



A WORLD WITHOUT WATER



 BIRMINGHAM
WATER WORKS

SCHOOL PROGRAM CURRICULUM GUIDE



GREETINGS

Water is the most valuable commodity in any household, Birmingham Water Works (BWW) places a priority on educating students about the various aspects of water, its importance to daily living, and the need to be water-wise because water is so precious.

This curriculum guide can be used throughout the year to educate students about water. The curriculum's lessons are broken down similarly and include objectives, vocabulary words and definitions, and "Did You Know?" facts about water. We are very excited about this program, and we believe it will be an excellent tool to educate our youth about the importance and benefits of water.

If you need more information or additional resources, or if you have any questions, please contact our Public Relations department via email at publicrelations@bwwb.org or phone at 205-244-4225. Thank you for participating in this valuable program, and we hope you have fun implementing it in your classroom this year!

Sincerely,

Birmingham Water Works





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WATER RESOLUTIONS

Healthy Lifestyle

OBJECTIVE:

This chapter will educate students about the importance of drinking water to maintain a healthy body. Students will learn fun, healthy facts about water and tips for living healthier lives.

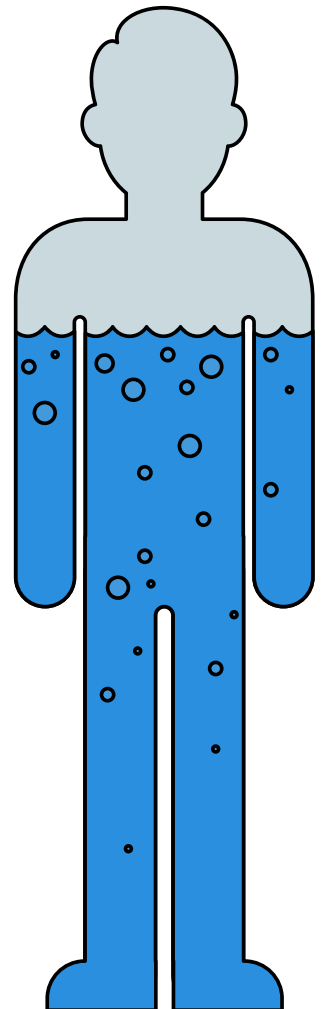
DO I NEED WATER?

All living things must have water to survive, whether they get it from a water fountain, a rain cloud, or a little bottle attached to the side of a hamster cage. Though it might seem hard to believe, water is the most necessary nutrient of all. You can't survive more than a week without water. More than half of your body weight is water — 65-to-70 percent, in fact. That said, if you weigh 60 pounds (27 kilograms), fewer than 25 of those pounds (11 kilograms) are minerals and other solid internal body parts; the remaining pounds are water!

Every system in your body depends on water. For example, water flushes toxins out of vital organs, carries nutrients to cells, and provides a moist environment for ear, nose, and throat tissues. A lack of water can lead to **dehydration**, a condition that occurs when you don't have enough water in your body to carry out normal functions. Even mild dehydration can drain your energy and make you feel tired. Did you know that dehydration can also lead to kidney failure, stroke, or even a coma?

It is easy to see the importance of drinking water to stay healthy. We need it every day in order to function, so let's learn more about the water in our bodies and how it keeps us healthy. Ready, set, hydrate!

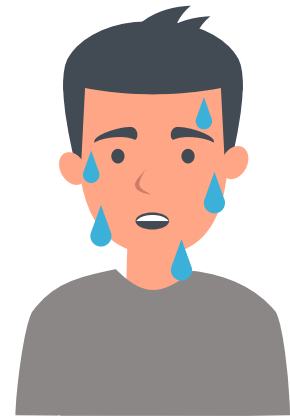
65 to 70 %
of your body
weight is water.





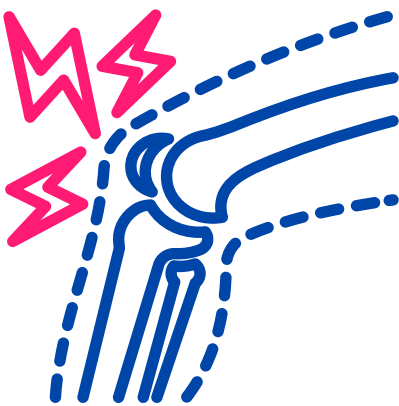
YOU ARE SO WATER-FUL!

Just like the peanut is the main ingredient in peanut butter, water is the main ingredient in the fluids that constantly move through your body's systems. Water is the main ingredient in the blood that travels through your **circulatory system**, the system of organs and tissues involved in circulating blood and other vital fluids through the body. It's also a component of lymph, a fluid that helps the body fight illness, carried by your **lymphatic system** (sort of like a secondary circulatory system). It's also the foundation of the juices in your **digestive system**, which allows you to digest food. Don't forget **perspiration**, also called sweat; this water comes through the skin as a part of your body's temperature-regulating system.



