Student Publication **Grade 7**

Water Matters!

Saving Your Water through Science

Southwest Florida
Water Management District

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Student Name

CONTENTS

This student guide is the seventh grade module of the "*Water Matters!*" curriculum developed by the Southwest Florida Water Management District (SWFWMD). *The* "*Water Matters!*" curriculum will provide content to help you become a good steward of Florida's precious water resources. When reading this student guide, look for vocabulary words in the text that appear *italicized* and in **bold**. At the end of this module is a vocabulary quiz that will include some of these words.

Many other *free* materials are available from the SWFWMD and can be ordered online at *WaterMatters.org/Publications/*.

Introduction

Water is one of the most common and precious substances on Earth. It is essential for human life and for the environment. No matter how old we are or where we live, we need clean, fresh water to keep us alive and healthy. With a limited water supply and a growing population, it is important to use our water carefully and protect it from pollution.

As you read this publication, you will learn about Florida's fresh water — both above and below the ground. You'll also learn how water becomes polluted and how monitoring and testing the quality of water can help protect humans and the environment.

The "*Water Matters!*" curriculum is brought to you by the SWFWMD. The SWFWMD is a regulatory agency of the state that manages the water resources for west-central Florida. Its goal is to meet the water needs of current and future water users while protecting and preserving the water resources within its boundaries.

Section One:
Watersheds, Surface Water and Groundwater

There is no such thing as new water. The same water the dinosaurs consumed is the same water available now and will forever be the same water. Did you know that 75 percent of the Earth's surface is covered with water and 97 percent of it is ocean water? This means of the water on Earth, about 3 percent is fresh water, and 2 percent of this is frozen in glaciers and ice caps! It is wild to think the water utilized by the world's population of seven billion people is found in only one percent of the Earth's water.

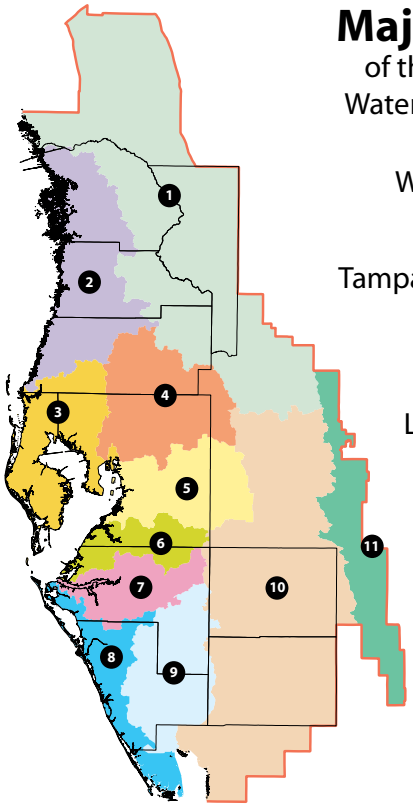
The hydrologic cycle, along with Florida's weather and climate, affects how much water enters our watersheds, surface water bodies and groundwater supplies. How are the health and well-being of watersheds, surface water and groundwater interconnected?

Watersheds

Everyone lives, works and plays in a watershed, and everyone in a watershed is part of the watershed community. A watershed is also home to the wide variety of plants and animals that live in the area.

A ***watershed*** is an area of land that water flows across as it moves toward a common body of water, such as a stream, river, lake or coast. It can also be described as a land area from which water drains or "sheds" into a larger body of water. Watersheds can be very large, draining thousands of square miles to a major body of water, or very small, draining a few acres to a small pond. Watersheds may contain open fields, forests and wetlands, as well as cities, suburbs and agricultural lands.

Did you know there are more than 50 main watersheds in the United States? The largest of these watersheds is the Mississippi River watershed, which touches 31 states and two Canadian provinces. As the Mississippi River watershed illustrates, major watersheds are typically named after a significant water body or hydrologic feature within that watershed. Usually it is the same common body of water into which the watershed's runoff drains.



Major Watersheds
of the Southwest Florida
Water Management District

1. Withlacoochee River
2. Springs Coast
3. Tampa Bay/Anclote River
4. Hillsborough River
5. Alafia River
6. Little Manatee River
7. Manatee River
8. Southern Coastal
9. Myakka River
10. Peace River
11. Lake Wales Ridge

Watersheds are separated from each other by areas of higher elevation called ***ridge lines*** or ***divides***. Watersheds have different shapes because the topography of the land is different. Topography is the study of surface features of an area such as a mountain or valley. Florida's relatively flat land surface makes it hard to recognize watershed boundaries. Within the geographical boundaries of the SWFWMD, 11 primary watersheds have been identified. Do you know in which watershed you live? Try to identify your watershed from the map on page 5.

