 or water@cornell.edu.

Cornell University Source Water

Fall Creek is the source of water for the CUWS. The water intake is on Forest Home Drive near the Cornell Plantations Arboretum entrance. Fall Creek originates in Lake Como northeast of Ithaca and flows through a 125 square mile watershed. During 2016, the Cornell University Water System did experience extreme drought like much of our region. However, the source water quantity was sufficient to provide all water needs to the system. Water restrictions were in place from July through October to provide mandatory conservation measures and resulted in a 20% reduction in water demand. The system serves the University's campus and supplies water to City customers in the Cornell Heights area and to Bolton Point-Town of Ithaca customers on the south side of Fall Creek in the Forest Home area. The Water Filtration Plant is located at 101 Caldwell Road, Ithaca, NY 14850.

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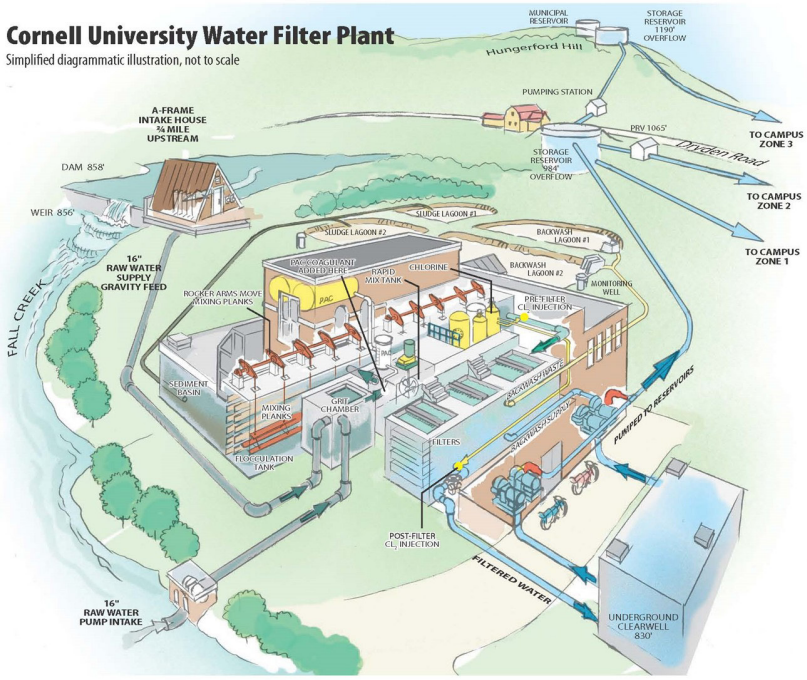

A. Water Treatment Process

Pre-Treatment: Screens are used to prevent leaves and debris from entering the treatment process. Coagulants, such as Alum or Poly-aluminum chloride are added to remove impurities.

Mixing: The water is rapidly mixed to distribute the treatment chemicals evenly.

Coagulation and Flocculation: The water flows into large basins where the coagulants react with impurities in the water (coagulation) causing them to form larger, heavier particles called floc (flocculation).

Sedimentation: Flocculated water flows into basins where the floc particles settle to the bottom, thereby removing impurities and chemicals from the water.

Filtration: Following the settling process, water flows through layers of anthracite coal, sand and gravel where further removal of particulate impurities occurs.

Post-Treatment: Chlorine is added to inhibit bacterial growth in the distribution system, and a corrosion inhibitor is added to prevent the potential leaching of lead and copper into the water from plumbing systems.

"Eighty percent of the earth's surface is covered by water, but only one percent of the earth's water is suitable for drinking."

B. Health Effects and Individuals At-Risk

All drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate the water poses a health risk. Some people may be more vulnerable to disease causing microorganisms or pathogens in drinking water than the general population. Immunocompromised persons such as those with cancer undergoing chemotherapy, those who have undergone organ transplants, those with HIV/AIDS or other immune system disorders, some elderly, and some infants can be particularly at risk from infections. These people should seek advice from their health care provider about their drinking water.

