Meet the Little Blue Heron, or “Lil’ Blue Heron,” as he is known here. He is a native waterbird of Tennessee and the entire Southeastern United States. He supports water and the industry that protects and cleans it. When you engage with @lilblueheron, you help build awareness about water, environmental safety, public health, and sustainability.
Follow me to find out all about the water you use every day. We will explore the water cycle and learn how water flows over the land and even underground. We will meet some special people in our community and learn how they work to provide clean water for all of us. Finally, we will learn what we can all do to protect our water supply.

Did you know that a gallon of water weighs about 8 pounds?

Hey! I weigh 8 pounds, too!

I think you mean 8 OUNCES.

Read more: http://www.lenntech.com/water-trivia-facts.html#ixzz3LhPtyL42
Where is Our Water?

Everywhere! We see it in oceans, rivers, lakes, wetlands, and clouds in the sky. It falls to earth as rain, snow, sleet, and hail. It is always moving from the atmosphere to land and back again. This is what we call the water cycle or hydrologic cycle. It is nature’s largest recycling project.

Water can be solid (sleet, hail, or snow) or liquid (rain) as it falls from clouds to the earth as precipitation. Any form of precipitation can fall in the oceans to become salt water, fall on land to become fresh water or be used by plants. When water is caught by leaves and branches of plants and used before it hits the ground, the process is known as interception.

Water that has fallen from clouds can later be evaporated back into the atmosphere as a gas. Evaporation happens when the liquid water turns back into a gas and rises into the atmosphere. Evaporation of water happens from the surface of any body of water: oceans, streams, lakes, wetlands, and even driveways. The evaporated water collects in clouds to eventually fall as precipitation again as the cycle continues.

Rivers, lakes, springs, wetlands, and seeps make up our fresh water reserve. Fresh water is all water that is not salty, like ocean water. We use fresh water every day for drinking, bathing, cooking, and more.

Surface water forms from precipitation or comes to the surface as groundwater. As rain and snow collect at higher elevations, streams are formed. Streams can also form as a result of water “seeping” or “springing” from underground. Many streams are seen above ground, but many others...
are out of sight under rivers or wetlands. The Cumberland, Tennessee, Hatchie, Obed, and Pigeon are rivers in Tennessee. What river is closest to your home?

Sometimes a dam is built across a river to hold back some of the river’s water for storage. These man-made lakes are called *reservoirs*. This stored water can be used to generate electricity or for fresh drinking water. Can you name some reservoirs near your home? Have you ever been fishing or boating on a reservoir?

Springs and seeps flow into *ephemeral* and *intermittent* streams. These streams eventually form rivers. Ephemeral streams fill and flow during rainfall, but often dry up or carry very little water between rain storms. These streams are never connected to groundwater.

*Intermittent* streams flow continuously during the wetter times of the year. These streams form from groundwater, springs, rainfall, or snowmelt. *Perennial* rivers, or rivers that flow year round, are fed by these streams, wetlands, and groundwater. Small rivers flow into larger rivers, and large rivers flow into huge rivers that eventually make it to the ocean!
**Groundwater** is fresh water that moves beneath the surface of the earth. It emerges at the surface as tiny seeps and springs. **Seeps** and **springs** are very similar. Springs flow from a clearly defined opening in the ground and form small ponds or lakes. Seeps are formed when small amounts of underground water collect on the surface where the soil is **saturated** or filled to the point that no more water can be absorbed.

In some areas rainwater and snowmelt soak through the soil to become groundwater. As more and more water collects underground, the entire area stays saturated with water. This layer of rock and soil saturated with water is called the water table. A water table is not flat, but rises and falls depending on the shape of the land and what types of rock and soil are present. An **aquifer** is a place where the groundwater is abundant enough to provide a useful amount of water to the surface through one or more wells.