Perspiration is water that comes through the skin as part of your body's temperature-regulating system.

WHAT DOES WATER DO FOR ME?



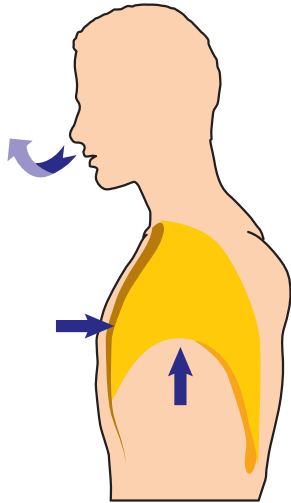
Joints are places where bones meet, such as knees and elbows.

If you've ever heard a squeaky door or wheel, you know the sound of something you need to **lubricate**. Lubricating, or making something slippery, allows things to move easier by keeping the parts from rubbing. In the case of your body, however, the lubricant responsible for keeping your parts moving smoothly doesn't come from a hardware store — it comes from water.

Water is in charge when it comes to keeping things moving freely because it's a big part of the fluid that lubricates the body's **joints**, places where the bones meet, such as knees and elbows. Straightening your leg or bending your finger is easy because water is helping out.

STAY COOL

Your body likes to be at about 98.6° F. If you're out running around or exercising in warm weather, you can feel pretty hot. Sometimes you don't even have to be exercising; if the weather is warm enough, you can feel hot just sitting still. That's where water comes in. When your body generates a lot of heat, water comes up through your skin as sweat evaporates into the air. As the sweat evaporates, it cools your skin, which cools your blood. When your blood is cooler, your insides become cooler, and your whole body cools down. Thanks to water, your body has its own personal air conditioner!



Your breath contains droplets of water that are usually too tiny to see.

REPLACE IT

As you can see, water works hard in your body every day. That's why it's important to give your body the water it needs to carry out all of its different jobs. On a regular day, your body loses two to three quarts of water — enough to fill a two-liter soda bottle — in an almost invisible way through evaporation. Water escapes from your body through your skin and breath. How? Your breath contains droplets of water that are usually too tiny to see. They become visible for a quick second in the cold when you can “see your breath.” Likewise, the water in your skin evaporates into the air. Your body also loses water through urine and bowel movements. For your body to function properly, you must replenish its water supply by drinking water and consuming beverages and foods that contain water.

STAY HYDRATED!

It's generally not a good idea to use thirst alone as a guide for when to drink water. By the time you become thirsty, you could already be slightly dehydrated. Also, be aware that as you get older your body is less able to sense dehydration and send your brain signals of thirst. To keep from getting dehydrated and to ensure that your body has the fluids it needs, drink water - have a glass with each meal and between meals. Hydrate before, during, and after exercise too. Keep in mind that if you drink water from a bottle, thoroughly clean or replace it often.



FLUORIDE ADDED

An additional health benefit provided by Birmingham Water Works (BWW) is the addition of fluoride to the water supply. A naturally-occurring compound, fluoride helps promote strong teeth and prevent tooth decay. The mixing of fluoride into our water supply is called water fluoridation, a process that adjusts the natural fluoride concentration of water to the level recommended for great dental health. This has been proven to help prevent dental decay in children, adolescents, and adults.

Since BWW began adding fluoride to its water supply decades ago, many local dentists have noticed improvements in the dental health of their patients, both children and adults. The American Dental Association has called fluoridation one of the top five medical achievements in recent history. And the Centers for Disease Control and Prevention has said fluoridation is the most reasonable, cost-effective, and cost-saving method of delivering fluoride to the community, adding that more water systems should provide fluoride in their water supplies. So, drink more tap water at home to help you receive a good report on your next visit to the dentist's office!



**Fluoride helps
promote strong
teeth and prevent
tooth decay.**

SEE HOW IMPORTANT IT IS TO DRINK WATER?

Drinking water is a healthy thing to do. It is important for you to drink plenty of it, especially when it's hot outside. Water keeps your body healthy and helps your body discharge toxins through the liver and the kidneys. With an abundant intake of clean, healthy water, your body can perform all of its natural healing processes. Perhaps best of all, water contains no calories, no matter how much you drink!