Environmental Protection Agency/Center for Disease Control (EPA/CDC) guidelines on appropriate means to lessen the risk of infection by cryptosporidium, giardia, and other microbial pathogens are available from the Safe Drinking Water Hotline (800-426-4791). No trace of either of these pathogens has been detected in previous testing of the treated water of Cornell. Individuals who think they may have one of these illnesses should contact their health care provider immediately. For additional information please contact the Tompkins County Health Department, 55 Brown Road, Ithaca, New York 14850 or by phone at 607-274-6688.

C. Water Quality Data

INTRODUCTION: The sources of drinking water (tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material. It also can pick up substances resulting from the presence of animals or from human activities. Contaminants that may be present in source water include microbial contaminants, inorganic contaminants, pesticides and herbicides, organic chemical contaminants, and radioactive contaminants. To ensure that tap water is safe to drink, the State and the EPA prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. State Health Department and Federal Drug Administration regulations also establish limits for contaminants in bottled water, which must provide the same protection for public health.

In accordance with State regulations, the Cornell Water System routinely monitors your drinking water for numerous contaminants. Tables 3a shows the analytical test results for contaminants that were detected. These results are compared to the applicable state guideline or maximum contaminate level (MCL). Table 3b shows the unregulated contaminants that were detected. Table 4 shows the contaminants that were not detected in your water.

C. Water Quality Data (cont.)

The State allows testing less frequently than once per year for some contaminants since the concentrations of these contaminants do not change frequently. Therefore some data, though representative, are more than one year old.

TOTAL COLIFORMS: Coliforms are bacteria that are naturally present in the environment and are used as an indicator that other, potentially harmful, bacteria may be present.

LEAD AND COPPER: The Cornell water system was required to sample for lead in 2014. There were no violations of State standards. We will sample again during the summer of 2017.

SODIUM: People who are on severely restricted sodium diets should not drink water containing more than 20 mg/l of sodium. Since the 2016 level of sodium in Cornell water was **23** mg/l, customers on severely restricted sodium diets might wish to consult their health care providers. People who are on moderately restricted sodium diets should not drink water containing more than 270 mg/l of sodium. The sodium levels of the water from all three local systems are well below this level.

EXCHANGES: During the course of the year, for maintenance, or for emergency help, potable water is exchanged among the three Ithaca area water systems. If you wish to know if this occurred, the time periods, and the water volumes, please call the Cornell Water System.

UCMR: Required testing by the EPA for the Unregulated Contaminant Monitoring Rule #3 (UCMR3) was completed by Cornell in 2013. Sampling for the next round (UCMR4) will begin in 2018. Information about the rule and the contaminants can be found on EPA website (epa.gov; search for UCMR3). The results for Cornell UCMR3 and for the pending UCMR4 sampling can be found on the Cornell Energy and Sustainability website.

D. General Water Information

Table 1: General Water Data - 2016

Water System Public Water Supply ID	Cornell University 5417680
Water source	Fall Creek
Approx Population Served	31,000
Number of Service Connections	254
Total Production in 2016 (MG)	466
Average Daily Withdrawal (MGD)	1.307
Average Daily Delivered (MGD)	1.278
Average Daily Lost (MGD)	0.029
Annual Charge per 1000 gallons	$10.86

Table 2: General Water Quality Data - 2016

Water System Public Water Supply ID	Units	Cornell University 5417680
Turbidity (EP)	NTU	0.065
Total Hardness	mg/L	150
Total Alkalinity	mg/L	140
Total Dissolved Solids	mg/L	NR
Iron (Soluble)	mg/L	NR
Chlorine Residual (EP)	mg/L	1.08
Chlorine Residual (POU)	mg/L	0.34
Turbidity (POU)	NTU	0.165
Total Organic Carbon (EP)	mg/L	1.80
Dissolved Organic Carbon (EP)	mg/L	1.97

NR=Not Required, EP=Entry Point, POU=Point of Use

Definitions of NTU and mg/L found in Section E.

COMMON WATER QUALITY DEFINITIONS

ALKALINITY is a measure of the capability of water to neutralize acids. Bicarbonates, carbonates and hydroxides are the most common forms of alkalinity.

HARDNESS is a measure of the calcium and magnesium content of natural waters. The harder the water, the greater the tendency to precipitate soap and to form mineral deposits. Alkalinity and hardness occur naturally due to the contact of water with minerals in the earth's crust.

pH indicates how acidic or alkaline a water sample is. A value of 7 is neutral, 0-6 is acidic and 8-14 is alkaline.

