RIVERXchange®

MY WATERSHED JOURNAL

Engaging, *hands-on activities* where students learn about their local watershed.

Hello Students &Families!

Congratulations on being selected to participate in RiverXchange!

RiverXchange is a 5th grade science program where you will learn a lot about your local river, the Rio Grande, and your precious water supply. Additionally, you will learn about how to protect these local waters and keep them clean for all (like your family, local farmers, wildlife, and native plants) who depend on them. The journal in your hands will compliment the RiverXchange presentations you will receive with your class and includes at-home science lab activities that will help you understand the importance of good water quality and watershed health.

What is a **watershed**, you ask? A watershed is an area of land that drains to the same body of water. For example, you live in the ***Middle Rio Grande Watershed,*** an area of land that expands from the Westside to the Sandias and includes any land that drains water in that area to the Rio Grande. Don't worry if that doesn't make total sense yet - it will eventually! What is important to know now is that *everyone lives in a watershed.* So just as it is important to know what state, city and neighborhood you live in, it is also important to know your watershed *and how to keep it healthy*, since everyone who lives there depends on the ability to have access to enough clean water to live.

In this journal, you will get to learn some of the science behind how a watershed works - and how it can be impacted by pollution. The activities in this journal do require a few materials to complete the labs, but should be something you already have at home or can collect outdoors. We recommend that you work on finding these materials right away so that you are ready for each lab in your journal. Please see the list on the next page for all the materials you will need and read each lab's instructions before collecting the materials so you understand what they are for.

The most critical and exciting part of this journal is that it encourages you to get outside and explore important watershed features. We think that as a RiverXchange participant it is important that you and your family take the time to visit a local water feature and that's why we've written it into the journal. Please note that one activity requires you to collect still-water (not river water) and you might find this close to your home. Additionally, we strongly encourage you to take a trip to the river to make observations and experience the amazing Bosque ecosystem. The best way to get to know your ecosystem is to explore it!

Finally, above all, we want you to be safe taking part in these activities at home. Remember to *always check with an adult* before you go outside to observe or collect anything and please note any safety precautions for each lab. For additional information on this journal and **a list of water collection sites and river access points around the city** please visit www.riverxchange.com/waterlabs2021.

We hope you have a great year!

Sincerely,

The RiverXchange Team

Table of Contents

List of Supplies

- Students will need pencils and colored pencils each activity.
- For the Stormwater Activity you'll need:
  - ☐ Your watershed journal
  - ☐ An adult to go outside with you
- For the Water Filtration Activity you'll need:
  - ☐ 1 plastic bottle
  - ☐ 1/2 cup cotton balls
  - ☐ 1/2 cup large pebbles
  - ☐ 1/2 cup small pebbles
  - ☐ 1/2 cup sand
  - ☐ 1/2 cup leaf or plant matter
  - ☐ 1 cup of dirty water
  - ☐ 1 empty clear cup
- For the Ecosphere Activity you'll need:
  - ☐ 3 labeled glass or plastic jars with air tight lids
  - ☐ Water, soil, and algae from a still water source

Draw Yourself Here!

Hello, my name is:

_____

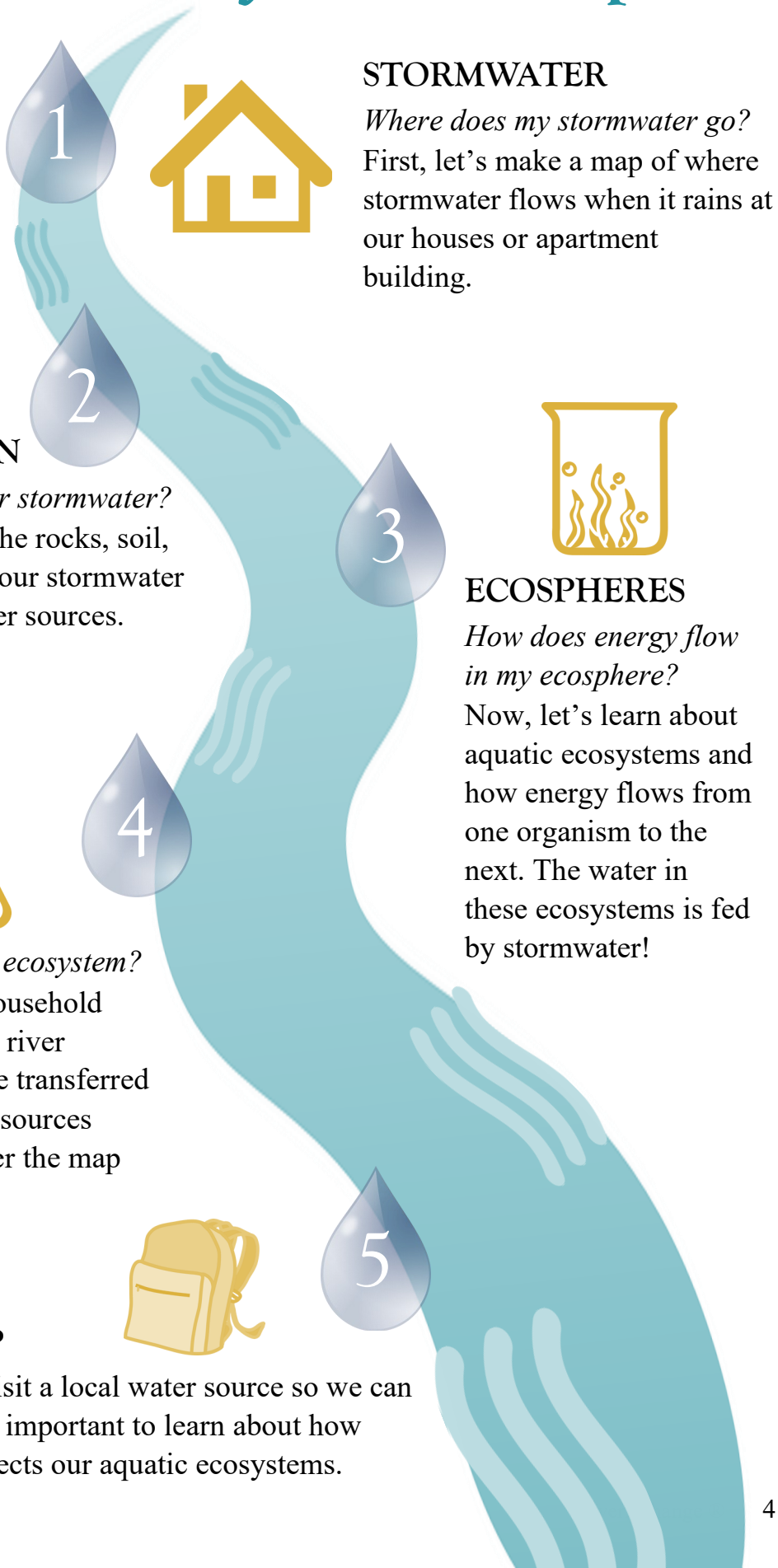
and I live in the

_____

watershed.