In Tennessee, groundwater moves differently in different regions. In West Tennessee, groundwater moves easily and uniformly through sands, gravels and thick river deposits from the Mississippi. Much of the fresh water supply is pulled up from these aquifers. In Middle Tennessee, groundwater moves through cracks and cavities in limestone formations. Groundwater is shallow and can move quickly through caves in one area and very slowly in others where caves have yet to form. In East Tennessee, groundwater moves through soil and stones and limestone formations.

Sometimes a dam is built across a river to hold back some of the river's water for storage. These man-made lakes are called **reservoirs**. This stored water can be used to generate electricity or for fresh drinking water. Can you name some reservoirs near your home? Have you ever been fishing or boating on a reservoir?

A **watershed** is an area of land where all streams, rivers, rain, and surface runoff flows to a single point. Watershed boundaries are high points from which water flows downhill to the nearest waterway. All of the land use inside a watershed impacts the quality of water in the streams and rivers. Our schools, homes, and businesses are all part of a watershed. It is important to keep our land clean because that land carries runoff to the rivers and streams that provide our fresh water supply.

In Tennessee we have 55 recognized watersheds. These major watersheds have smaller watersheds within them. In 2008 the state created a program to identify watersheds along major roads. As you travel the interstates and state highways of Tennessee, look for the green signs that name the watershed you are driving through.
How Does Nature Clean Water?

Clean, fresh water is important for all life on earth. Humans use fresh water from rivers, reservoirs, and groundwater to supply homes, businesses, schools, and industry. Plants, animals, and all other living things need fresh water to live. Let’s examine how water is cleaned naturally.

A watershed is designed to clean itself. It does this in several ways. When water flows over the land as runoff, some pollution particles get bound up in the soil or taken up by the roots of plants. Intermittent streams move above and below ground, filtering water as they go. Many small streams, flowing most or all year round, flow through shallow rocky areas called riffles. Water is filtered and aerated as it moves through riffles. Riffles usually flow into deeper pools. These pools are nature’s settling areas, where larger bits of dirt and other pollutants can fall to the bottom. Rivers with riffles and pools can be found throughout most of the Southeast except in the lowest, flattest areas.

Small streams at high elevations are called headwaters. They provide valuable cleaning services because of their many riffle-pool combinations and the infiltration that happens there. Infiltration is the process of water flowing down through the ground toward the watertable. As water filters through undeveloped land covered with plants, microbes in the soil consume some pollutants as food. Other pollutants can be changed chemically into non-pollutant particles, while others may be diluted over time.

Another one of nature’s cleaning tools is the buffer zone. Buffer zones are the vegetated areas right next to rivers. Protected buffer zones filled with trees, bushes and grasses filter and slow rainwater before it enters a creek or river. Luckily for us, these river-side or riparian areas also serve another purpose. Allowing plants to grow in these areas (instead of building roads and other structures there), provides protection from flooding.

Setting aside headwater areas and buffer zones for parks and open spaces can save cities millions of dollars in water cleaning costs and flood damage.
Protecting Headwaters Pays-

Just ask New York City.

In 1990, the federal government told all public water providers they must filter water for microbial contaminants. New York City needed to do this for more than 7 million people in the city. At that point, they had a choice to make. They could either build a $4 to $6 billion dollar water treatment plant to filter water from the upstate watershed - or partner with nature to clean the same water. City leaders chose to work with nature. The city and nearly 30 watershed communities signed the New York City Watershed Agreement, which protected family farms and woodlots. This was an expensive path ($1.4 billion dollars) but well worth it! New York City continues to get clean water, and land upstate is protected for all to enjoy.
FOR FUN! Tweet, complete & snap pictures of the items below. Be sure to tweet them to @lilblueheron and include the corresponding hashtags in your tweet! Your tweets will be added to the ‘Scavenger Hunters’ list on @lilblueheron twitter page.