A watershed is usually described as an open or closed system. In an open system, the water collects in an area until it overflows into a larger body of water such as a stream or river. These watersheds can be small or large, and most are interconnected. The process of collecting and overflowing continues with water moving downhill from one watershed to another, until the water finally moves out to sea. Most watersheds are open systems. In a closed system, the water collects at a low point and leaves only through evaporation or by seeping into the ground beneath it.

Healthy watersheds offer many benefits. They provide water for drinking, irrigation, agriculture, industry, boating, fishing and swimming. Healthy watersheds also supply food and shelter for wildlife and are important for a strong environment and economy.

Surface Water

When precipitation falls in a watershed, the water drains to a common ***surface water*** body. Water seen on the Earth's surface is called surface water and exists in many shapes and forms. Surface water in Florida includes rivers, lakes, streams, creeks, ponds, sloughs and wetlands. It accounts for 20 percent of the water supply in west-central Florida. Some rivers provide water for public use in cities such as Tampa, Bradenton, Punta Gorda, Port Charlotte and North Port.

Over time, many surface water bodies in our state have suffered from pollution and habitat loss caused by a variety of sources such as wastewater and industrial discharge, runoff from agricultural usage and development. The Florida Legislature, state agencies, local governments and other organizations recognize the importance of restoring and protecting damaged or at-risk surface water bodies. Many protection efforts are underway through programs such as the SWFWMD's Surface Water Improvement and Management Program (SWIM). The SWIM Program identifies a list of priority water bodies within the region and implements plans to improve them.

Wetlands are surface water bodies and offer many benefits to neighboring bodies of water. ***Wetlands*** are lands that are wet all, or part, of the year and support plants adapted to changes in water level. Freshwater wetlands include cypress swamps, hydric hammocks, hardwood swamps, marshes and wet prairies, while salt marshes include coastal saltwater marshes and forested wetlands such as mangrove swamps.

More than half of America's original wetland habitats have been altered and destroyed — drained for farmland, filled for development and used as waste-dumping sites. We now realize that wetlands play a very important role in keeping our environment clean and healthy.

Wetlands benefit us in several ways:

- Wetlands provide wildlife habitat for plant and animal species including many threatened and endangered species as well as commercially important species.
- Wetlands improve water quality because the plants and soils in wetlands act as filters, trapping pollutants before the pollutants filter into nearby water bodies.
- Wetlands also provide flood protection, acting as sponges to collect rainwater and helping prevent residential or commercial areas from flooding.
- Wetlands also slow down shoreline erosion in coastal areas by binding sediments with roots.

Organizations like the SWFWMD are working to protect and restore wetlands. The SWFWMD has purchased conservation lands — many of them wetlands — to carry out its mission of balancing water needs and protecting the environment. These lands are essential to keeping our water resources clean and healthy.

Check out SWFWMD's **"Restoring A Wetland Ecosystem"** podcast at *WatersMatters.org/Podcasts* to learn how human actions can alter wetland ecosystems and create limiting factors in an environment.

Groundwater

We know that precipitation in Florida is often rain, and rain travels across a watershed sometimes entering surface water bodies. Rain can also percolate through the sand that covers most of Florida's land and into the bedrock beneath. Much of Florida has a ***karst terrain***, meaning the bedrock, mostly limestone in Florida, dissolves slowly over time as acidic rainwater passes through the bedrock. Water that has seeped into the ground and is held in soil and rock is called ***groundwater***. Groundwater, pumped up from the aquifer through wells, provides 80 percent of the water supply in west-central Florida.

Water can be exchanged between groundwater and surface water through aquifer recharge and discharge. In Florida, groundwater is recharged naturally by rain, but not all rainwater finds its way into the ground. The majority of rainfall returns to the atmosphere through evaporation and transpiration or runs off across the land and into surface water bodies. We depend on sufficient amounts of rain to provide groundwater, and the environment does too.

In some areas of the state, aquifers are connected with the lakes, rivers and wetlands above them. For instance, in a spring, groundwater is naturally pushed up from the aquifer to the Earth's surface. This discharge often forms spring-fed rivers.

Weather conditions, such as a drought, can reduce the amount of groundwater exiting a spring and supplying flow to the river. A reduction in water levels can harm the many plants and animals that rely upon the river.