- For the Pollution Activity you'll need:
  - ☐ 3 labeled ecospheres from previous activity
  - ☐ Household chemicals that can pollute water (fertilizer, soap, vinegar, etc.)
- For the Field Experience you'll need:
  - ☐ Water, snacks, backpack, journal, etc.
  - ☐ An adult to go with you

The Watershed Journal Map



STORMWATER

Where does my stormwater go?
First, let's make a map of where stormwater flows when it rains at our houses or apartment building.

WATER FILTRATION

How does nature filter our stormwater?
Next, let's discover how the rocks, soil, and ecosystem help filter our stormwater before it gets to local water sources.

ECOSPHERES

How does energy flow in my ecosphere?
Now, let's learn about aquatic ecosystems and how energy flows from one organism to the next. The water in these ecosystems is fed by stormwater!

POLLUTION

How can stormwater affect my ecosystem?
Next, let's see how common household items can pollute and harm our river ecosystem. These pollutants are transferred from our houses to local water sources through stormwater—remember the map you drew in the first activity!

FIELD TRIP

Finally, let's visit a local water source so we can see why it's so important to learn about how stormwater affects our aquatic ecosystems.

How to Use Your Journaling Sheets

Each activity includes a journaling sheet (like the one below) where you can record your observations and thoughts. We are using the 3 prompts—claim, evidence, reasoning—from the Next Generation Science Standards. Please read each section below as it will guide you on how to complete the journaling sheet for each activity.

CLAIM

At the top of each activity page, there is a question. Read the page, think about what it says, then try to answer the question.

Ask yourself "What do I know?"
You can use these prompts to guide your **CLAIMS**:

- *What have you observed about this topic?*
- *What have you learned before about this topic?*
- *Who could you ask about this topic?*

EVIDENCE

This is where you will collect evidence to answer the question. Don't worry, you don't have to come up with this on your own. Simply read the activity page and follow the instructions. Then record your observations in this box.

Ask yourself, "How do I know it?"
You can use these prompts to guide your **EVIDENCE**:

- *Can you draw a picture or model of your claim to better explain it?*
- *Can you do an experiment or make an observation that will support your claim?*
- *Can you ask an expert or find information from a valid source to support your claim?*

Example Evidence for:
"Where does my stormwater go?"

REASONING

Reasoning is your explanation of why the evidence you used supports your claim. Be sure to include scientific terms & concepts provided in the terms list for each activity.

Ask yourself, "How does the evidence support my claim?"
You can use these sentence stems to guide your **REASONING**:

- _____ *supports my claim because* _____.
- *The evidence shows that* _____.
- *This evidence works together to build a case that* _____ *because* _____.

Where does my stormwater go?

Did you know that you live in a watershed? It's true! We all do. A **watershed** is an area of land where all the water drains into the same river, lake, or ocean.

We can learn a lot about our watershed during a storm. Think about the last time it rained. Where did the stormwater go? The path stormwater takes from our houses and cities until it ends up in a body of water, helps us understand our watershed. **Stormwater** is defined as the rainwater that runs off the land and city surfaces into street gutters, drains, or arroyos.

For this activity, we'd like to discover the path of stormwater at your house or apartment. Be sure to ask a parent for permission to go outside!

Terms to Know:

- Watershed
- Stormwater
- Permeable Surface
- Non-Permeable Surface

Supplies:

- Pencil
- Colored pencils

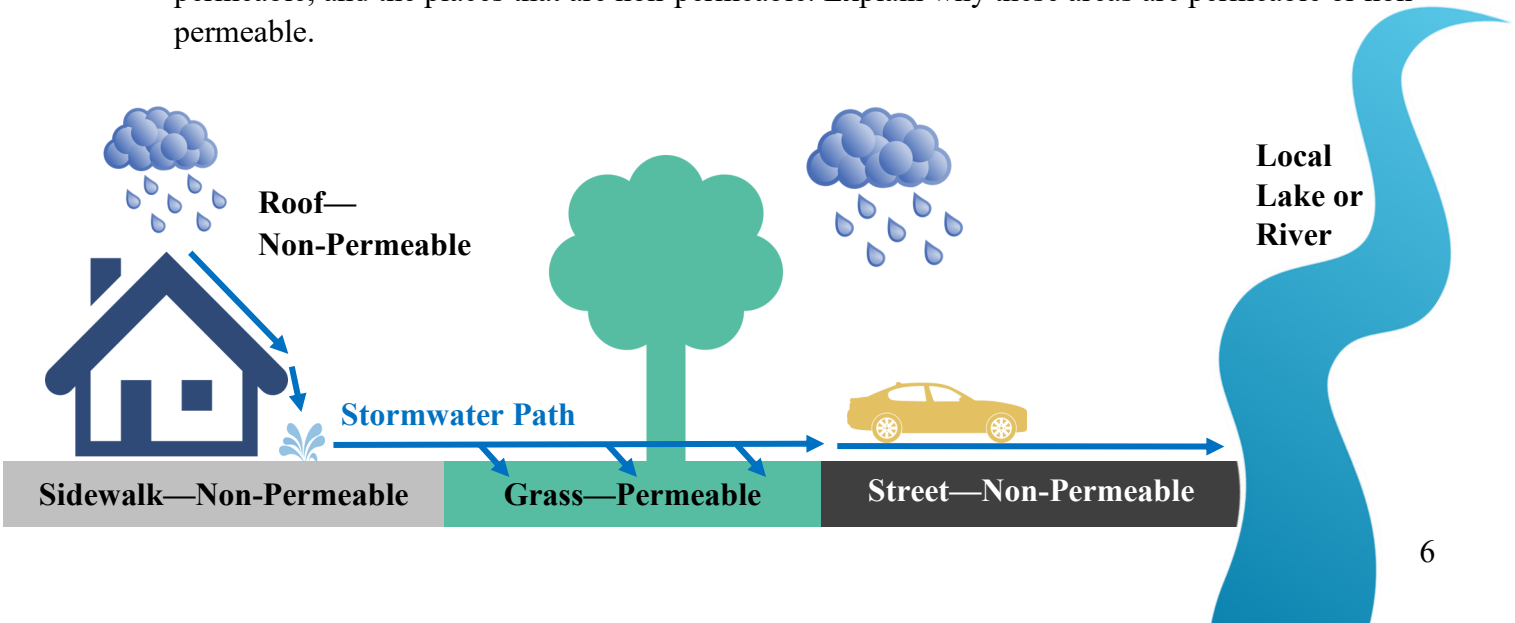
INSTRUCTIONS:

1. Go outside and walk around your house or apartment building. Think about the last time it rained and imagine where the stormwater might have flowed. Hint: look for signs of water stains, water damage, or little water canals formed in the soil.

2. Draw a map of your house or apartment building. Label everything on your map—your house, the big tree, the sidewalk, a gravel path, a garden, and so on. Be sure to use color to draw the features on your map!