- Picture of surface water with buffer zone. Hashtags: #TNWater #lifesupport
- Picture of potable water in a container. Hashtags: #TNWater #lifesupport
- Tweet water use from water bill with conservation goal. Hashtags: #water #conservation #lifesupport
- Ask “@TAUDtweets how much of the state of TN is ground water?”
- Tweet one of the ways you can be a good water ambassador. Get some ideas from page 15. Hashtags: #conservation #lifesupport
- On pages 20-21, find which watershed is closest to your town and tweet its name. Hashtags: #watershed #lifesupport
- On page 16, tweet the first sentence of the answer to the third question. Hashtags: #TNWater #lifesupport
- Take a picture of the rain garden on page 18. Hashtags: #raingarden #lifesupport
- Ask “@TAUDtweets how many water utilities are in the state of TN?”
- Tweet your favorite thing about water to the following all at one time: “@lilblueheron @TAUDtweets @The_Compact...” #lifesupport
Flowing Water . . .

We know that clean, healthy water is necessary for all living things on earth. It is also important to have the right amount of water. Businesses need water for making products. We need water for drinking, cooking, bathing, and fun activities like swimming and water skiing. We also need water for things we seldom think about. For instance, in order to release treated wastewater back into rivers and lakes, we need enough water in the river or lake to form a base of clean water.

Low water levels concentrate pollutants in a smaller space. That means water utilities must use more chemicals to treat water during droughts when pollution is more concentrated. Compare this to something you are already familiar with. Think about how sweet a large glass of tea is with a tablespoon of sugar in it. Now, imagine drinking a small glass of tea with the same amount of sugar. The small glass of tea will taste much sweeter than the large one. Pollution concentrates the same way.

Some cities have Conservation and Efficiency Plans to solve drought challenges before they become problems. One tool that smart cities use is green infrastructure. Green infrastructure is the practice of managing stormwater by working with nature - changing land practices in order to do three things:

• Slow the rate of runoff to reduce erosion.
• Increase infiltration down into the ground to feed aquifers.
• Increase filtration of stormwater to clean it before it gets to the river.

In addition to using green infrastructure some communities reuse gray water. Gray water is the water that goes down the drain from our sinks, bathtubs, and showers. This water can be used for landscape irrigation or to irrigate pasture and cropland.

Water conservation can be promoted by encouraging drip irrigation instead of spray irrigation, by better scheduling of irrigation days, and by teaching water conservation tips to citizens.

Just as too little water is problematic, too much water can lead to trouble too. Since ancient times flooding and drought have always happened. It is a pattern that repeats throughout history. Every natural water level has its own special importance to wildlife, plants, and humans. Although flooding can be harmful, our ancestors used floods to their advantage. They kept their homes out of the way of floods and put their crops closer to the river’s edge. Periodic flooding of cropland adds nutrients to the soil.

The flood/drought cycle is valuable to wildlife. Some creatures need both high and low water for reproduction and feeding purposes. Some fish only lay eggs in fast-moving water, which spreads the eggs along the bottom. Young fish need slower summer flows so they can use their energy for growth instead of swimming against a strong current.

When we protect rivers and lakes to insure fresh water supplies in our homes and businesses, we’re also protecting them for other creatures who call these places home! One of the ways we measure water health and cleanliness is to survey how many different aquatic creatures are in the waterway. This is called biodiversity. Biodiversity is the range of different kinds of plants and animals in an area.
Life Support: Tennessee’s Water

. . . In the City

Water flow is important to everyone – in big cities, small towns, and rural areas. Each area has unique opportunities and challenges too. In the city, everything we need is at our fingertips and convenience rules. However, cities also have challenges with impervious surfaces, cross connection contamination and replacement costs for aging water and wastewater infrastructure.

An impervious surface is any horizontal surface that storm water cannot get through. In cities, there are a lot of impervious surfaces. Almost all streets, rooftops, driveways, and parking lots are impervious. When stormwater hits these surfaces, it picks up speed and washes pollutants into nearby streams, causing erosion and water quality problems in urban creeks.

Cross connection contamination can occur when pipes carrying potable (drinkable) water come in contact with other non-potable water sources such as systems using chemicals like air conditioning units. This contact can cause contamination of our drinking water supply.