MY WATER COMPANY

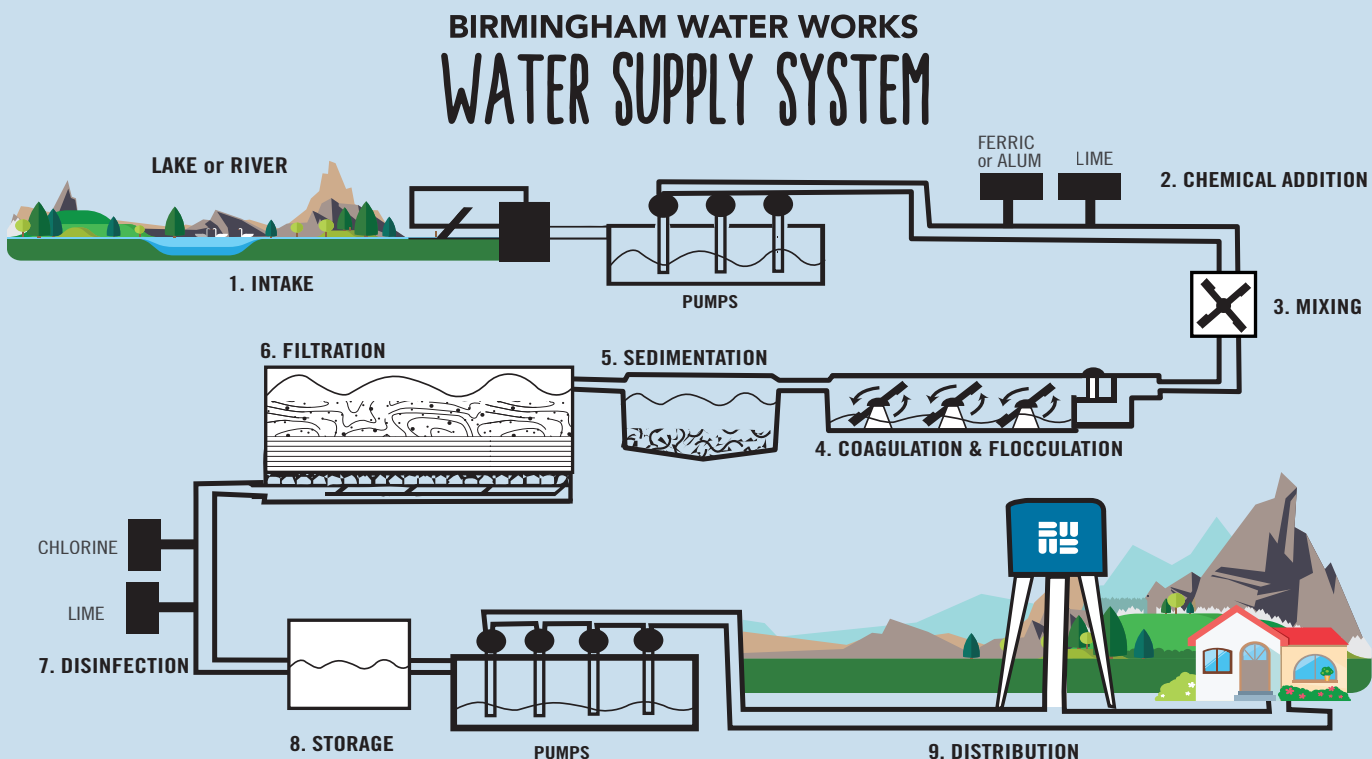
OBJECTIVE:

In this chapter, students will learn the history of Birmingham Water Works Board and how its facilities formed over many years. This chapter will provide an interesting spin on this information as well.

THE ORIGINS OF THE WATER SUPPLY SYSTEM

The search for **pure drinking water**, or water that's free of germs and harmful bacteria, dates back to the 13th and 15th centuries B.C. Paintings on ancient Egyptian walls display men using a **siphon**, a tube to lift liquids from larger containers and eliminate **sediment**, the gravel-like dirt that settles to the bottom of natural bodies of water, from drinking water.

Historically, water was considered clean if it was clear. Today, we know that's not the case. Around 343 B.C., Roman engineers created a **water supply system** that delivered about 130 million gallons of water every day through aqueducts, channels, and canals. Around the end of the third century B.C., Rome, Greece, and Egypt created the first public water supply systems. In 1804, water was delivered by a water utility to an entire town — Paisley, Scotland — for the first time.





MY WATER COMPANY

The mission of BWW is to provide the highest quality water and service to its customers and entire service area.

As a concerned corporate citizen, BWW is responsive to the needs of the entire community and strives to maintain, preserve, and conserve our precious water resources in order to ensure adequate water quality and supply for future generations.