TOTAL ORGANIC CARBON (TOC) is a measure of the organic content of water. A high concentration of TOC in water may lead to high levels of disinfection byproducts.

TURBIDITY is a measure of the cloudiness of water. It is an indication of the effectiveness of water treatment. NYS regulations require that treated water turbidity always be below 1 NTU (nephelometric turbidity unit). For filtered systems 95% of the composite effluent samples must be below 0.3 NTU.

Interesting Water Facts

There are over 58,900 community water systems in the United States processing more than 34 billion gallons per day.

The average residence in the United States uses 107,000 gallons of water a year.

It takes 62,600 gallons of water to produce one ton of steel.

It takes 101 gallons of water to make one pound of wool or cotton.

Water acts as a natural buffer against extreme or rapid changes in the earth's temperature.

It would take 219 million gallons of water to cover one square mile with one foot of water.

One gallon of water weighs 8.34 pounds.

When the weather is very cold outside, let the cold water drip from the faucet served by exposed pipes. Running water through the pipe - even at a trickle - helps prevent pipes from freezing.

E. Detected Contaminants

Notes and Definitions for Tables 3-5:

AL (action level): The concentration of a contaminant that, if exceeded, triggers additional treatment or other requirements that a water system must follow.

Lead and Copper: The maximum level values reported for lead and copper represent the 90th percentile of the samples taken. Testing for these metals is only required every three years.

HAA5 (haloacetic acids): These are a group of chemicals that are formed when chlorine or other disinfectants used to control microbial contaminants in drinking water react with naturally occurring organic and inorganic matter in water. The regulated haloacetic acids, known as HAA5, are monochloroacetic, dichloroacetic, trichloroacetic, monobromoacetic, and dibromoacetic acids. The maximum level detected of HAA5 is the highest of the four quarterly running annual averages calculated during the year and is the basis of the MCL for these compounds.

Maximum Level Detected: The highest measurement detected for the contaminant during the year. For total THMs and HAA5 the maximum level detected is the highest of the four quarterly running annual averages during the year.

MCL (maximum contaminant level): The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible.

MCLG (maximum contaminant level goal): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

mg/L (milligrams per liter): Corresponds to one part in one million parts of liquid (parts per million, ppm).

MRDL (maximum residual disinfection level): The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary to control microbial contaminants.

MRDLG (maximum residual disinfectant level goal): The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contamination.

N/A (not applicable).

ND (not detected): Laboratory analysis indicates that the constituent is not present.

NTU (nephelometric turbidity unit): A turbidity of approximately 5 NTU is barely noticeable by the average person.

pCi/L (picocuries per liter): A measure of radioactivity in water.

Range: The range of lowest to highest measurements detected for contaminants measured during the year.

THM (trihalomethane): These are a group of chemicals that are formed when chlorine or other disinfectants used to control microbial contaminants in drinking water react with naturally occurring organic and inorganic matter in water. The regulatedtrihalomethanes are bromodichloromethane, bromoform, chloroform, and dibromochloromethane. These compounds result from the disinfection of water with chlorine. The maximum level detected of THMs is the highest of the four quarterly running annual averages calculated during the year and is the basis of the MCL for these compounds.

TT (treatment technique): A required process intended to reduce the level of a contaminant in drinking water.

ug/L (micrograms per liter): Corresponds to one part in one billion parts of liquid (parts per billion, ppb).