3. Now, discuss the flow of stormwater at your house or apartment with a parent, sibling, or friend. Where does stormwater go? Why do you think it flows that direction? Does the water soak into the ground in some areas and not others? Using a blue marker or colored pencil, draw the path of stormwater on your map.

4. **Permeable surfaces** are areas where water can seep into the ground, for example, areas with grass, soil, and gravel. **Non-permeable surfaces** are areas where water is not able to seep into the group, for example, sidewalks, pavement, and asphalt. Label the places in your map that are permeable, and the places that are non-permeable. Explain why these areas are permeable or non-permeable.



CLAIM

Use your observations to answer the following question in a complete sentence: *"Where does my stormwater go?"*

EVIDENCE

Draw a map of your area & label all its features (building, grass, concrete, asphalt, etc.). Label which features are permeable and non-permeable. Draw a blue arrow to represent the path that stormwater takes on your map.

REASONING

Use scientific terms & concepts to explain why your evidence supports or refutes your claim. Be sure to use words from the "Terms to Know" Box.

How does nature filter our stormwater?

Did you know that soil is the world's largest water filter? It's how nature keeps our freshwater clean and usable! Even though 71% of our Earth is covered in water, only 2.5% of it is **freshwater**—water that is found in local lakes and rivers, and is not salty. Because there is so little freshwater, it's vital that we keep it clean!

Freshwater is naturally filtered by traveling across the land in rivers or percolating down into the earth towards an aquifer. An **aquifer** is an underground body of rock or sediment that serves as a reservoir for groundwater.

The more our water is polluted, the harder it is to clean naturally. For example, when it rains where you live, stormwater travels across pavement picking up pollutants before it flows into local lakes or rivers. Let's learn about how our soil filters water by making our own filters!

Terms to Know:

- Freshwater
- Water Filtration
- Aquifer

Supplies:

- 1 plastic bottle
- 1/2 cup cotton balls
- 1/2 cup large pebbles
- 1/2 cup small pebbles
- 1/2 cup sand
- 1/2 cup leaf or plant matter you find on the top of the ground
- 1 cup of dirty water
- 1 empty clear cup

INSTRUCTIONS:

1. First, collect your supplies. Find a plastic drinking bottle and cotton balls, then go outside and collect the materials needed to make your filter—rocks of different sizes, sand, and plant matter. You should be able to find these materials in your yard or a nearby empty lot. Remember, the soil around Albuquerque is mostly sand! If you want to upgrade this project, use a 2 liter bottle and 1-2 cups of each filter material.

2. Now, have some fun making dirty water! Just add dirt to a cup of water. If you want to simulate stormwater from the city, you can also add a small amount of oil or small pieces of trash.

3. Now create your filter! Cut the bottom off your plastic bottle. Turn the bottle upside down and place the cotton balls in the mouth-part of the bottle (see picture below). Use a spare piece of paper to plan out your filter and where you want to place each layer of rock, sand, and plant matter. Now build it!

4. Once you have finished layering your filter materials, place the empty clear cup under your filter. Now pour the dirty water into your filter. (Be sure to take the cap off first!) You may have to pour small amounts at a time. Compare the filtered water (that's passed through the filter) to the dirty water. How well did your filter clean the water? How could you redesign it to make it better? What would happen if you used only asphalt in your makeshift filter? Would it filter water like your soil filter? Test it out!

HOW IT WORKS:

As water moves down through the soil, contaminates are removed by physical, chemical, and biological processes. This **water filtration** process is why groundwater tends to be cleaner than surface water found in rivers and lakes.

Parts of an Aquifer

Be sure to label the parts of your filter that represent a real aquifer! Aquifers include the large pebbles, small pebbles, sand, and the water filtering through.

Be sure to remove the cap before trying to filter water!

CLAIM

Use your observations to answer the following question in a complete sentence: *"How does nature filter our stormwater?"*

EVIDENCE

Draw each layer of your filter and label them. How do you think each layer helps filter pollutants from stormwater? Remember, layers can remove pollutants physically, chemically, or biologically. Below, describe how your filtered water was different from your dirty water. Don't forget to label the parts of your filter that represent an aquifer!

REASONING

Use scientific terms & concepts to explain why your evidence supports or refutes your claim. Be sure to use words from the "Terms to Know" Box.

How does energy flow in my ecosphere?

Terms to Know:
- Ecosphere
- Aquatic Ecosystem

A group of living organisms that live in a specific area and interact with each other, along with non-living factors in the environment, is called an ecosystem. **Aquatic ecosystems** are ecosystems that exist IN a body of water. Even though we read about these ecosystems in books, they're hard to observe first-hand because we can't always see underwater. But, guess what?! We can make our own mini aquatic ecosystems call ecospheres! **Ecospheres** are closed aquatic ecosystems that are self-sustaining. In other words, these ecosystems have all the energy and nutrients they need to survive indefinitely, as long as the right organisms are in balance! Stormwater from our houses feed local aquatic ecosystems—either keeping them healthy or harming them with pollutants. Let's investigate our aquatic ecosystem by making an ecosphere!

INSTRUCTIONS:

1. Find 3 clear glass jars or plastic containers and label them #1, #2, and #3. You could collect plastic water bottles or used jars from neighbors! Go to an area with standing water. This could be a local pond, acequia, or a still section of a river. If you gather water from a fast-moving river, you will not get a good sample of organisms. Please see www.riverxchange.com/waterlabs2021 for ideas on sites to collect water samples.

2. Use your jars to scoop up water and soil from the water source. Each sample should be about *one-quarter soil, one-half water, and one-quarter air*. **You'll need a good amount of algae** in order to see organisms and ensure your ecosphere survives. If you catch a fish, put it back in the water. Ecospheres do not work with fish. Screw the lid on. Do this for all your jars.

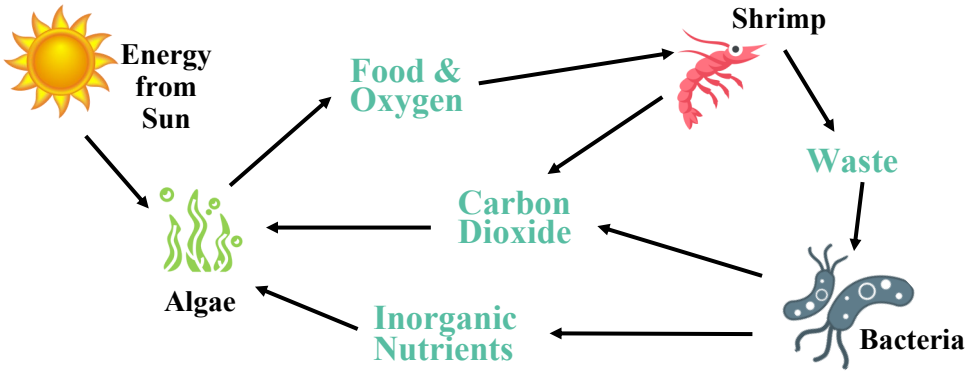
3. Take your ecospheres home and let it settle for a few days. Be sure to place it in a spot that's sunny, but does not get direct sunlight. If it gets too hot, it will not survive. Once the soil has settled, observe your ecosphere daily for 7 days. At the same time each day, record the number of snails, shrimp, and nematodes (worms) you see in each jar. Some ecospheres can last for months! See how long yours lasts!