Aside from natural occurrences, people can also negatively impact groundwater levels. In Florida, water is owned by the public, not by any person, company or government. If you want to withdraw large quantities of water, develop property or construct a well, there's a good chance you'll need a permit from one of the state's five water management districts. Florida's laws require water management districts to approve permits as long as the water use is reasonable and beneficial, doesn't impact an existing legal use and is in the public interest. The permitting process makes sure there is enough water for all users, both people and the environment.

Do you think water under the earth's surface is protected from stormwater runoff or contaminants? Unfortunately, pollutants like pesticides and fertilizers, septic tank seepage, stormwater runoff and materials from landfills and abandoned wells can soak into our groundwater. In the past, people often discarded motor oil and other hazardous materials by pouring the substances directly into the ground. These contaminants quickly soaked into the sandy soils and entered our groundwater. Septic tanks not well maintained also contribute to pollutants entering our groundwater. Consider your own neighborhood. Are lawns and gardens sprayed frequently with pesticides and herbicides? Many of these chemicals can eventually seep into the ground, as well as into our drinking water. Can you think of ways to keep this from happening?

Additional efforts to reduce groundwater pollution include regulations for new solid waste landfills, while old landfills are being cleaned to reduce possible contamination. Another effort includes government agencies offering assistance in plugging abandoned wells. Plugging the wells prevents contaminants from directly entering the aquifer. The continued education and responsible actions of citizens, businesses and government agencies are making a difference in the quality of our drinking water.

Section One:
Questions

1. Explain where groundwater comes from and how it makes its way into the aquifer.

2. Describe how groundwater and surface water bodies are connected. Do you think pollution and contaminants in one could affect the other?

3. Using evidence from the text, explain why wetlands are a valuable natural resource.

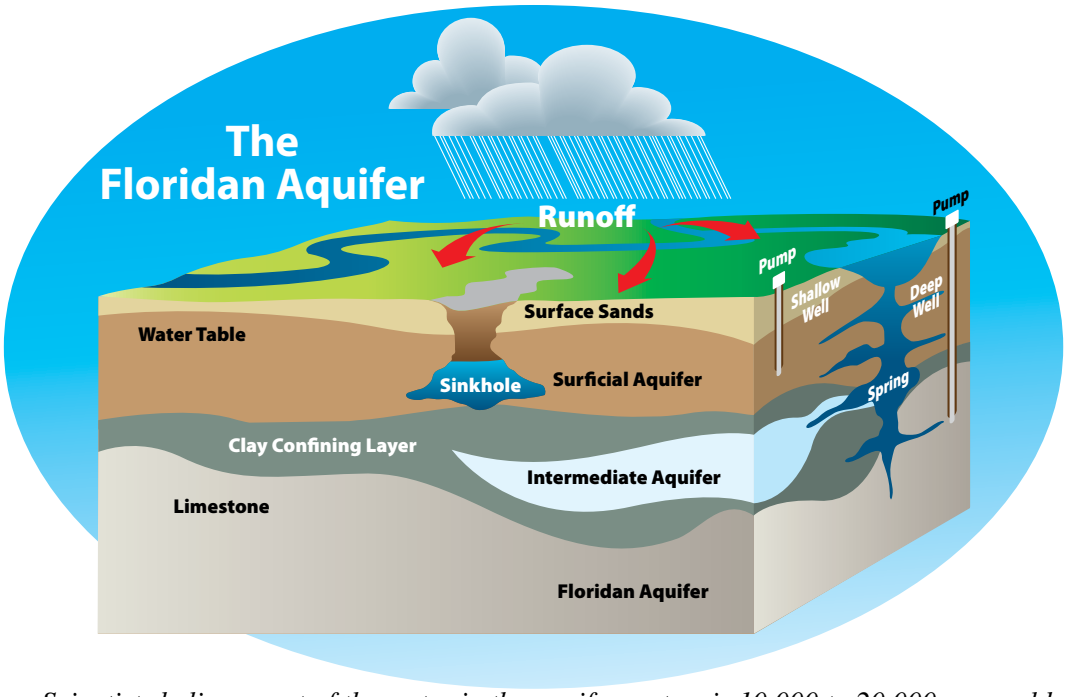
Section Two:
A World Beneath Your Feet

Florida's Aquifers

Florida is part of a coastal plain. It is relatively low-lying, flat land with sand covering most of its surface. Under the surface are loosely packed sediments and layers of calcium-rich limestone and dolomite that make up the aquifer system. ***Aquifers*** are sponge-like layers of underground rocks and limestone that hold and release water. Water may travel quickly through parts of the acquifer with large caves and conduits, or it may travel very slowly where spaces are smaller.