E. Detected Contaminants (cont.)

Table 3a. Contaminant	Units	Viola-tion Y/N	Date of Sample	Maximum Level Detected (Range)	Regulatory Limit	MCLG	Likely Source of Contamination
Microbiological contaminants							
Turbidity	NTU	No	2016	0.231	TT=<1 NTU	N/A	Soil runoff.
Turbidity samples	% below MCL	No	daily	100%	TT=95% of samples <0.3NTU	N/A	Soil runoff.
Disinfection By-Products							
Total THMs Site 1 Site 2 Site 3 Site 4	ug/l	No	2016	 57.8 (56.0-59.9) 65.5 (59.3-72.0) 63.6 (56.6-73.2) 62.9 (53.8-74.1)	MCL = 80 Running Annual Average	N/A	By-product of drinking water chlo-rination.
Total HAA5 Site 1 Site 2 Site 3 Site 4	ug/l	No	2016	 24 (20-32) 29 (22-37) 36 (30-46) 33 (27-45)	MCL = 60 Running Annual Average	N/A	By-product of drinking water chlo-rination.
Chlorine Residual	mg/l	No	2016	1.5 (0.8-1.5)	MRDL=4	N/A	Due to drinking water chlorination.
Inorganics							
Barium	mg/l	No	11/22/16	0.024	MCL=2	2	Drilling wastes; discharge from metal refineries; erosion of natural deposits.
Chromium	mg/l	No	11/22/16	0.0018	MCL=0.10	N/A	Discharge from steel and pulp mills; erosion of natural deposits.
Copper	mg/l	No	2014	0.080 (0.006-0.440)	AL=1.3	1.3	Household plumbing corrosion; erosion of natural deposits; wood preservatives.
Lead	ug/l	No	2014	3.8 (ND-5.6)	AL=15	0	Household plumbing corrosion; erosion of natural deposits.
Nickel	mg/l	No	11/22/16	0.0013	N/A	N/A	Discharge from steel and pulp mills, erosion of natural deposits.
Nitrate*	mg/l	No	10/27/15	0.58	MCL=10	10	Fertilizer runoff; septic tank leach-ing; sewage; erosion of natural de-posits.
Sodium	mg/l	No	11/22/16	23	See Water Quality, Section C	N/A	Naturally occurring; road salt; ani-mal waste; water softeners; water treatment chemicals.
Radioactive							
Gross Alpha	pCi/l	No	03/19/08	0.21	MCL=15	0	Erosion of natural deposits.

*Due to sampling transition error, Nitrate was not analyzed in 2016, which is a monitoring violation.

E. Detected Contaminants (cont.)

Table 3b.
Detected Unregulated Contaminants (from 2013 UCMR3 list on Page 7)

Contaminant	Units	**Viola-tion Y/N**	Date of Sample	**Maximum Level Detected (Range)**	Regulatory Limit	MCLG	Likely Source of Contamination
Chlorate	ug/L	No	2013	277 avg	Unregulated	N/A	Chlorate ion is a known byproduct of the drinking water disinfection process, forming when sodium hypochlorite or chlorine dioxide are used in the disinfection process.
Hexavalent Chromium	ug/L	No	2013	0.017 avg	Unregulated	N/A	Hexavalent chromium can enter waterways through the erosion of natural deposits or from industrial discharges.
Chromium, Total	ug/l	No	2013	0.099 avg	Unregulated	N/A	Chromium is a metallic element found in rocks, soils, plants, and animals. It is used in steel making, metal plating, leather tanning, corrosion inhibitors, paints, dyes, and wood preservatives
Strontium, Total	ug/L	No	2013	74.4	Unregulated	N/A	Strontium occurs nearly everywhere in small amounts. Air, dust, soil, foods and drinking water all contain traces of strontium. Ingestion of small amounts of strontium is not harmful. However, high levels of strontium can occur in water drawn from bedrock aquifers that are rich in strontium minerals.

F. Non-Detected Contaminants

Table 4a

CONTAMINANT	CUWS 2016
Microbiological	
Total Coliform	X
E. Coli	X
Inorganics	
Antimony	X
Arsenic	X
Asbestos	X
Beryllium	X
Cadmium	X
Color	NR
Cyanide	X
Fluoride*	X
Mercury	X
Nitrite	X
Selenium	X
Silver	NR
Thallium	X
Synthetic Organics & Pesticides; Groups 1 & 2	
Alachlor	X
Aldicarb	X
Aldicarb sulfoxide	X
Aldicarb sulfone	X
Atrazine	X
Carbofuran	X
Chlordane	X
Dibromochloropropane	X
2,4-D	X
Endrin	X
Ethylene dibromide	X
Heptachlor	X
Heptachlor epoxide	X
Lindane	X
Methoxychlor	X
PCB - aroclor 1016	X
PCB - aroclor 1221	X
PCB - aroclor 1232	X
PCB - aroclor 1242	X
PCB - aroclor 1248	X
PCB - aroclor 1254	X
PCB - aroclor 1260	X
Pentachlorophenol	X
Toxaphene	X
2,4,5-TP (Silvex)	X
Aldrin	X
Benzo(a)pyrene	X
Butachlor	X
Carbaryl	X
Dalapon	X
Bis (2-ethylhexyl) adipate	X
Bis (2-ethylhexyl) phthalate	X
Dicamba	X
Dieldrin	X
Dinoseb	X
Glyphosate	NR
Hexachlorobenzene	X
Hexachlorooxyclopentadiene	X
3-Hydroxycarbofuran	X
Methomyl	X
Metolachlor	X