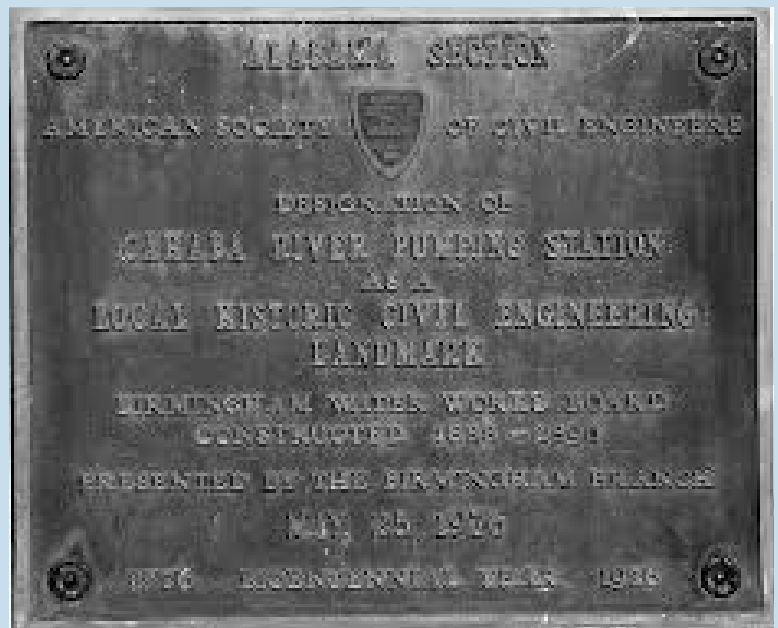
THE WATER SYSTEM'S HISTORICAL TIMELINE

Birmingham's water system, consisting of operations and processes water goes through from the time it enters the water cycle to the time it reaches faucets, has supplied the Birmingham area with high-quality drinking water for more than 100 years. The citizens of Birmingham established the Water Board in 1951, but the system dates back to 1871.

From the mud and dust of Jones Valley, the Elyton Land Company incorporated Birmingham in 1871. At the time, the town depended on creeks, springs, and wells as water sources, unaware of the health dangers that could arise. Birmingham was a city for just one year before water became a very big demand for the growing community.

In 1885, because of the quick growth and development, the new city formed the Birmingham Water Works Company, founded by N.T. Porter, James E. Johnson, J.W. Shaw, E.W. Ruckers, and James Webb.

In 1887, water from a new canal was delivered from Five Mile Creek to a **reservoir**, a large man-made or natural lake-like area that is used to store water, in North Birmingham at a rate of four million gallons per day (MGD). In 1888, the growth of Birmingham led to the Cahaba River becoming a new source for water. The development of a reliable water source, a resource that's healthy, clean, and free of all contaminants, brought industries to the area – and the "Magic City" was born.





Cahaba Pumping Station

In 1890, the **Cahaba Pumping Station**, which had its own coal mine for fuel, used steam-driven pumps to supply Birmingham with water at a total capacity (or the largest amount possible) of 25 MGD. Along with new pumps at Cahaba Pumping Station, large water mains were installed to meet the continual growth and development of Birmingham. In 1903 and 1904, the Shades Mountain Filter Plant and North Birmingham Plant were built. Both facilities provided people with untreated water, or water that has not yet been treated with chemicals, filtered, or boiled to remove viruses and bacteria to make sure it is safe to drink.

Several pumps were added to the Cahaba Pumping Station Pumping Station to ensure adequate water was supplied to the rapidly growing city.

With this increase came the construction of a dam and reservoir, completed in 1910, on the Little Cahaba River. A dam is a barrier constructed across a waterway to control the flow of water or to raise the level of water.

Finally, scientists learned how to purify water. In 1915, liquid chlorine was developed for the disinfection of water supplies and, through sedimentation and filtration, the BWW furnished treated water!

In 1951, Birmingham decided to purchase the water system from a private operator and established an independent Water Board, an independent group of officials who represent the water utility and make decisions for the safety and maintenance of the water system. The good thing about an independent water system rather than one run by the city is water revenues, or money made from selling water, can be used for water system projects instead of other unexpected city projects.



BIRMINGHAM'S GROWTH

As the city began to grow, so did the need to add more water sources and increase the system's ability to work at all times. BWW officials have made major expansions every decade from 1950 to the present, and the system now has four water sources and approximately 4,000 miles of transmission lines, the pipelines through which water runs. Efficiency is still one of the company's most important objectives, as more than 770,000 people are served across BWW's service area.



THE HISTORIC CAHABA PUMPING STATION

Today, BWW's historic Cahaba Pumping Station is more than just a pumping station; it's a learning center and a working museum where people can view the processes and history of the BWW and see early tools, equipment, photographs, and other artifacts. Several buildings have been renovated, but the original design remains intact. Currently, the Cahaba Pumping Station Museum is the place where the past meets the present. Its history reveals the foresight and planning that have characterized BWW from its earliest days.



LEAK DETECTIVES

Detect and Prevent - General Household Education

OBJECTIVE:

This chapter will provide general household education about water, including how to detect different leaks in the home and how to check for them. Students will learn how to use the leak-detection dye tablet to determine if a toilet flapper needs to be replaced.

DETECT AND PREVENT

WATER IS WASTED THROUGH LEAKS!

Did you know an average American home can waste 11,000 gallons of water every year due to running toilets, dripping faucets, and other household leaks? A **water leak** is an unplanned hole or crack through which water escapes, and nationwide more than 1 trillion gallons of water leak from U.S. homes each year.

BE A LEAK DETECTIVE!