In west-central Florida, there are three main aquifer systems: the surficial, the intermediate and the Floridan aquifer system. The Floridan aquifer system is the largest and deepest aquifer in our area, and it supplies our drinking water.

Throughout central Florida, the aquifer system is about 100–200 feet beneath the Earth's surface, but is found closer to the surface in some areas. This means geographic location determines how deep a well must be drilled to get water. In general, water that comes from deeper aquifers is better quality because aquifers closer to the Earth's surface are more susceptible to contamination.



Scientists believe most of the water in the aquifer system is 10,000 to 20,000 years old.

Florida's Karst Terrain

Much of Florida's landscape is made up of "karst" terrain. A karst terrain is the land surface produced by acidic rainwater dissolving bedrock. In Florida, bedrock is usually limestone, a soluble rock made of shell fragments, mud and sand, and it is composed of mostly calcium carbonate. As rain falls, it mixes with carbon dioxide (CO_2) in the atmosphere. When it seeps into the soil, more CO_2 from decaying plants is contributed to the rainwater. This combination produces a weak acidic solution called carbonic acid that dissolves the limestone. As this acidic water percolates into the Earth, it creates tiny passages that continue to widen as more water seeps into them. Eventually, some of these passages become large enough to form a ***cave*** or ***cavern***, which is one characteristic of a karst terrain as well as the presence of springs and sinkholes.

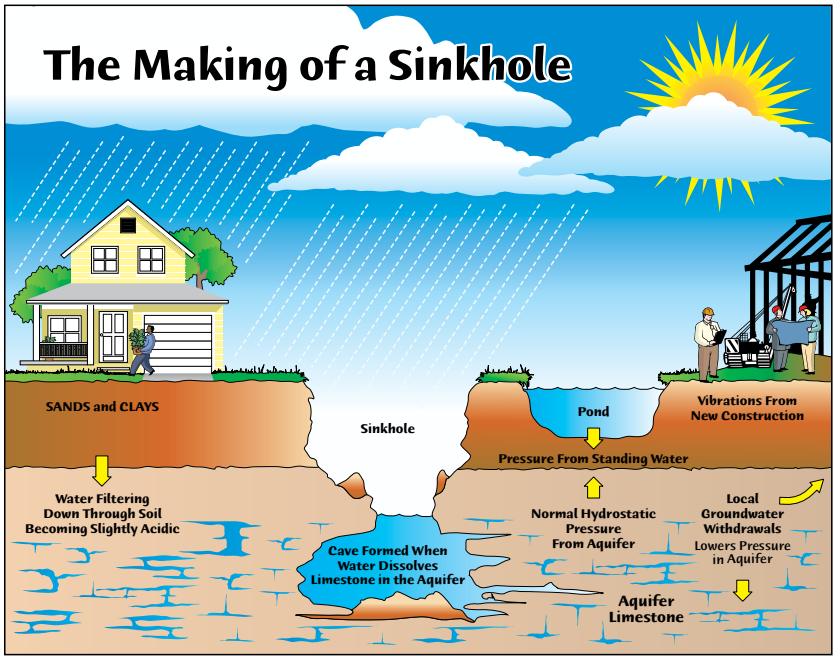
Springs

A ***spring*** is a natural opening in the ground where water flows directly from the aquifer to the Earth's surface. Springs form when groundwater is under pressure and flows up through an opening called a spring vent. As mentioned in Section One, springs supply fresh water to spring-fed rivers. In parts of west-central Florida, springs also supply fresh water to bays and estuaries. Springs have tremendous ecological value and are home to countless plants and animals.

Florida has the largest concentration of springs in the world, but over time, the springs' water quality and amount of water they discharge have been threatened by both human activities and natural factors. With more than 150 springs within the SWFWMD, the SWFWMD's Springs Team is leading the effort to improve water clarity and habitat in west-central Florida springs.

Sinkholes

A ***sinkhole*** is a natural depression in the land surface caused when the underlying bedrock dissolves. As rain falls through the atmosphere, it forms a weak carbonic acid. It becomes even more acidic while passing through soils underground. This acidic water slowly dissolves limestone, especially along fractures and weak layers and causes cavities. When a sinkhole occurs, the overlying sediments and ground collapse into the cavities below forming a natural depression.



Sinkholes are classified as geologic hazards. Homes, roads, cars and other items can fall into or be severely damaged if a sinkhole opens below them. In fact, sinkhole repairs cost families, local governments and the insurance industry millions of dollars annually. Open sinkholes can also threaten our water supplies as they provide direct access for pollutants to enter the aquifer system.