CONTAMINANT	CUWS 2016
Metribuzin	X
Oxamyl vydate	X
Picloram	X
Propachlor	X
Simazine	X
Principal Organics	
Benzene	X
Bromobenzene	X
Bromochloromethane	X
Bromomethane	X
N-Butylbenzene	X
sec-Butylbenzene	X
tert-Butylbenzene	X
Carbon tetrachloride	X
Chlorobenzene	X
Chloroethane	X
Chloromethane	X
2-Chlorotoluene	X
4-Chlorotoluene	X
Dibromomethane	X
1,2-Dichlorobenzene	X
1,3-Dichlorobenzene	X
1,4-Dichlorobenzene	X
Dichlorodifluoromethane	X
1,1-Dichloroethane	X
1,2-Dichloroethane	X
1,1-Dichloroethene	X
cis-1,2-Dichloroethene	X
trans-1,2-Dichloroethene	X
1,2-Dichloropropane	X
1,3-Dichloropropane	X
2,2-Dichloropropane	X
1,1-Dichloropropene	X
cis-1,3-Dichloropropene	X
trans-1,3-Dichloropropene	X
Ethylbenzene	X
Hexachlorobutadiene	X
Isopropylbenzene	X
p-Isopropyltoluene	X
Methylene chloride	X
n-Propylbenzene	X
Styrene	X
1,1,1,2-Tetrachloroethane	X
1,1,2,2-Tetrachloroethane	X
Tetrachloroethene	X
Toluene	X
1,2,3-Trichlorobenzene	X
1,2,4-Trichlorobenzene	X
1,1,1-Trichloroethane	X
1,1,2-Trichloroethane	X
Trichloroethene	X
Trichlorofluoromethane	X
1,2,3-Trichloropropane	X
1,2,4-Trimethylbenzene	X
1,3,5-Trimethylbenzene	X
m-Xylene	X
o-Xylene	X
p-Xylene	X
Vinyl chloride	X
MTBE	X

CONTAMINANT	CUWS
UCMR 1	**2003**
2,4-Dinitrotoluene	X
2,6-Dinitrotoluene	X
Acetochlor	X
DCPA mono-acid degradate	X
DCPA di-acid degradate	X
4,4'-DDE	X
EPTC	X
Molinate	X
Nitrobenzene	X
Perchlorate	X
Terbacil	X
UCMR 2	**2008**
1,2-Diphenylbrazine	X
Diazinon	X
Disulfoton	X
Fonofos	X
Nitrobenzine	X
Prometon	X
Terbufos	X
2-Methylphenol	X
2,4-Dichlorophenol	X
2,4-Dinitrophenol	X
2,4,6-Trichlorophenol	X
Diuron	X
Linuron	X
UCMR 3	**2013**
1,2,3-trichloropropane	X
Methyl bromide	X
Methyl chloride	X
HALON 1011	X
HCFC-22	X
1,3-butadiene	X
1,1-dichloroethane	X
1,4-dioxane	X
Vanadium	X
Molybdenum	X
Cobalt	X
Strontium	DU
Chromium1	DU
Chromium6	DU
Chlorate	DU
PFOS	X
PFOA	X
PFBS	X
PFHxS	X
PFHpA	X
PFNA	X
Other PFQA	
Gross alpha	D
Gross beta	X
Radium	X

X = Monitored, but not detected
D = Refer to detected list , DU = Refer to detected unregulated contaminant list, Table 3b
NR = Not required and not monitored in the past five years
UCMR = Unregulated Contaminant Monitoring Requirements
*=Due to sampling transition error, Fluoride was not analyzed in 2016, but was not detected in previous years.