4. Draw a model that describes how energy flows from organism to organism in your ecosphere. Use the diagram below for help, but only include organisms that you know are in your ecosphere. If your ecosphere did not survive, think about what went wrong and design a new one! Test your new design and see if it works. (Be sure to keep your ecospheres for the next activity on pollution!)

HOW IT WORKS:

An ecosphere is a self-sustaining system because energy & nutrients are able to cycle through the ecosystem and sustain the needs of all organisms. Look at the model below to see how energy and nutrients flow through an ecosphere. (Use it as an example to draw your model!) Shrimp are not necessary to maintain a healthy ecosphere, but they're fun to watch!

Supplies:
- Pencil & colored pencils
- 3 labeled glass or plastic jars with air tight lids
- Water, soil, and algae from a still water source



CLAIM

Use your observations to answer the following question in a complete sentence: *"How does energy flow in my ecosphere?"*

EVIDENCE

At the same time each day, record the # of organisms you see in each ecosphere in the table below. You may see snails, shrimps, nematodes, and the like. To the right, draw a model of how energy flows in your ecosphere. Be sure to include what you can see (for example, algae) as well as what you can't see (bacteria). Use the model on the previous page for help.

Snail & Shrimp

Snail using its siphon to get air.

Nematodes

	Jar #1 –Organisms			Jar #2—Organisms			Jar #3—Organisms		
Day 1									
Day 2									
Day 3									
Day 4									
Day 5									
Day 6									
Day 7									

REASONING

Use scientific terms & concepts to explain why your evidence supports or refutes your claim. Be sure to use words from the "Terms to Know" Box.

How can stormwater affect my ecosystem?

When you think of pollution, what comes to mind? **Pollution** includes any kind of man-made waste that has a negative impact on the environment. When we talk about pollution, we often talk about harmful chemicals from factories that cause plants and animals to die. But did you know that common household items, like fertilizer, soaps, and dog poop, can also be considered pollution? They can!

Pollution comes in many forms. Some types of pollution have a direct negative affect on plants and animals—like adding acidic chemicals to an aquatic ecosystem. Many aquatic organisms are very sensitive to changes in pH (how acidic or basic the water is) and will not survive if the pH changes. Another direct impact is when dog poop enters an aquatic environment and adds harmful bacteria to the water. This can cause fish to die, create health issues for other aquatic animals, and cause humans to get sick. Yuck!

Other types of pollution have an indirect negative impact. Stormwater can carry nutrients, like phosphates and nitrates from fertlizers, from our houses or local farms into local water sources. The nutrients in the water feed algae and aquatic plants—giving them everything they need to grow. The problem is, they grow in excess and eventually cause the ecosystem to collapse. This type of pollution—an excess of nutrients that cause algae to grow in excess— is called **eutrophication.** (See below for details.) Let's take a look at how pollution affects our local aquatic ecosystems.

Terms to Know:

- Pollution
- Eutrophication

Supplies:

- Pencil & colored pencils
- 3 labeled ecospheres from previous activity
- "Pollution" from your house–fertilizer & vinegar

INSTRUCTIONS:

1. Use your 3 ecospheres from the previous activity. Label jar #1 "control, jar #2 "fertilizer" (you can use soap if the soap contains phosphates—look at the ingredient label) and jar #3 "vinegar" (or lemon juice if you don't have vinegar). Take a picture of each jar.

2. Put your control to the side—you're not going to add anything to it. This will be used to compare the changes that happen in the other two ecospheres. Add a PINCH of fertilizer to jar #2. (Be sure to ask an adult for help, fertilizer is poisonous! You can also use soap with phosphates.) This jar represents eutrophication. Add a splash of vinegar or lemon juice to jar #3. This represents what happens during acid rain or when our water sources become too acidic.

3. After your ecospheres have set for a week, take another picture. Compare those pictures to the pictures you took a week ago. Did any ecospheres change? If so, how did they change? Do the jars with pollutants have more or less algae than the control jar? Why do you think that is? Record your results on the next page. (In theory, your fertilizer jar should grow more algae and your vinegar/lemon juice jar should have less. If you haven't seen changes yet, add more fertilizer or vinegar and observe them for another week.)

HOW IT WORKS:

Stormwater washes pollutants from fields and houses into our rivers and lakes. These pollutants—fertilizers, soaps, dog poop, etc.— contain nutrients like nitrogen and phosphorus. This is the first step of eutrophication.

Nutrients cause algae to grow very quickly. These algal blooms block sunlight and kill aquatic plants. Eventually the algae dies too. Bacteria digest the dead plants and algae—taking up all the oxygen in the water.

Without oxygen in the water, many aquatic organisms die—including fish, plants, and insects. These unhealthy aquatic ecosystems negatively affect other plants & animals that rely on them for food and water.

CLAIM

Use your observations to answer the following question in a complete sentence: *"How do household chemicals affect my ecosystem?"*

EVIDENCE

In the table on the left, draw your samples before adding chemicals then 1 week after you added your chemicals. This model will show people how pollutants changed your ecospheres over time. Explain what happened below.

	Draw or describe your jar BEFORE adding pollutants.	Draw or describe your jar AFTER adding pollutants— 1 week later
Jar # 1 Control		
Jar #2 Eutroph-ication		
Jar #3 Acid Rain		

REASONING

Use scientific terms & concepts to explain why your evidence supports or refutes your claim. Be sure to use words from the "Terms to Know" Box.

FIELD EXPERIENCE: Visit a Local Water Source

Have you ever heard this saying?

You love what you know.
You care for what you love.

It means that you're more likely to care for something you love, and you only love things that you know.

Supplies:

- Water
- Snack
- Your Watershed Journal
- Pencil & Colored Pencils
- A Friend or Family!

Think about one of your closest friends. How did you first get to *KNOW* each other? Well, you told each other your names, right! Then over time you became great friends because you learned about each other—your interests, your personalities, your quirks. By learning about them over time, you developed a strong friendship—one of love and care for each other. You'd do anything for your closest friends!

The same is true for us and nature. We're only going to love and care for nature if we first get to *KNOW* nature. And the best way to get to know nature is to spend time with her! This week, plan a field experience to a local water source. Be sure to invite family and friends!

Mourning Cloak Butterfly

Nymphalis antiopa

INSTRUCTIONS:

1. Ask your parents to help you plan a morning or afternoon at a local lake or river. Set a date and time! Then ask your parents if you can bring a friend. Invite them to go with you!