Wastewater infrastructure (sometimes called gray infrastructure) is made up of all the pipes and pumps needed to carry wastewater from our homes, schools, hospitals and businesses. Cities have hundreds of miles of gray infrastructure, much of which is very old. In fact, some Tennessee gray infrastructure was put in place about the time the first cars were being built.

“The first rule of intelligent tinkering is to keep all the parts.” – Aldo Leopold

What do you think Mr. Leopold meant? How are human uses of rivers, lakes, and wetlands similar to wildlife uses of water? How are they different? Do you think waterways would be healthier with a wide range of animal species or just a few?
Flowing Water . . .

The country has fresh air and room to roam – but don’t think water and wastewater aren’t a concern here. Cross connections occur in the country too.

Because many families rely on water from wells for use in their homes, they have to make sure it is free of pathogens (disease-causing microorganisms). During times of drought they may need to make choices about how and when to do tasks such as taking showers or running the washing machine, because there is not enough water pressure to do both at the same time.

Septic tanks are used to dispose of human waste in many rural areas. While septic tanks are safe when maintained properly, poor maintenance can allow pathogens to leak into nearby creeks, caves, and groundwater.

Similar challenges can be seen in rural neighborhoods where decentralized wastewater is in use. Usually a decentralized system is a septic system which can be modified to be used by a group of houses or neighborhood. The challenges of septic tank maintenance are still the same.

To overcome these challenges, some rural neighborhoods form homeowner associations to which all residents pay dues. These dues are used to pay for maintenance of decentralized wastewater systems and other neighborhood needs.

To prevent cross connection contamination, never submerge anything connected to the public water supply in other liquids, including other water sources, like troughs, pools, hot tubs, or soapy buckets. Always allow a 2" air gap between a hose and a receiving container.
In the Country

PLUMBING VENT

SEPTIC TANK

DRAIN FIELD
Water utility systems have the big job of supplying us with the healthy water we need, cleaning the water after it goes down our sinks and toilets, and transporting water from place to place.

Water treatment professionals are in charge of collecting water from rivers or lakes and cleaning and disinfecting it for use.

If the water contains too many minerals (like calcium or magnesium), hydrated lime and sodium carbonate are added to “soften” the water. The water is filtered through sand, charcoal, and new artificial membranes to make sure it is the cleanest it can be.

Finally, ultraviolet treatment or a disinfectant is added. Then the water travels to storage tanks or directly to homes and businesses.

On the way, water may travel through miles of pipes. These pipes must be installed, maintained, and monitored for water loss and contamination. These processes require a lot of energy. Professional operators must be experts in order to provide us with the water we need without taking too much water from the creatures in rivers, wetlands, and lakes. To protect nature’s water cycle, water utility professionals also clean water before it is returned to the rivers and lakes.

It is important for water and wastewater professionals to do their jobs well, and it is important that we help them, so the next town downstream also has clean, plentiful water to drink!
If all the world’s water fit into a gallon jug, the fresh water available for us to use would equal only about 1 tablespoon.

Uh, did you just drink all the water?

I couldn’t help it... my part was on the bottom!

Read more: http://www.lenntech.com/water-trivia-facts.htm

Clean, chorinated water is used... at your house, your school, businesses, farms, and restaurants for drinking, washing, cooking, cleaning, growing food, and many other things!
Providing clean water to all of us requires a lot of electricity to run the water and wastewater treatment plants. But did you know it also takes a lot of water to produce electricity?

Most of our electricity in Tennessee and Kentucky is produced at coal-fired power plants. Producing electricity from coal requires a lot of water. Water is needed for mining and preparing coal to be burned at the power plant. Water is boiled to produce steam that turns the turbine to get the electrons moving at the power plant. Then more water is used to cool the process when necessary. Nuclear and hydroelectric power plants also require abundant water to generate electricity. Water is needed for energy production, and energy is needed for water production.

List some ways we can save both water and energy. Who saves money when we save water and energy?

<table>
<thead>
<tr>
<th>SAVING WATER</th>
<th>SAVING ENERGY</th>
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Life Support: Tennessee’s Water
The next time you go swimming or take a drink of water, you will know just how much energy and expertise it takes to provide potable water for all of us. Water and wastewater professionals have important roles to play. But YOU are part of the clean water cycle, too.