Did you know 90 percent of high water bills are caused by leaks? You can help your family save water and money by taking time to **detect**, or identify, leaks in your home. This can be a difficult task, so get your parents to help!

First, make sure no one in your home is using water. Then go to your **water meter**, a device that measures the amount of water used in your home each month. The water meter is located inside a box, usually near the edge of your property. Open the meter lid and check to make sure the dial on the face of the water meter is not moving. If the red triangle, or dial, is spinning on the water meter there's a leak somewhere.



WATER METER: A device that measures the amount of water used in your home each month.

The Usual Leak Suspects And How to Track Them Down

It is important to constantly check your home for leaks. It will save your family water, time, and money. Below are some examples of the most common household leak bandits.

Toilet: A leaking toilet causes more water waste than any other fixture in the home. A toilet leak can waste about 200 gallons of water every day and can cost more than \$100 in water a year. The cause of most toilet leaks is a worn-out flapper; as such, experts recommend replacing the flapper every three to five years. In a properly-functioning toilet, water should only move from the tank to the bowl when the toilet is flushed.

With your parents' help, try this experiment before bedtime to determine if you have a toilet leak. First, turn off the water valve leading to the toilet. Then, place a drop of food coloring into the toilet tank. Check the toilet the next morning, and, if the food coloring turns up in the bowl, then there's a leak.



Faucet: A faucet with even a slow drip wastes 10 to 25 gallons of water. Every drop adds up, as 15 drops per minute can amount to almost three gallons of water wasted per day, 65 gallons wasted per month, and 788 gallons wasted per year! Most faucet leaks are plainly visible, as water drops come out of the faucet.

Occasionally, though, faucets may leak in other places such as the on-and-off handle (or handles) or from the pipe below the sink. If dripping is visible from pipes or if there are wet, damp areas underneath the sink, then there's possibly a leak.

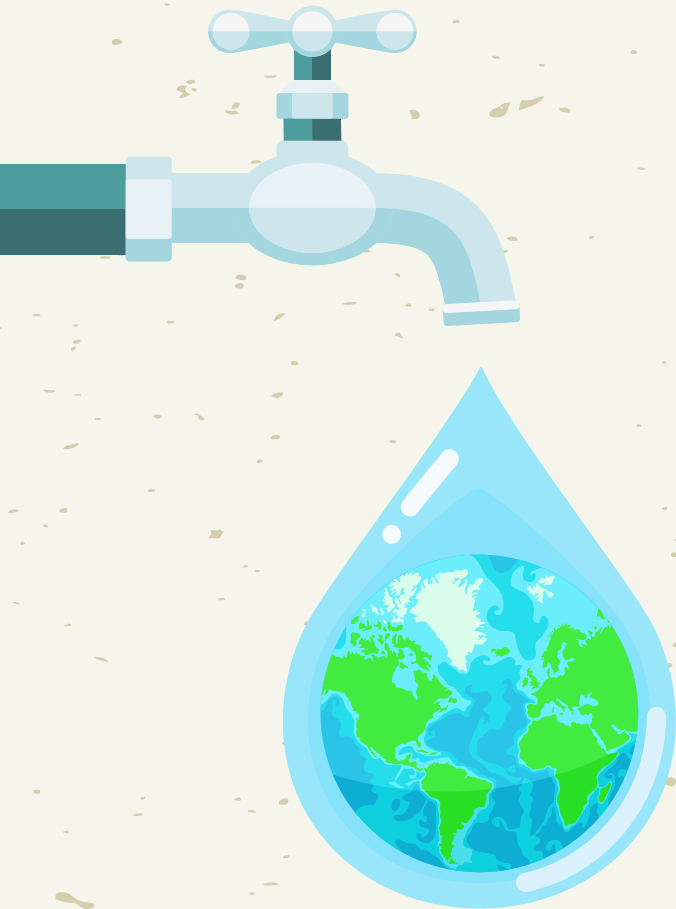
Appliances: If there's a puddle in front of the dishwasher, there's possibly a leak. As for the washing machine, you may notice water dropping down the outside of the machine or a pool of water around the appliance.

GO green

Use Water Wisely

OBJECTIVE:

Students will learn how water is used every day and how to identify ways to become water wise inside and outside the home. This chapter will also explain how to use the rain gauge, water hose nozzle, and more!