2. Plan out everything you'll need for your field experience—food, water, your watershed journal, colored pencils, a backpack, and a fun activity while you're there. Ask your friend for help you plan your field experience.

3. Fill out the first parts of the journaling sheet on the next page. These are the logistics of your field experience.

4. On the day of your field experience, do the "I Notice, I Wonder, This Reminds Me Of" activity and fill in your journaling sheet. Take a picture of you and your friends or family on your field experience!

LOGISTICS

Logistics includes all the details that you need to plan BEFORE you go on your field experience. Ask a friend for help and be sure to get your plan approved by your parents!

Date of Field Experience: _____

Time: _____

Where You Plan To Go: _____

Snacks: _____

Amount of Water per Person: _____

Friends You Want to Invite: _____

Directions on How to Get There & Where to Park: _____

_____

Describe a fun activity that you want to do while you're there: _____

_____

_____

_____

Remember to pack sunscreen, insect repellant, binoculars, magnifying glass, a plastic container to observe insects, or anything else you might need while there!

I NOTICE...

Find one thing in nature that you want to observe a little more closely. In this box, write down everything you notice about that object or organism.

I WONDER...

As you were making observations, what questions or musings came to mind? Write them here.

THIS REMINDS ME OF...

Did your observations remind you of anything? Perhaps it was smell that reminded you of an experience from years ago. Maybe the color reminded you of a friend, or the shape reminded you of a special memento at home. Write your thoughts below.

PRESENTATIONS

Stormwater Presentation

What is an impermeable surface? List 3 examples of impermeable surfaces.

What is a permeable surface? List 3 examples of permeable surfaces.

What is stormwater? Is it cleaned before it travels to your local water source (for example, a lake or river)?

How important is stormwater in our communities?

How important are local water sources for our community?

What everyday actions can we take to keep local water sources clean?

The Rolling River traveling model teaches students about stormwater and local watersheds.

Drinking Water Presentation

Where does your drinking water come from?

Where does the water go after I use it?

List 5 things you can do to save water at home.

1. _____

2. _____

3. _____

_____

_____

4. _____

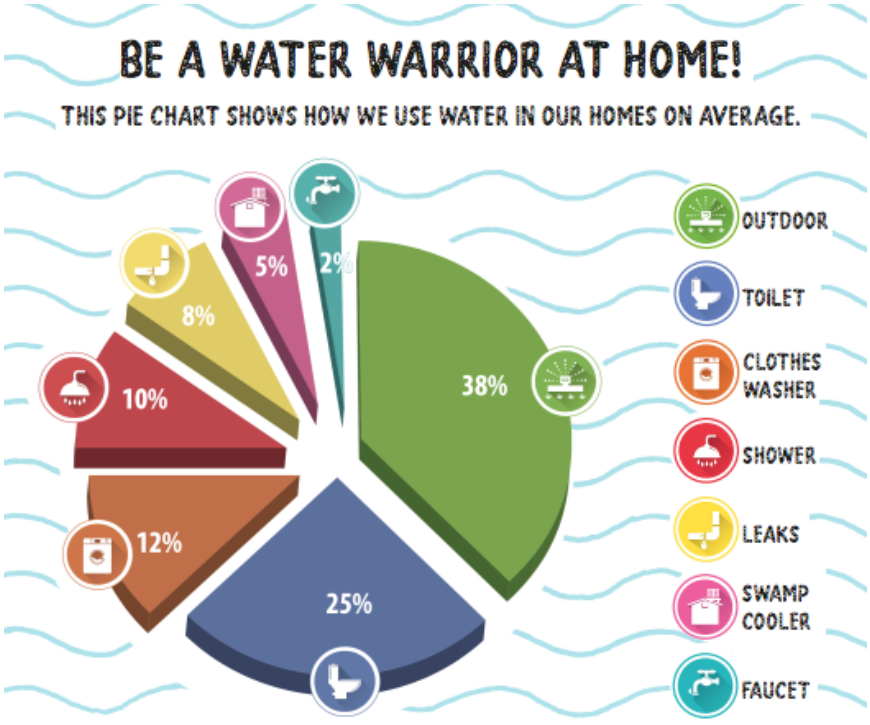
_____

_____

5. _____

_____

_____



Graphic from ABCWUA

HOW MUCH WATER DO YOU USE IN A DAY?

FILL IN THE TABLE BELOW.

ACTIVITY	# OF TIMES PER DAY	MULTIPLY	# OF GALLONS USED
DRINKING WATER 1 CUP IS ABOUT 1/16 GALLON	____CUPS	X .0625	
TOILET FLUSHING ABOUT 3.5 GALLONS PER FLUSH	____FLUSHES	X 3.5	
BRUSHING TEETH (WATER RUNNING) ABOUT 3 GALLONS PER MINUTE	____MINUTES	X 3	
DISHWASHER 15 GALLONS PER LOAD	____LOADS	X15	
LAUNDRY 40 GALLONS PER LOAD	____LOADS	X40	
SHOWER = 2.5 GALLONS/MINUTE	____MINUTES	X2.5	
FULL BATH = 40 GALLONS	____BATHS	X40	
WATERING YARD WITH HOSE OR FULL SPRINKLERS = 300 GALLONS/HOUR	____HOURS	X300	
TOTAL GALLONS			

I USED _____ GALLONS IN ONE DAY.

Graphic Adapted from ABCWUA

In both Albuquerque and Rio Rancho efforts have been made to reduce water consumption through public education programs and it has worked! Do a Google search with your parents to find these values.

How many gallons per day (GPD) on average did people use in the year 2000? _____

What is the average GPD per person in your city now? _____

How many gallons per flush and gallons per minute are used today for new toilets and shower heads? _____