Weathering and Erosion

Weathering is the process by which rocks are broken down — through exposure to wind, water, heat and cold — into smaller and smaller pieces, forming soils. You might think rocks are stronger than water, but water is a powerful force that can weather and wear away rock. For example, as ocean waves smash rocks against each other, rocks are worn smooth, eventually turning into sand. This is called ***mechanical weathering***. During mechanical weathering, cracks in rock are created when temperature changes cause minerals in rock to expand and shrink. Water expands as it freezes and contracts as it melts. Therefore, when water seeps into existing cracks and freezes, it can actually split the rock.

Another type of weathering is ***chemical weathering,*** which is commonly produced by rain. Water is a universal solvent because more substances will dissolve in water than in any other liquid. Some types of rock will completely dissolve in water, while others change when water is added to their structure. For example, nitrous oxide (N_2O) and sulfur dioxide (SO_2) are released during the burning of fossil fuels. When these pollutants mix with water (H_2O), they form nitric acid (H_2NO_4) and sulfuric acid (H_2NO_4), which are the two main components of acid rain. Acid rain can accelerate chemical weathering and wear on buildings and statues. Acid rain also dissolves limestone in Florida.

Climate is another factor that affects chemical weathering because as the temperature increases, so does chemical weathering. Hotter temperatures cause chemical reactions to occur faster. Chemical reactions and weathering also increase when there is more precipitation because more water is present.

Erosion is what happens to material that has been loosened by weathering. Erosion can take a long time like a river carving out a canyon. Or the change could be quick like a flash flood or landslide. Gravity, wind, rain, rivers, oceans and glaciers all have an erosive effect. Rain erodes the land by splashing down and dislodging weathered material. Heavy rainfall also carries away sediment into streams, rivers and oceans. One of the most highly visible examples of erosion can be seen at the beach. As wind blows across the ocean, waves are created. Waves erode loose sand on beaches, and this repeated motion washes the sand back into the ocean. Waves are also responsible for depositing sand on beaches, too. As the tide rises and falls, materials are moved among different levels of the shore.

Section Two:
Questions

1. Describe the journey of a raindrop as it falls from the sky to the point it reaches the Floridan Aquifer.

2. Explain why caverns, springs and sinkholes are common in areas with a karst terrain?

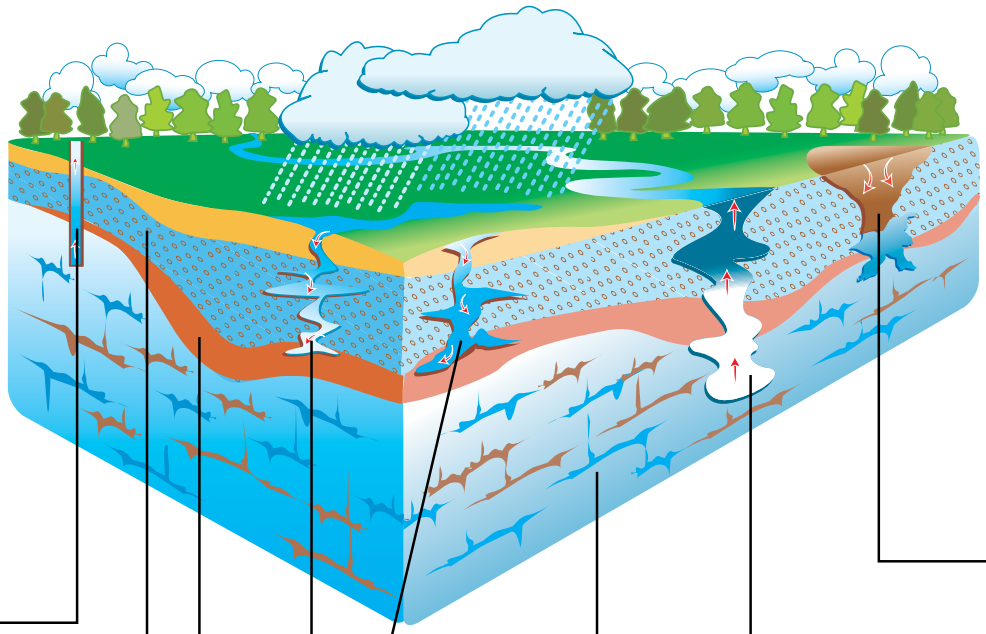
3. Explain how water contributes to weathering?