Here are ways you can be a good water ambassador – today and every day!

• I can be “water smart” by turning off water when I’m not using it – like during the time I brush my teeth.
• I’ll take shorter showers to reduce the water I use. I can scrub up fast and make the water last.
• My friends and I can ask our parents to water plants outside before 10:00 in the morning or after 6:00 in the evening – to minimize loss by evaporation.
• I can help build a rain barrel to collect water for outside uses.
• I can conserve water by only running the dishwasher and washing machine when there is a full load.
• I can turn out the lights, turn off the TV, and unplug other devices when I’m not using them because I’ve learned it takes water to produce electricity.
• I can write letters to local officials asking them to build more greenways and parks in headwaters to protect the health and quantity of water in our rivers.
• I can call local officials to find out what our town and county are doing to protect water quality and supply in our area.
• I can volunteer for local watershed groups or utility departments planting trees, doing litter clean-ups, restoring river banks, and teaching others to be good stewards.
Interview with a Water/Wastewater Manager

Q: Why did you decide to become a water utility director?

A: I love water, and I love people. This job allows me to work with great people who are focused on keeping our water clean!

Q: What kind of job training is needed to work in the water and wastewater profession?

A: There are many kinds of jobs! Water and wastewater operators may have a high school education and obtain certifications that allow them to operate treatment plants, distribution systems, and sewer collection systems. Engineers who design and optimize water and wastewater systems need at least a four-year college degree, preferably a master’s degree. Other professionals who support our business have college degrees in accounting, business, biology, or chemistry.

Q: You clean water before it comes to our home, so why is it important for rivers and lakes to stay clean?

A: The dirtier the water, the more it costs to treat it. Keeping the water in our rivers and lakes clean reduces the amount of chemicals, energy, and labor needed to treat the water, so the costs we pass on to the customer are lower.

Q: What happens if we waste water?

A: Wasting water means we have wasted chemicals, energy, and other precious resources needed to keep it clean. To get that water back to a quality suitable for human use will cost even more in chemicals, energy, labor, and other resources!
Do you like computer games? Imagine a job that allows you to work with computers all day! This is just one of the exciting ways water and wastewater professionals help communities have clean water. Here are some examples of careers in water:

**Manager**

Water/Wastewater Managers make sure all of the equipment is working properly and the people are working well together. They oversee all the business and operations of the plants. If you like people, problem-solving, math, and science – this may be the job for you.

**Operator**

Water/Wastewater Operators inspect systems to make sure they are operating properly. The operator works in the lab, takes care of mechanical systems, keeps daily records, and performs other important duties. If you like making things work and moving from one task to another, you may like this job.

**Engineer**

Water/Wastewater Engineers make sure all the mechanical and chemical systems work properly. They work with managers and other team members to design new and better systems in their treatment plants and help design safety systems, too. Do you like making sure all the pieces of a puzzle fit together? You may want to be a water or wastewater engineer.
Volunteering for watershed organizations and utility districts helps our waterways and our communities!

Across Tennessee there are many opportunities to get involved in helping keep our rivers and lakes as clean as they can be - and teaching others to do the same.

Right now, you and I can help water utility workers with storm drain stenciling in several communities across the state. By using materials donated by utility departments, we can remind people of our connections to rivers by painting on storm drains: “Do not dump – Drains to river.” Some watershed groups like the Cumberland River Compact are partnering with their local utilities to install green infrastructure by building rain gardens in public places.

Utilities and watershed groups plant thousands of trees in riparian areas. Planting trees holds river banks in place, restores shore habitat, and also helps with water infiltration. Tree planting can be done by volunteers of all ages, letting us all get involved with helping our waterways and making our communities beautiful, healthy places to live!

Cummins, Inc. volunteers construct a rain garden at Charlotte Park Elementary.
Credits: Mekayle Houghton, Cumberland River Compact

Volunteers plant trees along a riparian zone.
Credits: Carolyn Wright, Cumberland River Compact
Harpeth Hall students plant trees along a riparian zone to slow runoff into the creek.