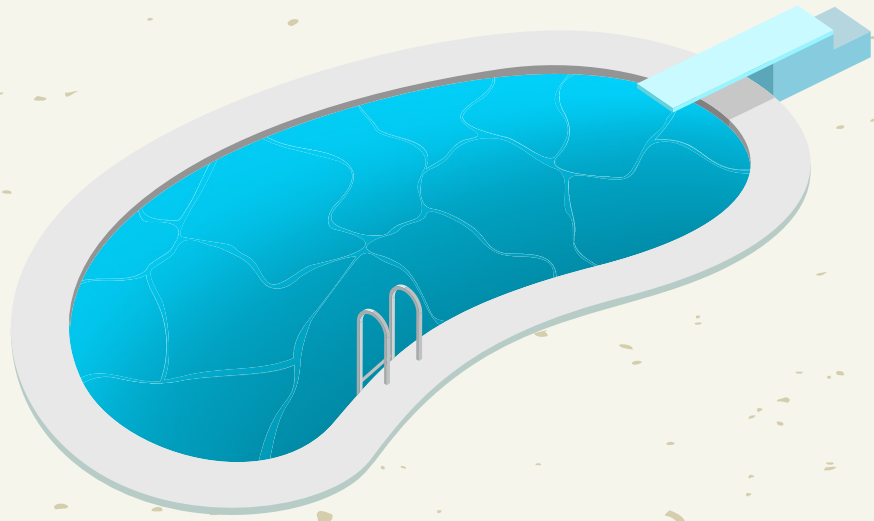
USE IT WISELY

Water is one of the Earth's most important natural resources. All living things need water to live. Even though there is water everywhere, most of the world's water is too salty for people to use. We need freshwater every day in our lives for drinking, bathing, cooking, and so much more.

Unfortunately, freshwater is not nearly as plentiful as saltwater. Many areas in North America face serious water shortages and even drought. Our population keeps growing and growing, which puts stress on our water supply. That is why we need to use water wisely every day to conserve, or to maintain and save for continued survival, and ample supply of this valuable natural resource. We should keep our sources clean and be careful not to waste them.

HOW MUCH WATER DO I USE?

Did you know the average BWW household uses about 7,500 gallons of water per month? That's almost 245 gallons of water per day, which is almost enough water to fill a large swimming pool! Water has a significant impact on just about everything you do. It helps produce the food you eat and the clothes you wear. It's important for a lot of fun stuff you like to do.



**240 Gallons of
Water/ Large
Pool**

**Average BWW
Household Daily
Water Use**

**Note: The best
time to water
your yard is
in the early
morning or late
afternoon.**



OUTDOOR WATER USAGE

When the weather is hot, outdoor water usage increases, as people water their lawns, wash their cars, and fill their swimming pools. In fact, 50 to 70 percent of your family's summertime water bill is for outdoor use.

Overwatering, or watering more than necessary, is the number one waster of water and the leading cause of disease and insect problems in grass. The good news is most lawns can grow with less water than people think. When there is not a lot of rainfall during the summer, it is recommended customers should apply about one inch of water per week.

HELPFUL OUTDOOR WATERING TIPS

Help your parents determine when your grass needs watering by stepping on it. If the grass springs back up, then it doesn't need water; however if the blades of grass lie flat, water it. Help your parents decide if your shrubbery needs watering simply by feeling the soil. If you feel moisture, the area does not need watering.

The best time to water your yard is in the early morning or late afternoon when it's cooler outside. Watering when it's hot and sunny is wasteful because most of the water evaporates before the lawn and plants even receive it. In fact, as much as 30 percent of water can be lost to evaporation when watering at noon on a windy day. Evaporation can make hundreds, even thousands, of gallons of water disappear!

LET'S DO OUR PART!

We can all help conserve our water supply by turning off faucets when we're not using them, using less water in the bathtub (or taking showers instead), turning off the water while brushing our teeth, and repairing leaking pipes. There is so much we can do each day to save water. If each of us does our part, there will be plenty of water for everyone!



WHAT IS A DROUGHT?

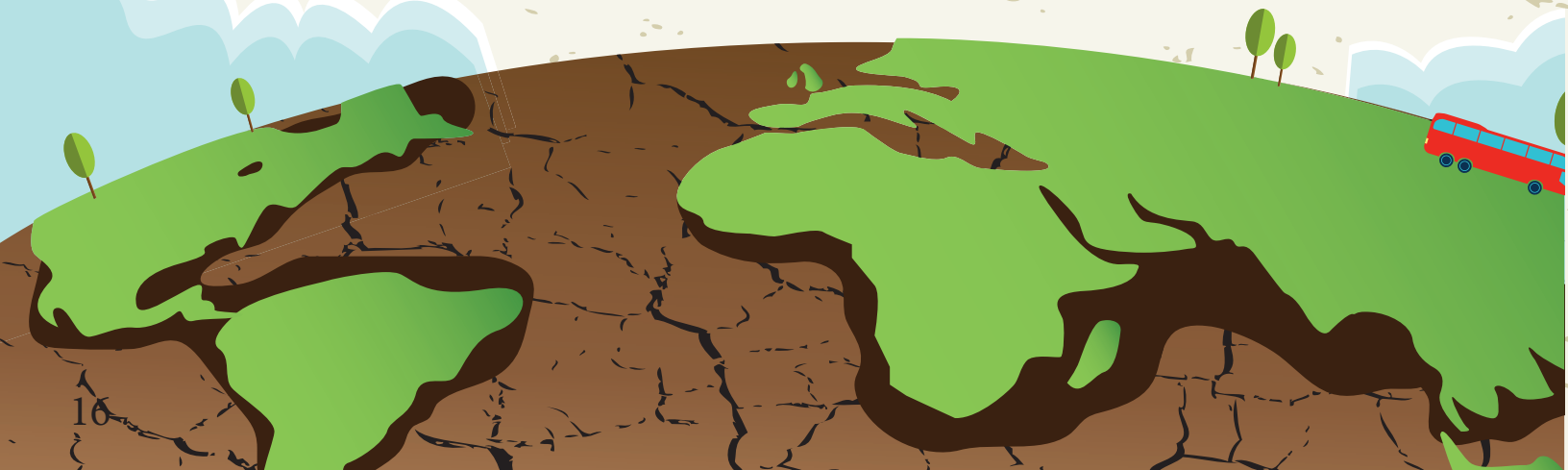
When we hear drought, we often think of no rainfall, hot weather conditions, brown lawns, water shortages, and dried-up streams and ponds. Drought is so much more than the lack of rainfall; it's actually the result of less rainfall than normally expected over an extended period of time, usually several months or longer.