Florida's Aquifers

Correctly label the graphic of Florida's aquifers. Don't forget to label the spring and sinkhole, which both have direct access to the water beneath your feet!

Word Bank

Floridan aquifer	Intermediate aquifer
pump	recharge
sinkhole	spring
Surficial aquifer	



Section Three:
Pollution and Water Quality

Water is vitally important to every aspect of your life and also vitally important to the environment. Monitoring water resources helps scientists discover and address water quality problems. Also, through monitoring the quality of both surface water and groundwater, scientists are better able to understand how the two are connected and how to help protect them from pollutants.

State and federal governments have adopted sets of water quality standards for water bodies and for water based on how it is used. For example, water used for drinking must meet a much higher standard than water used for crop irrigation or to cool machinery in a factory. Data from water monitoring helps scientists rate water bodies based on the water's intended use. A good water quality score means the water can fully support its intended uses, but an impaired water quality means the water cannot support one or more of its intended uses.

Pollution in Our Watershed

So how do water bodies become impaired? Although there are natural processes in water that alter its quality, water pollution is usually the major contributor. Pollutants are usually grouped according to categories such as micro-organisms, suspended solids, inorganic compounds, synthetic organic compounds and radioactive materials. To list all the different pollutants in these categories would take a long time. The commonly known pollutants include trash, chemicals, fertilizer, pesticides, sewage, wastewater, litter, oil and acid rain. Do you see a similarity? Many pollutants enter our water because of things people do.

Point-source pollution is a type of pollution that can be traced to a single point or location. You can "point" your finger directly at the source. Examples include polluted water leaving a factory through a pipe that empties directly into a river and garbage being dumped directly into a lake. Point-source pollution is often easier to identify because you can see the cause of the pollution and do something about it.

Nonpoint-source pollution

On the other hand, ***nonpoint-source pollution*** is much harder to identify because it cannot be traced to a single point or location. It is more likely to occur and comes from a variety of sources such as pesticides, fertilizers, automobile fluids, leaky sewers and septic tanks, sediments from soil erosion, metals and air pollution. The effects of both point-source and nonpoint-source pollution can be seen locally or hundreds of miles from the source.

Stormwater Runoff

There is a strong connection between land and water, and it is important we realize our actions on land can negatively impact water resources. ***Stormwater runoff*** is a type of nonpoint-source pollution. It occurs when rainwater picks up pollution as it washes over roads, parking lots, driveways, roof tops and other hard surfaces and washes the pollution into ditches, storm drains and water bodies.

West-central Florida receives an average of 53 inches of rain each year, and much of it occurs during heavy downpours. When rain is falling heavily, the soil cannot soak it all up, and this extra rainwater becomes stormwater runoff. Untreated stormwater runoff is considered the state's leading source of water pollution.

How does stormwater runoff negatively affect humans, plants and animals? For starters, it contributes almost all the sediment, or loose soil, in our waters. Sediments and loose soil cloud water and reduce the sunlight penetrating through the water. Aquatic plants need sunlight for photosynthesis — for survival. Other plants and animals depend on the oxygen produced by plants through photosynthesis. Reduced oxygen levels limit the plant and animal species a water body can support and make it harder to clean impurities from the water. In addition to sediments, but many other types of pollution affect oxygen levels in surface waters.

Retention ponds are used to limit stormwater runoff. Retention ponds, constructed or natural, collect and filter rainwater, allowing it to seep through the soil and into the ground without directly discharging into a larger body of water. Aquatic plants along the banks and in shallow areas of retention ponds help prevent erosion and use excess nutrients collected from stormwater runoff. These ponds also provide a habitat for many animals.

Retention pond

How we use our land is important. A large part of the stormwater problem has occurred because of urbanization. Urbanization is when streets, sidewalks, parking lots and buildings begin to cover the soil. As more and more buildings, roads and parking lots are built, we are left with less and less open space. In open space, stormwater can soak into the ground — recharging the aquifer. When there isn't enough open space, stormwater runs across these covered surfaces, washing harmful pollutants into our surface water bodies.

Types of Pollution

Many pollutants are from natural sources such as organics, sediments, bacteria, viruses, etc. In large quantities, these natural sources have a negative effect on the environment and our water supply. It is important to remember you cannot tell much about the quality of water simply by looking at it; most pollutants are invisible to our eyes. Let's read more about pollutants.

Organic Pollution is a form of pollution that includes human wastewater/sewage, animal wastes and food by-products. Organic wastes release nutrients and fuel bacteria that can deplete oxygen in the water. Organic wastes often contain types of bacteria called pathogens, which are waterborne disease-causing organisms that affect humans and animals.