Credits: Carolyn Wright, Cumberland River Compact

Cummins, Inc. volunteers construct rain gardens in Antioch, TN. These rain gardens hold water so it can seep back into the ground instead of running off to creeks. This reduces erosion and builds up local water reserves.

Credits: Carolyn Wright, Cumberland River Compact

Deloitte volunteers construct rain barrels. These rain barrels will collect rain from the roofs of buildings and store it for watering plants.

Credits: Mekayle Houghton, Cumberland River Compact
Biologists and environmental specialists are continually collecting, analyzing, and interpreting data from watersheds as they work to maintain or restore the health of our streams, lakes, and rivers. One important test surveys the diversity of species living in the water. Other data these professionals collect relates to how many people live in each area and the kind of work they do there.

Informing citizens about watersheds close to home helps them understand how their behaviors affect the quality of water in their watersheds.
There are 55 watersheds in Tennessee. Do you know which watershed you live in?

I live in the shed where my humans keep the lawn mower! It is cool and dark and right next to the vegetable garden.

A “watershed” is the area of land where all of the water that is under or on top of the soil drains off and flows down hill to the same place.

That’s a TOOL shed.
Glossary

Aquifer: Underground layer of water-saturated sand or rock.

Biodiversity: The variety of different kinds of plants and animals in an area.

Buffer zones: Vegetated areas right next to rivers which protect rivers from erosion, serve as habitat for wildlife, and may be used as recreational greenway areas.

Cross connections: Connections between pipes carrying potable (drinking) water and other pipes which carry wastewater located in the same areas.

Decentralized wastewater: A septic system which can be modified to be used by a group of houses or neighborhood.

Ephemeral streams: Streams formed when rainwater flows across the earth into channels, present only in times of abundant rainfall.

Evaporation: Change of liquid water into water vapor.

Fresh water: Water that is not salty, like ocean water. Fresh water is found in lakes, rivers, streams, and reservoirs.

Gray infrastructure: Pipes, conduits, and pumps that run throughout a community carrying wastewater from schools, homes, businesses, and industry.

Gray water: Used water from sinks, tubs, and showers which can be used again outside.

Green infrastructure: The practice of managing storm water through land alteration to slow water and reduce erosion, increase infiltration to feed aquifers, and increase stormwater filtration to clean it.

Groundwater: Water stored in aquifers.

Headwaters: The uppermost parts of river systems made up of ephemeral and intermittent streams, seeps and springs.

Hydrologic cycle: Also called the water cycle. Cycle of water movement from atmosphere to earth and back again.

Impervious surface: A surface that does not allow water to infiltrate into the soil. Roads and roof tops are examples of impervious surfaces.

Infiltration: The act of water flowing down through the soil toward the water table.

Interception: Precipitation that does not reach the ground but is caught by leaves and branches of plants and trees. This water can then travel down the plant to the root system or be evaporated back into the atmosphere.

Intermittent stream: Stream formed from groundwater, springs, rainfall, or snowmelt that flows continuously most of the year but may occasionally cease to flow when water supply is low.

Karst: Limestone formations that develop cavities from the interactions between water and the rock.

Pathogens: Disease-causing microorganisms.
**Perennial**: Stream that flows year-round regardless of rainfall.

**Potable**: Water safe to use for drinking.

**Precipitation**: Water that falls from clouds to earth as a solid or a liquid. Rain, sleet, hail and snow are all precipitation.

**Reservoir**: A pond, lake, or basin, either natural or artificial, for the storage, regulation, and control of water. In Tennessee we dam rivers for water supply reservoirs like Old Hickory Lake.

**Riparian zone**: Area of land near but not in direct contact with water flow most of the time. Can be important wildlife habitat.

**Runoff**: Also called stormwater runoff. Precipitation that runs off the land into streams, wetlands, or lakes.

**Saturated**: filled to the point that no more water can be absorbed.

**Seeps**: places where small amounts of groundwater collect on the surface of the earth in an area where the soil is saturated.