G. Major Modifications Completed 2016-17

- The first and second phases of the North Campus Cast Iron Water Main Replacement Project were completed. The water main was replaced along Forest Home Drive, avoiding the closed portion of the road. Water main was replaced from the Thurston Ave. bridge to Anna Comstock Hall.
- Lab spectrophotometer purchased for improved water quality monitoring.
- Valve actuators were replaced at the Water Filtration Plant

H. Future Projects and Capital Improvements 2017-18

- The North Campus Water Main Replacement Project will continue in 2017-18. The next phase will replace the water mains from Balch Hall to George Jameson Hall.
- Miscellaneous improvement projects will be constructed throughout the water distribution system.
  An interconnection station will be installed at the Cornell Water Filtration Plant to allow ease of water transfer between the neighboring Bolton Point water system to the Cornell Water System.
- Additional monitoring stations will be installed in the distribution system to ensure continued water quality.

I. Water Conservation

In 2016, because of the drought and the related water restrictions, additional conservation measures were implemented. The following strategies reduced water demands by approximately 20% overall in the Cornell University Water System:

Capturing condensate water at the Central Energy Plant and reusing for irrigation of tree plantings throughout campus; meeting one on one with stakeholders (researchers, labs, facilities with water intensive processes) to reduce water usage where possible; reducing irrigation across campus; trucking Cayuga Lake water and storing in temporary tanks at strategic locations to irrigate athletic fields, botanical gardens, and grounds; implementing Every Drop Counts campaign; reading water meters on a daily basis (remotely) to gauge water demands and usage at every building on a more frequent basis; implementing the Drought Emergency Planning Team (DEPT) and an Incident Management Team (IMT) to meet and deal with drought related issues.

You too can play a role in conserving water at work and at home by becoming conscious of the amount of water you are using and by looking for ways to use less whenever you can. It is not hard to conserve water. The following are some ideas that you can apply directly in your own facility or home:

Use your water meter to detect hidden leaks. Turn off all taps and water using appliances, then record the meter reading and check the meter after 15 minutes. If it registers, you have a leak.

Restaurants in the U.S. serve approximately 70 million meals a day. Every glass of water brought to your table requires another two glasses of water to wash and rinse the glass.

The bathroom accounts for 75 percent of the water used inside the home.

Water your lawn only when it needs it. If you step on the grass and it springs back up when you move, it doesn't need water. If it stays flat, it does.

Put 10 drops of food coloring in your toilet tank. If the color shows up in the bowl without flushing, you have a leak to repair. It is common to lose up to 100 gallons a day from a toilet leak. Fix it, and you save more than 30,000 gallons a year.

Do not hose down your driveway or sidewalk. Use a broom to clean leaves and other debris from these areas. Using a hose to clean a driveway can waste hundreds of gallons of water.

If every American home installed low-flow faucet aerators, the United States would save 250 million gallons of water a day.

Fix leaks as soon as they are found. A dripping faucet with a 1/16 inch stream wastes 100 gallons of water per day. Please contact your facility manager if you notice leaking water.

Saving water can lower your power bills by reducing your demand for hot or pumped water. These few simple steps will preserve the resource for future generations and also save up to 30% on your bill.

J. Security

Generally, security threats to the local water systems have consisted of primarily minor vandalism and property damage. However, our security efforts focus to a high degree on the much less likely, but more serious, threat of intentional contamination of the water supply and cyber attacks. We have performed security assessments of the entire system and updated our Emergency Response Plans to cover the possibility of terrorism and attacks. Weaknesses in procedures have been corrected and improvements to increase the security of the infrastructure have been undertaken. Local police are aware of the security needs of the water system and have maintained increased patrolling of our facilities. Your awareness and reporting of suspicious activity throughout the system is appreciated.

Cornell Water Links

Drinking Water Home

Lead Information

Past Water Quality Reports

Distribution System

K. Source Water Protection

The New York State Health Department is in the process of developing a Source Water Assessment Report for every surface drinking water source in the state. When the reports for our source is completed, we will review and provide a summary. If the report becomes available in 2017, a summary will be posted on our website and provided in next year's Annual Drinking Water Quality Report.

Cornell University Water

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