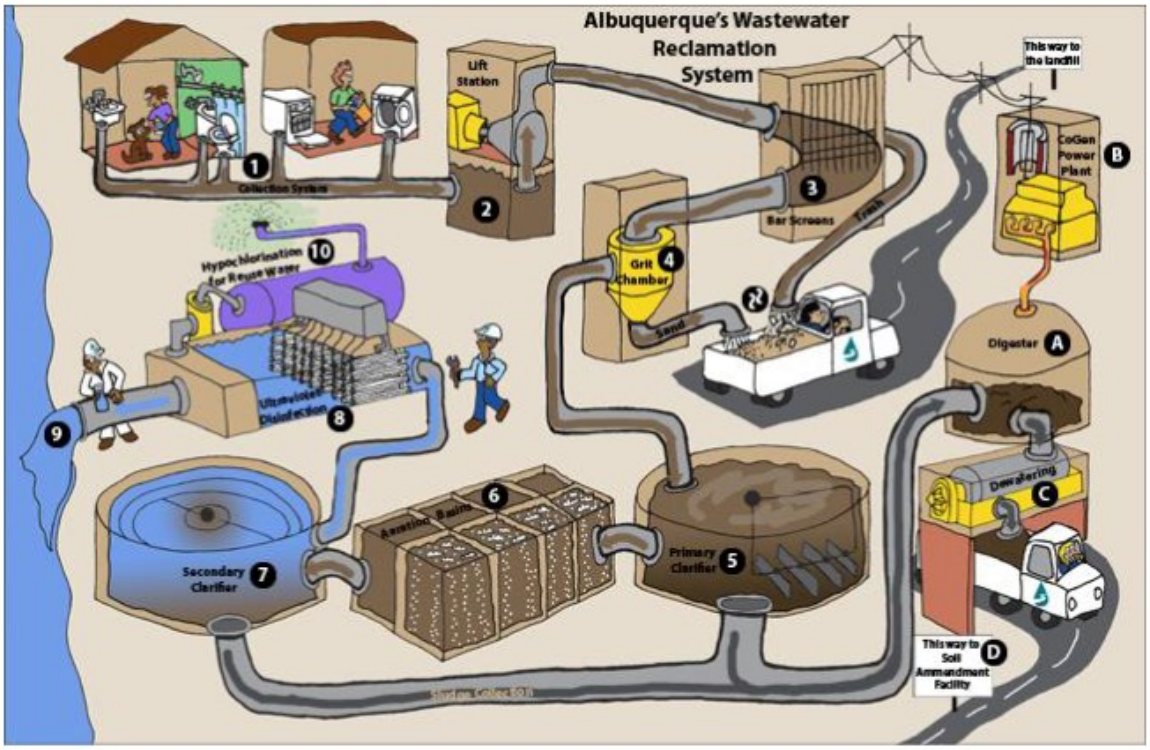
_____

Wastewater Presentation

What is wastewater and where does it go? (For example, after you flush the toilet or do dishes in the sink.)

What kinds of things should never be put down a drain?

What is a water bear and what job do they do?

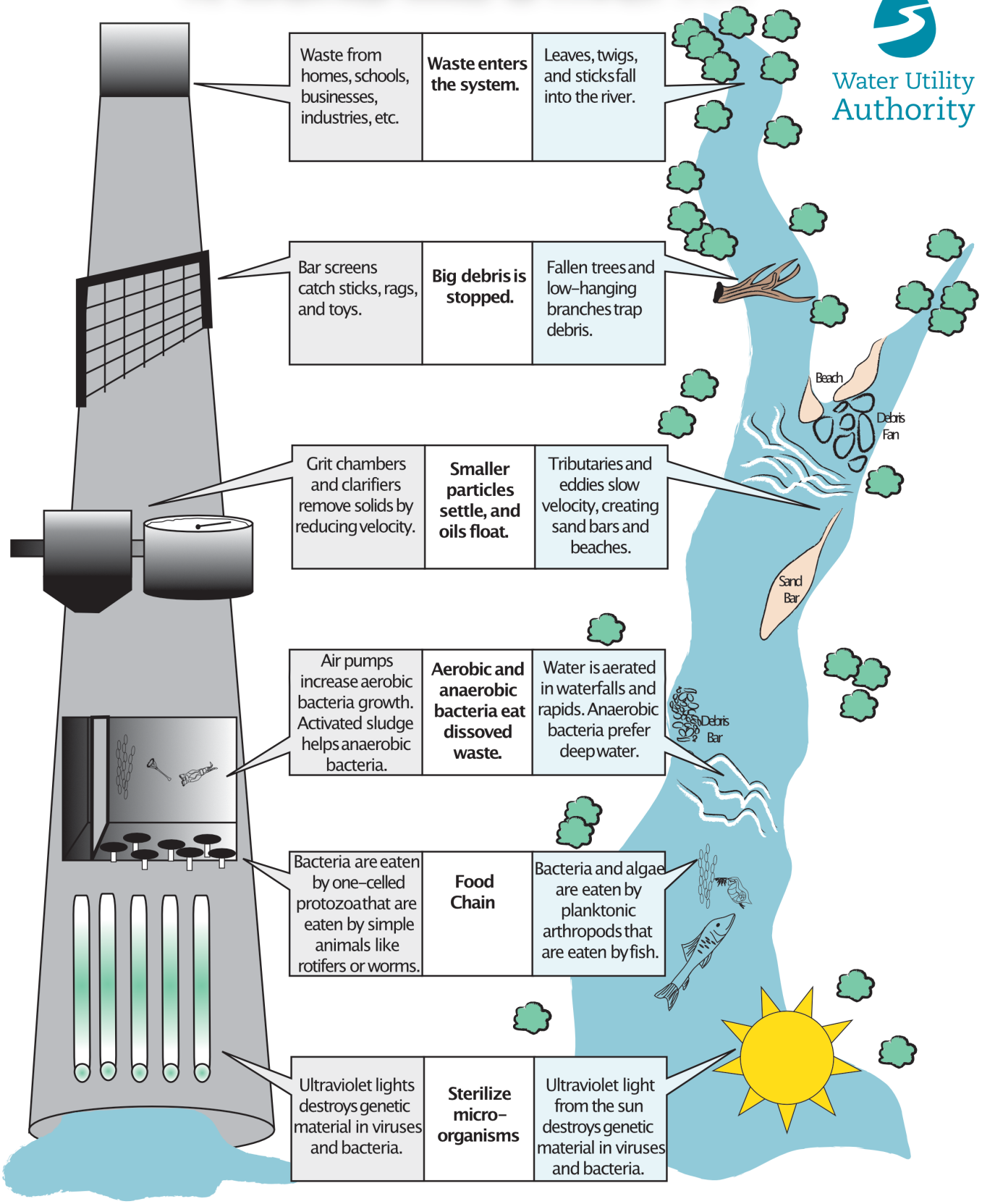


A. Digester
B. CoGen Power Plant
C. Dewatering

1. Collection System
2. Lift Station
3. Bar Screens
4. Grit Chamber
5. Primary Clarifier
6. Aeration Basins
7. Secondary Clarifier
8. Ultraviolet Disinfection
9. Clean Water Returned to River
10. Hypochlorination for Reuse Water

It works like a river . . .

Water Utility Authority



Agriculture & Water Presentation

What is agriculture and how important is it in your daily life?

What is irrigation and why do farmers use it?

What do farmers need to consider when growing food? What surprised you about what you learned?

Invitation to Build

Create Your Own Irrigation System

Directions: Design **one** of the following three irrigation systems: flood, sprinkler, or drip using any material you have at home. Some suggestions include paper cups, straws, coke bottles, cardboard, foil, pool noodles, push pins, scissors, tape and/or glue. Use your irrigation system on plants you may have at home or around your neighborhood.

1. ***Which of the three irrigation systems did you choose to create?***

_____

2. Did you successfully transport water to a plant? Why or why not? What would you change or modify if anything?

_____

_____

_____

_____

Virtual River Presentation

What is the Bosque? Why is there an effort to plant native trees there?

What benefits do native trees provide humans, wildlife, and the river?

What's the difference between native and invasive species? List examples here.

Cottonwood trees need clean stormwater to grow! Color and label the leaf, male branch, and female branch of this cottonwood tree.