**Septic tank**: A tank used to dispose of human waste in many rural areas.

**Spring**: water flowing from a clearly defined opening in the ground forming ponds and small lakes.

**Surface water**: Water that is on the Earth’s surface, such as in a stream, river, lake, or reservoir.

**Wastewater or waste water**: Water that has been contaminated by use and is not suitable for drinking.

**Water cycle**: Also called the hydrologic cycle. Cycle of water movement from atmosphere to earth and back again.

**Watershed**: An area of land where all surface waters flow to a single point.

That's a "reser-VATION." Most **reservoirs** are formed by constructing dams across rivers. Percy Priest Lake was formed when part of the Stones River was dammed.

I made a "reservoir" at a fancy restaurant downtown, but they had something called "escargot" on the menu, and it looked just like ME covered in garlic-butter and parsley! I felt a little uncomfortable.

Do you know how a reservoir is made?
How Many Terms Do You Know?

Across

4. A disease-causing microorganism.
6. Humans, plants, and land animals like to drink ___ water.
8. Area of land near a stream that can be an important wildlife habitat is known as a ___ zone.
9. A line of hills or mountains from which rivers drain, or a ridge between two rivers.
11. Another word for “rain.”
15. A vegetated area right next to a river is called a ___ zone.
17. The pipes, conduits, and pumps that run throughout a community carrying wastewater are called ___ Infrastructure.
19. Precipitation that does not reach the ground, but is blocked by leaves and branches of plants and trees.
21. A tank used to dispose of human waste in many rural areas is called a ___ tank.
23. Similar to puddles, where water comes up to ground-level from an aquifer.
24. An underground layer of water-saturated sand or rock.
26. When limestone dissolves and washes away, a ___ formation can develop and create a sinkhole or cave.
28. Another way to say “year-round.”
29. A variety of different kinds of plants and animals in an area.

Down

1. The act of water flowing down through the soil toward the water table.
2. A stream that does not flow when water supply is low is called an ___ stream.
3. Another term for the “dirty water” from sinks, bathtubs, and showers that can be re-used in a garden (2 words).
5. Water that is stored in aquifers.
7. The uppermost part or source of river systems are the ___.
8. When water flows downhill and takes soil, pollution, or debris into a stream, it is called ___-___. This term is hyphenated here to fit the puzzle. Normally, it is not hyphenated.
10. Water that is safe to use for drinking is called ___.
12. Old Hickory Lake is a type of ___ where water is stored.
13. Roads and roof tops are examples of an ___ surface.
14. Another term for “water cycle” is ___ cycle.
16. Water that has been contaminated by use and is not suitable for drinking.
18. You can accidentally create this when you leave a hose submerged in a container of dirty water (2 words).
20. When liquid water turns into water vapor.
22. When it rains a lot, and the water flows into channels forming streams, it is called an ___ stream.
25. Filled to the point where no more water can be absorbed.
27. A term for water that flows from a clearly defined opening in the ground, forming ponds and small lakes.
Habitat

Look for Great Blue Herons in saltwater and freshwater habitats, from open coasts, marshes, sloughs, riverbanks, and lakes to backyard goldfish ponds. They also forage in grasslands and agricultural fields. Breeding birds gather in colonies or “heronries” to build stick nests high off the ground.¹

¹ Cornell Lab of Ornithology, http://www.allaboutbirds.org/guide/Great_Blue_Heron/id
## Water Activity Log: Direct Use of Water

For each day, make a tic mark each time you do an activity. Add days 1-3 for the total column. Multiply the total number of times by the estimated water used to get the 3-day water use for each activity.