Nutrients are naturally occurring chemical elements that are necessary for plant growth, but can be harmful in excessive quantities. They are also the primary cause of water pollution. A large amount of nutrients are found in lawn fertilizers. Among the many types of nutrients, nitrogen and phosphorus are the most common in the

water bodies of west-central Florida. Excess nutrients can cause algae or unwanted vegetation to grow out of control and use the available oxygen in the water. The excessive growth also can block sunlight, reducing photosynthesis.

Pesticides and Herbicides can be found in insect and weed killers. When not used properly, these products could potentially kill plants, birds and fish. Like the nutrients in fertilizers, pesticides and herbicides can cause water pollution and threaten the very water that we drink.

Sediment or soil particles are one of the most destructive pollutants. Sediment pollution is caused by runoff from streets, parking lots, buildings, construction and agriculture. Loose soil is dangerous because it also carries other pollutants. Sediment can clog the gills of fish, suffocating the fish. It also can decrease the amount of sunlight aquatic plants receive.

Heavy metals are found in automobile exhaust, tires, paints and household batteries. Stormwater runoff deposits 80 to 95 percent of the heavy metals that enter Florida waters. Heavy metals are toxic to many aquatic organisms and reduce their ability to reproduce.

Petroleum products can cause pollution through automobile leaks and illegal dumping of used oil and gas. Although oil and gas float, the heavy metals they contain settle to the bottom of water bodies, smothering plants, starving fish and polluting the water.

We have looked at the different types of pollution and what kinds of problems they can cause. The main problem with water pollution is that it damages the one thing essential to all life — water!

Measuring Water Quality

When you are sick, the doctor uses different instruments such as a thermometer or a stethoscope to check the status of your health. Scientists use many different instruments to test the quality of water. Secchi disks, probes, nets, gauges and meters are just a few instruments used. Water quality is measured many different ways including sampling and testing water, collecting organisms that live in the body of water and by observing the surrounding environment.

Sampling and Testing Water

Learn more about the parameters scientists use to measure water quality.

Temperature

The ***temperature*** of water can affect it in many different ways. Some organisms prefer cool water, while some like it warm. Most aquatic organisms are cold-blooded. This means the temperature of their bodies matches the temperature of their surroundings. Reactions that take place in their bodies, like photosynthesis and digestion, can be affected by temperature. Aquatic species also are more likely to catch diseases when the water temperature is higher because bacteria generally tend to grow more rapidly in warm waters.

Testing water

It is also important to know that temperature affects dissolved oxygen. When the temperature goes up, water will hold more dissolved solids but fewer dissolved gases like oxygen. The opposite is true for colder water. Colder water contains more oxygen, which is better for some animals like fish and insect larvae.

Dissolved Oxygen

Dissolved Oxygen (DO) measures how much oxygen is in the water. Most oxygen in water comes from plants during photosynthesis and also from air as wind blows across the water's surface. Freshwater plants and animals need DO within a certain range to survive. Most healthy water bodies have high levels of DO, while there are some exceptions, like swamps, that have naturally low DO levels.

What causes DO levels to change? DO levels naturally decrease at night because photosynthesis stops when the sun is not shining. DO also decreases when there is a lot of organic debris in the water. This can be dangerous for aquatic species because microorganisms use all the oxygen in the water when processing the decomposing organic material, which lowers oxygen levels for other species.

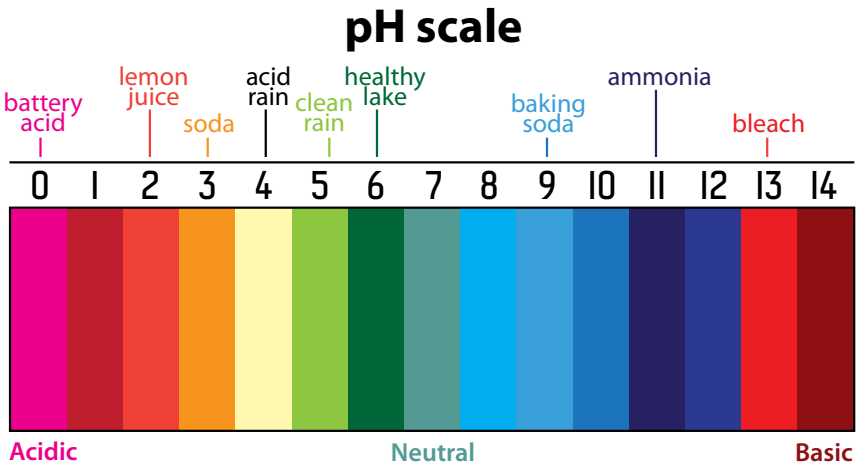
Turbidity

Turbidity refers to the lack of transparency or clarity of water, or how muddy it is. Turbidity is caused by organic debris, erosion, waves, floods and other sources. The presence of these things affects how much sunlight gets into the water and how deep the sunlight penetrates. Aquatic plants need sunlight for photosynthesis. Without light, photosynthesis is limited and plants die.