Image by Project Gutenberg:
https://www.gutenberg.org/files/52651/52651-h/52651-h.htm

Did you know?

Rio Grande Cottonwoods (*Populus deltoides wislizenii*) are a native tree species found only along the Rio Grande River.

Cottonwoods grow well in areas where their roots can reach underground water and where their seeds can germinate on bare, moist soil. That's why you'll only see them growing in areas with direct access to water—they cannot survive if the water table is too deep. Plants that can tap their roots directly into groundwater are called phreatophytes.

Rio Grande cottonwoods have heart-shaped leaves and grey bark with thick furrows. Their size depends largely upon the amount of water that's available—their trunks can reach 2-5 feet in diameter and they can grow to 90 feet tall! They can live anywhere between 60-100 years old.

Rio Grande Cottonwoods are dioecious, meaning some individual trees are males and others are females. In the spring, male trees produce catkins which bear pollen that can be carried by the wind to female trees. The female trees have flowers in long, greenish clusters. After pollination, the female trees produce tiny seeds with cottony plumes that can be dispersed by wind or water. Seeds are produced in late spring/early summer which historically corresponds to when the river would flood its banks—before humans began regulating river flow.

Cottonwood forests once dominated the floodplains of the river, but have been cleared for farming, river control projects, and urban development. Because of human actions, our Rio Grande Cottonwood forests are threatened—affecting all the species that rely on this special and unique habitat.

Like PRIZES? Post on the RIVERXchange® Blog!

As a RiverXchange participant, we want to hear your voice!

Throughout this journal, you have learned the importance of water conservation and watershed protection which is both about keeping water clean and making sure there is enough to go around. Water conservation is an important topic no matter where you live, because everyone lives in a watershed! What would you like to share with the world about what you've learned? What do you think is most important for people to know about water conservation and watersheds?

Use this area to draft your concept for a project you will complete that gets your message out. You could write a script for a public service announcement or video, a podcast, or play you will produce. You could write a story, poem, song, or even draw a cartoon. Get creative! And remember to post your final project on your RiverXchange class blog.

The RiverXchange Team will review your post and choose 3 winners for the most creative and informative projects. Prizes will be announced to your teachers.

Brainstorm your ideas here:

Glossary

Important Watershed Terms

- **Arroyo:** A Spanish word for a drainage ditch, gully or ravine which was carved by water drainage.
- **Continental Divide:** A drainage divide on a continent (in the U.S., the Rocky Mountains) such that the drainage basin on one side of the divide feeds into one ocean or sea, and the basin on the other side either feeds into a different ocean or sea.
- **Conserve**: To use something wisely; not wasting.
- **Delta:** The mouth of a river (so named because it is triangle-shaped like the Greek capital letter Delta).
- **Desert:** A region that receives less than 10" of precipitation per year.
- **Ecosystem services:** any positive benefit that wildlife or ecosystems provide to people. There are four types of ecosystem services: provisioning, regulating, cultural and supporting.
- **Erosion:** The process in which a material (such as a river bank) is worn away by water or air, often due to the presence of abrasive particles in the stream.
- **Flash flood:** A rapid flooding (less than six hours) of low-lying areas (such as washes, rivers, dry lakes, basins), caused by heavy rain, snow or sudden icemelt in surrounding areas.
- **Floodplain:** Land that may be submerged by flood waters, or a plain built up by materials deposited by a river.
- **Headwaters:** The source of a river (where it starts).
- **Riparian area:** The area around the banks of a natural body of fresh water, where the vegetation and landscape is directly influenced by that water.
- **Snowpack:** The amount of snow that accumulates annually in a mountainous area.
- **Surface water:** Water collected on the ground or in a waterbody such as a stream, river, lake, wetland or ocean.
- **Tributary:** A creek, stream, or river which feeds a larger stream or river or a lake.
- **Virtual Water**: all of the water consumption necessary for an agricultural or industrial production, or a service. In other words, this corresponds to the total quantity of water needed to produce something. The term 'virtual water' is used because the water consumed is generally not found in the finished products.
- **Wetland:** An area such as a marsh or swamp that is covered with shallow water or where the soil is naturally water soaked.
- **Xeriscape:** The use of low water use plants in landscape (not "zeroscape".) Xeros is Greek for "dry."

The Bosque provides food, water, and shelter for important migrating species like the Sandhill Crane.

Glossary

Stormwater Terms

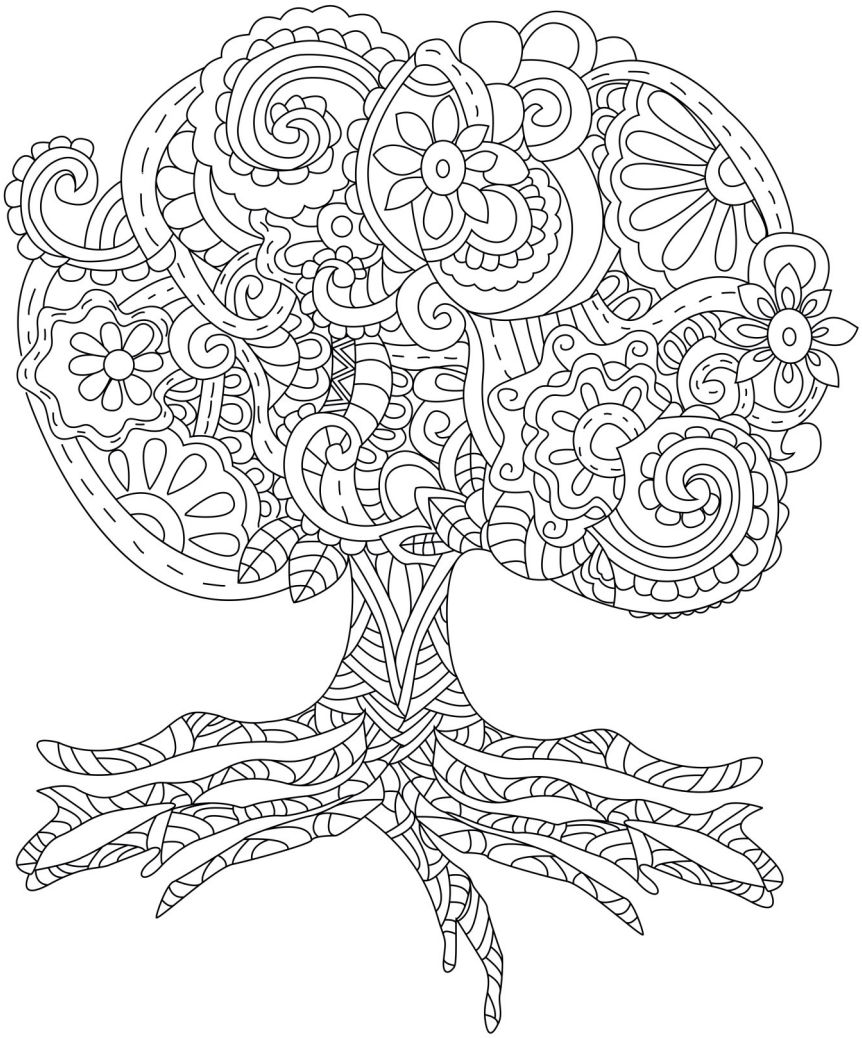
- **Condensation:** The process by which water changes from vapor to liquid (water in clouds condenses to form rain).
- **Evaporation:** The process by which water changes from liquid to vapor (water in a puddle, river, lake, ocean, or other body of water evaporates into the air).
- **First flush:** The first surface runoff of a rainstorm. This is when we see the highest levels of pollution in water entering the storm drains.
- **Infiltration:** The process of water sinking down into the ground to refill the aquifer. Also called percolation.
- **Nonpoint-source pollution:** Water pollution coming from a wide land area, not from one specific location. Occurs when rainwater, snowmelt, or irrigation runs off plowed fields, city streets, or suburban backyards, picking up soil particles and pollutants, such as nutrients, pesticides, and other chemicals.
- **Point-source pollution:** Water pollution coming from a single point, such as a sewage-outflow pipe or a factory.
- **Precipitation:** All the water that falls from the sky, in solid or liquid form, such as rain, snow or hail.
- **Runoff:** The rain or snow that does NOT sink into the ground, that runs off the land into a river, lake or other body of water (often carrying dirt and pollution with it).
- **Stormwater:** Runoff from a storm which either flows directly into a water body or is channeled into storm drains, which eventually discharge to surface waters.
- **Storm drain:** A drain, often under sidewalks, designed to collect excess rain and ground water from impermeable surfaces such as streets, parking lots, sidewalks, and roofs. Also known as a storm sewer.
- **Transpiration:** The process by which water comes out of the leaves of plants, primarily through openings in the leaves, and goes into the air.
- **Watershed:** The land area from which snowmelt and rain drain into a river, lake or other body of water. Also known as a drainage basin or catchment.