Drought is a normal part of climate. It can occur almost anywhere on Earth and can have a devastating impact on agriculture, community water supplies, tourism, and recreation, energy (power) production, river navigation, and the environment. Unfortunately, Alabama has experienced drought several times in its history. During a drought, the amount of available water is reduced, so it is extremely important for us to use water wisely year-round.

WHAT CAUSES A DROUGHT?

Several factors can cause a drought. It can be a lack of rainfall locally or snowfall in far away mountains, or it can be the result of a water supply that is inadequate to meet everyone's needs.

In order to understand why we don't always get the rainfall we need to expect, we must first understand weather and climate. Weather is the condition of the Earth's atmosphere over a brief period of time. And climate is the day-to-day weather over a longer period of time. Winds cause weather patterns, including clouds that bring rain, to move around the globe. Over the years, these patterns change, and we get less (or more) rainfall than is normally expected.



DROUGHTS ARE UNPREDICTABLE

Predicting a drought depends on the ability to forecast, or predict, precipitation and temperature. Scientists don't know how to predict droughts a month or more in advance for most parts of the world.

LOCAL DROUGHTS

BWW's service area has experienced several severe droughts. Recently, the Birmingham metropolitan area experienced repeated droughts in 2000, 2006, 2007, 2008, 2016, and 2017. Historically, the Birmingham area has also experienced droughts in 1904, 1908, 1931, 1943, 1954, 1986, and 1993.

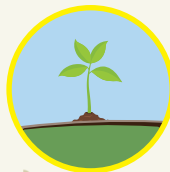
One of the most severe droughts in Birmingham's recent history occurred in 2007. Normal annual rainfall for the Birmingham area is 53.99 inches. From January 2007 to December 2007, there was a mere 28.86 inches of rainfall, which left a deficit, or shortage, of 25.13 inches.

SURVIVING DROUGHTS

BWW has created a five-stage Drought Management Plan to lessen the effects of droughts when they occur. On June 7, 2007, BWW initiated Stage Three, "Extreme Drought," because conditions had become so severe. This had a heavy impact on the dependable use of BWW's water resources and the utility's ability to meet the water needs of its customers. During Stage Three, customers are required to follow watering guidelines for lawn-watering, car washing, and other outdoor water uses. BWW also takes additional steps to limit water use.

Indeed, the Birmingham area survived the worst drought in its history as a result of the community working together to conserve its precious water resources. It is important we continue to do our part every day in order to lessen the impact of droughts when they occur.

DROUGHT STAGES



DO - Abnormally Dry

Agriculture ponds and creeks begin to decline
Ground is hard
Forage crops and pasture are stressed



D1 - Moderate Drought

Streams and ponds are low
Cash crop growth and yield are low
National forests ban campfires and fireworks



D2 - Severe Drought

Large cracks appear in home foundations
Crops are damaged
Burn bans begin
Restrictions on outdoor water usage & lawn watering



D3 - Extreme Drought Soybean pods shatter

Large-scale hay shortages
Wildfire count increases
Additional charges for excessive water usage
Additional lawn watering restrictions



D4 - Exceptional Drought

Lakes are extremely low
Trees and shrubs are defoliated & grass is brown
Wildfire count is very high
Lawn watering highly restricted

Source(s): NDMC, NOAA, USDA, BWW

HOW TO USE WATER WISELY INSIDE

INDOORS:

Turn off the faucet while you brush your teeth to save two to three gallons of water. You just need to wet your toothbrush and fill a small glass with water for rinsing out your mouth.



Take shorter showers. Or, to conserve even more water, turn on the water to get wet, turn it off to lather up, then then turn it back on to rinse off. Repeat this process when washing your hair.