<table>
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<th>Day 2</th>
<th>Day 3</th>
<th>3-Day Total</th>
<th>Estimated Water Used (gallons)</th>
<th>3-Day Water Use Total</th>
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<tr>
<td>Water running</td>
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<tr>
<td>Water turned off</td>
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<td><strong>Washing-Up</strong></td>
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<td>Wash face or hands</td>
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<tr>
<td>Taking a bath</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Showering</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard shower head</td>
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<td></td>
</tr>
<tr>
<td>Low-flow shower head</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Toilet Flushing</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Standard flow toilet</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low flow toilet</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Drinking/Cooking</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drinking water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooking a meal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Washing Dishes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washing dishes by hand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Running one dishwasher load</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Washing Load of Laundry</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard top load machine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front loader or water saver</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Total DIRECT Water Use

- **Brush Teeth:**
  - Total estimated use: \( \times 2 = \) .25 gallons

- **Washing-Up:**
  - Wash face or hands: 1 gallon
  - Taking a bath: 40 gallons

- **Showering:**
  - Standard shower head: 50 gallons
  - Low-flow shower head: 25 gallons

- **Toilet Flushing:**
  - Standard flow toilet: 5 gallons
  - Low flow toilet: 1.5 gallons

- **Drinking/Cooking:**
  - Drinking water: .25 gallons
  - Cooking a meal: 3 gallons

- **Washing Dishes:**
  - Washing dishes by hand: 10 gallons
  - Running one dishwasher load: 15 gallons

- **Washing Load of Laundry:**
  - Standard top load machine: 30 gallons
  - Front loader or water saver: 10 gallons

*Estimated water used based on typical household activities.*
# Water Activity Log: Indirect Use of Water

On each day, make a tic mark representing each serving consumed, piece of paper used, or item purchased (clothing only). Add days 1-3 for the total column. Multiply the Total Number of Times by the Estimated Water Used to get the 3-Day Water Use for each activity.

<table>
<thead>
<tr>
<th>Product Used or Food Consumed (1 serving)</th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>3-Day Total Estimated Water Used (gallons)</th>
<th>3-Day Water Use Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast Cereal</td>
<td></td>
<td></td>
<td></td>
<td>× 34 =</td>
<td></td>
</tr>
<tr>
<td>1 Slice of Bread</td>
<td></td>
<td></td>
<td></td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>1 Egg</td>
<td></td>
<td></td>
<td></td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>1 Hamburger</td>
<td></td>
<td></td>
<td></td>
<td>634</td>
<td></td>
</tr>
<tr>
<td>Chicken</td>
<td></td>
<td></td>
<td></td>
<td>204</td>
<td></td>
</tr>
<tr>
<td>Cheese Pizza</td>
<td></td>
<td></td>
<td></td>
<td>80</td>
<td></td>
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<tr>
<td>French Fries</td>
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<td>32</td>
<td></td>
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<tr>
<td>Cheese</td>
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<td></td>
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<td>140</td>
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<tr>
<td>Beans/Vegetable</td>
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<td>18</td>
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<tr>
<td>Apple</td>
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<td></td>
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<td>18</td>
<td></td>
</tr>
<tr>
<td>Lettuce/Salad</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
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</tr>
<tr>
<td>Add your own</td>
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<tr>
<td>Add your own</td>
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<tr>
<td>Add your own</td>
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<tr>
<td>Milk</td>
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<td></td>
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<td>67</td>
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</tr>
<tr>
<td>Juice</td>
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<td></td>
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<tr>
<td>Tea</td>
<td></td>
<td></td>
<td></td>
<td>9</td>
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</tr>
<tr>
<td>Soda (12 oz can)</td>
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<td></td>
<td></td>
<td>24</td>
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</tr>
<tr>
<td>1 Piece of Paper</td>
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<td></td>
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<td>2.5</td>
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</tr>
<tr>
<td>1 Cotton T-Shirt</td>
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<td></td>
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<td>660</td>
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<tr>
<td>1 Pair Jeans</td>
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<td>2,113</td>
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</tr>
</tbody>
</table>

Total INDIRECT Water Use
How Many Ways is Water Used to Process Food?

Examples of Indirect Water Use

Source: http://www.environment.nationalgeographic.com/environment/freshwater/embedded-water

Life Support: Tennessee’s Water