Oxygen also can be reduced in turbid waters because less dissolved oxygen (DO) is produced when fewer plants are present. Dead plants also increase the organic debris on which microorganisms feed, further reducing the DO level. No DO means other aquatic life forms cannot live in the water.

pH scale

The ***pH scale*** describes the acidity or alkalinity of something. The scale has a range from 0 (extremely acidic) to 14 (extremely basic) with 7 being neutral. Here are some examples to compare pH values: lemon juice has a pH of 3 — this makes it an acid; pure water is right in the middle, or neutral, with a pH of 7; and liquid bleach has a pH of 11 — this makes it a base.



Strong bases, just like acids, can burn your skin. Why? Our bodies are made mostly of water, and water has a pH of 7. Things that are close to pH 7 work well with our bodies. The same holds true for aquatic organisms. Most aquatic organisms survive best in water between 6.5 and 8.5. If the water becomes too acidic or too basic, it can kill them. Did you know pollutants cause pH to change?

Collecting Organisms (Biological Indicators)

Macroinvertebrates are organisms that lack a backbone (invertebrates) and are large (macro) enough to be visible without a microscope. Knowing which macroinvertebrates are present helps scientists determine the

water quality of a body of water. Like many other organisms, macroinvertebrates are sensitive to changes in pH, dissolved oxygen, temperature, salinity, turbidity and water chemistry.

Scientists know that certain types of macros can tolerate polluted water while other types cannot. Leeches, aquatic worms and midge larvae are ***tolerant species***, which means they can withstand poor water quality. They can be found in polluted as well as clean aquatic ecosystems. ***Somewhat tolerant or somewhat sensitive species*** are organisms that can live in good or slightly polluted water ecosystems. Dragonfly nymphs, crayfish and beetles help make up this group. Lastly are the ***sensitive or intolerant species*** such as the dobsonfly nymph, mayfly nymph and caddisfly larvae. These organisms are highly sensitive to pollution and impaired water quality can easily drive them away if it doesn't harm or kill the organism first.

Dragonfly nymph

Observing the Surrounding Environment (Visual Survey)

Another way to test water quality is to just observe the surrounding area. For instance, scientists may observe how many trees and shrubs are along a body of water and how much shade they provide. More coverage provides more habitat for fish and wildlife. Tree coverage also plays a role in limiting phytoplankton blooms by reducing the amount of sunlight reaching the water, which improves water clarity. Vegetation also can trap pollutants before they enter the water body.

Check out SWFWMD's **"Measuring Water Quality"** podcast at *WatersMatters.org/Podcasts* to learn more about temperature, dissolved oxygen, pH and turbidity.

Section Three:
Critical Thinking

Water is an expansive network of branching wetlands, lakes, creeks, springs, rivers, estuaries, bays and more. Each water body can contain very different levels of pollution. An estuary is a semi-enclosed body of water where fresh water mixes with salt water. In Section Three, you learned that scientists rate water quality as impaired when the water cannot support one or more of its intended uses. Estuaries have the highest rate of impairment.

Look at this image of Tampa Bay, Florida's largest estuary. Take note of the many rivers emptying into the bay, and think about where the rivers originated. Write a paragraph explaining why you think estuaries have the highest rate of impairment. Explain what factors, including human impact, affect the water quality of Tampa Bay.

Vocabulary Review

Choose three vocabulary words (bolded and italicized) from the text that you have difficulty understanding and complete the charts. To improve your understanding of the vocabulary words, exchange your chart with a partner and discuss.

Vocabulary Term:	**Understanding Level (Before)**	✓	✓	✓	✗
	Understanding Level (After)	✓	✓	✓	✗
In My Own Words:					
Illustrate:	**New Information:**				

Vocabulary Term:	**Understanding Level (Before)**	✓	✓	✓	✗
	Understanding Level (After)	✓	✓	✓	✗
In My Own Words:					
Illustrate:	**New Information:**				