Keep a container of cold drinking water in the refrigerator instead of running the faucet.



Help your parents check faucets and pipes for leaks, which waste water 24 hours a day, seven days a week.

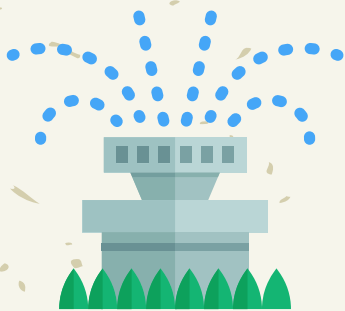
Avoid flushing the toilet when unnecessary.



& OUTSIDE YOUR HOME

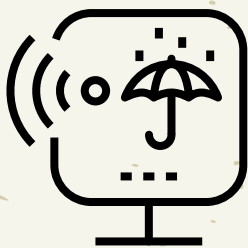
OUTDOORS:

Sweep the driveway with a broom instead of using a water hose.



Don't water the lawn between 10 a.m. and 4 p.m., when heat causes water to evaporate.

Help your parents check the sprinkler system for leaks; look for muddy spots and broken or clogged sprinkler heads.



Add a rain sensor or rain switch to your automatic sprinkler system to avoid wasteful watering on rainy days.

When washing the car, suggest that your parents park on the grass and use a hose with an automatic shut-off nozzle.



CELEBRATE WATER

OBJECTIVE:

This chapter will highlight things students can do throughout the summer because they have clean water.

WHAT TO PLAY OUTSIDE DURING THE SUMMER:

Since we have access to BWW water, there are so many fun options of what you can do this summer! Playing outside can be hot during the summer months, but having fun, quality water to cool down with or in is important.

Activities throughout the summer that include water are swimming in your local swimming pool, playing with water balloons and water shooters, or simply running through a sprinkler. All of these fun games are made possible by BWW water.

In addition, your parents can take you to a water park. Water parks take pride in keeping their water clean and safe for all children to play in, so clean, quality water helps them stay in business.



Another fun thing you can do is create a lemonade stand. You will need great tasting water to make and sell lemonade. You can also use water to make snow cones. If your water was dirty you would not be able to make a refreshing snow cone. Additionally, homemade popsicles can be really refreshing. You can put fresh fruit, juices, water, and other ingredients in them.

Some things are more fun with your parents help too! The first thing you can do with your parents is wash a car. Everyone benefits! They get a clean car, but you get to play in the refreshing water. You can also give your dog or your neighbor's dog a bath. They get to cool off and so do you. You can also create an at-home slip 'n slide using a tarp and dishwasher soap with your parents' help. Remember, safety is key.



OVERALL LESSON PLAN:

Always remember that drinking water and staying hydrated is one of the best things you can do for your body. It keeps your mind sharp, your reflexes quick, and your energy levels high. Throughout this book you have learned about the water system, the water cycle, Birmingham Water Works, the importance of water, how to detect leaks, and how to conserve water.

Water is a key resource in life. We can't imagine a world without water!



VOCABULARY

Cahaba Pumping Station: A place that had its own coal mine for fuel and used steam-driven pumps to supply Birmingham with water at a total capacity (or the largest amount possible) of 25 MGD.

Circulatory System: The system of organs and tissues involved in circulating blood and other vital fluids through the body.

Dehydration: A condition that occurs when you don't have enough water in your body to carry out normal functions.

Detect: Identify.

Fluoride: A naturally-occurring compound that helps promote strong teeth and prevent tooth decay.

Joints: places where the bones meet, such as knees and elbows.

Lubricate: Make something slippery, allow things to move easier by keeping the parts from rubbing.

Lymphatic System: Sort of like a secondary circulatory system.

Perspiration: Also called sweat; this water comes through the skin as a part of your body's temperature-regulating system.

Pure Drinking Water: Water that's free of germs and harmful bacteria.

Reservoir: A large man-made or natural lake-like area that is used to store water.

Sediment: The gravel-like dirt that settles to the bottom of natural bodies of water, from drinking water.

Siphon: A tube to lift liquids from larger containers.

Water Fluoridation: A process that adjusts the natural fluoride concentration of water to the level recommended for great dental health.

Water Leak: An unplanned hole or crack through which water escapes.

Water Meter: A device that measures the amount of water used in your home each month.

Water Supply System: A method to deliver about 130 million gallons of water every day through aqueducts, channels, and canals.

VOCABULARY WORD FIND



Cahaba Pumping Station
 Circulatory System
 Dehydration
 Detect
 Fluoride
 Joints

Lubricate
 Lymphatic System
 Perspiration
 Pure Drinking Water
 Reservoir
 Sediment

Siphon
 Water Fluoridation
 Water Leak
 Water Meter
 Water Supply System



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 Birmingham, AL 35222



www.bwwb.org