The coyote is a common resident in the Bosque. Coyotes are highly intelligent animals who play an important role in the ecosystem as a top predator.

Glossary

Wastewater & Drinking Water Terms

- **Aeration**: the introduction of air into a material.
- **Aquifer:** A wet underground layer of water-bearing rock or materials (gravel, sand, silt or clay) from which groundwater can be extracted using a well.
- **Chlorination**: the process of adding chlorine to drinking water to disinfect it and kill germs.
- **Clarifier**: a key piece of wastewater treatment equipment that assists in separating contaminants from water.
- **Digester:** a huge vessel where chemical or biological reactions are carried out.
- **Disinfection**: Water disinfection means the removal, deactivation or killing of pathogenic microorganisms.
- **Diversion**: the act or an instance of diverting or straying from a course, activity, or use.
- **Drinking water:** Water that has been purified to standards set for human consumption.
- **Drought:** a prolonged period of abnormally low rainfall, leading to a shortage of water.
- **Ecosystem**: a biological community of interacting organisms and their physical environment.
- **Fossil Fuel**: a natural fuel such as coal or gas, formed in the geological past from the remains of living organisms.
- **Groundwater:** Water located beneath the earth's surface in cracks between soil particles and fractures in rock formations. A large and usable quantity of groundwater is called an aquifer.
- **Inorganic material**: matter which is not derived from living organisms and contains no organically produced carbon.
- **Microorganism**: a microscopic organism, especially a bacterium, virus, or fungus.
- **Organic material**: matter that has come from a recently living organism.
- **Pollution**: the presence in or introduction into the environment of a substance or thing that has harmful or poisonous effects.
- **Reclamation**: the process of converting wastewater into water that can be reused for other purposes.
- **Reservoir**: a large natural or artificial lake used as a source of water supply.
- **Rio Grande**: one of the principal rivers in the southwest United States and northern Mexico. The Rio Grande begins in south-central Colorado in the United States and flows to the Gulf of Mexico.
- **Septic system:** A small-scale sewage treatment system common in areas with no connection to a municipal wastewater system. A septic tank is a key component of a septic system.
- **Sewer system:** A system of underground pipes used to transport human waste. In some communities, the sewer system is combined with the storm system (known as a combined sewer).
- **Sludge**: the solid, semisolid, or slurry residual material that is produced as a by-product of wastewater treatment processes
- **Water table:** The top surface of an aquifer (how far you have to dig down to find water).
- **Wastewater:** All the water that goes down a drain into a municipal sewer system or septic system, AKA sewage.
- **Well:** A man-made hole with a pipe that goes down to the water table. A pump helps bring the groundwater up.



The Rio Grande Cottonwood has long been a sign of fresh water—both for people and for animals.

Glossary

Agriculture Terms

- **Abandon**- to withdraw from often in the face of danger or encroachment.
- **Acequia**- an irrigation ditch or canal (Spanish).
- **Agriculture Careers**- Agriculture is big business. The industry has been around for thousands of years and approximately 22 million Americans are involved in agriculture- related industries.
- **Agriculture strike**- a series of strikes by agricultural workers in the state of California in 1933.
- **Buffer**- something that serves as a protective barrier. An area of land designated for environmental protection.
- **Center-pivot Sprinkler** - is a method of crop irrigation in which equipment rotates around a pivot and crops are watered. An electric motor drives the sprinkler.
- **Contour farming**- follows the "natural shape" of the slope without altering it.
- **Dust Bowl**- a region that suffers from prolonged droughts and dust storms.
- **Drip emitters**- release water directly on to plants from the mainline tubing.
- **Erosion**- the movement of soil particles due to water or wind.
- **Forage**- feed/food for animals especially when taken by browsing or grazing.
- **Great Depression**- the 1930s, when the U.S. and many other countries were in a very bad depression.
- **Habitat**- the place or environment where a plant or animal naturally or normally lives and grows.
- **Irrigation**- the watering of land by artificial means to foster plant growth.
- **Laser level**- A tower-mounted laser level is used in combination with a sensor on a box- scraper in the process of bringing land to near-flatness with a slight grade for drainage.
- **Migrate**- to move from one country, place, or locality to another.
- **Plow**- an implement used to cut, lift, and turn over soil especially in preparing soil for seeds (seedbed).
- **Precipitation**- a deposit on the earth of hail, mist, rain, sleet, or snow.
- **Side Roll Sprinkler**- consists of rigid aluminum pipes, mounted on large wheels with the pipe acting as an axle. A gasoline engine drives the sprinkler.
- **Siphon**- a tube used to move water upwards from a reservoir or ditch and then down to a lower level of land.
- **Terrace farming**- wide steps are cut around the slopes of hills to prevent soil erosion.
- **Vegetation**- plant life or total plant cover (as of an area).

Chile is an important cash crop for farmers in New Mexico, with approximately 8,000 to 10,000 acres harvested annually in our state. In 2018 farmers produced 71,000 tons of chile!

The Rio Grande Watershed

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