



The Rio Grande
0 150 Miles

Map Key

- Rio Grande River
- San Juan Mountains
- City
- New Mexico Bosque
- Chihuahuan Desert
- Continental Divide
- Sabal Palm Forest
- Gulf of Mexico

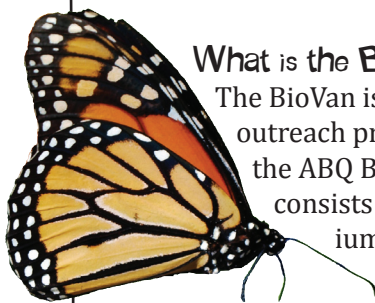


The Rio Grande and ME

El Río Grande y YO

ABQ BIOPARK *A Teachers Guide to the BioVan*

GRADE LEVEL: 2-3



What is the BioVan?

The BioVan is an education outreach program for the ABQ BioPark, which consists of the Aquarium, Botanic Garden, Zoo and Tingley Beach. The mission of the BioVan is to give students an introduction to the diversity and interdependence of life and to encourage stewardship of the Rio Grande. The BioVan presentation follows the course of the Rio Grande as it starts in the San Juan Mountains of Colorado and empties into the Gulf of Mexico and open ocean of the Atlantic.

Why the BioVan?

The Rio Grande and ME. El Río Grande y YO. It's our responsibility to care for the river because it is important to us. It supports life here in Albuquerque all the way to the Gulf of Mexico. Community, plants and animals are nourished by its fresh water from its beginning in Colorado to the ocean. Water is a critical natural resource, and precious to us, especially in the southwest desert. The Rio Grande supports mountains, forest, river and desert ecosystems and all the plant and animal life associated with them in an interdependent web that extends further than we can imagine. In the end, what counts most is that we must be good stewards of the river, the Rio Grande. The ABQ BioPark and the BioVan help make this happen.

How do the BioVan work?

The BioVan is staffed by a facilitator, environmental educator, a teaching artist and volunteer Rio Rangers. It includes live animals, plants, biofacts and a follow-up activity. Using a variety of teaching strategies, the BioVan combines science with the arts. Other components of the program

include a teacher workshop, a Bio-Box which contains hands-on loan materials, grade-specific Teacher Guides and a free weekly hike in the Bosque for two classrooms!

How to Use the Teacher's Guides

Three BioVan Teachers Guides are available for grades K-1st, 2nd-3rd, 4th-5th. The same *key concepts* are noted in each Teacher's Guide. These concepts are to help guide the *teacher* throughout the BioVan learning experience. The grade level concepts do vary and are designed to build upon the previous grade concepts. The grade level concepts are for the *students*.

Each Teacher's Guide has three lessons: Water as a Natural Resource, The Rio as an Ecosystem and Stewardship. Each lesson has two activities: one activity is hands-on and one activity is a written with the worksheet provided. Worksheets are at the back of each lesson. Each lesson is designed to interrelate with the other lessons within the guide and to build upon the same lesson in the other two grade-specific guides.

TEACHER CONCEPTS

Adaptation – a modification of an organism or its parts which enables it to survive and reproduce in its environment.

Aquifer – An underground layer of rock, gravel or sand that stores water.

Biodiversity – The variety of plant and animal species in an environment.

Conservation – The conscious use of natural resources in a way that assures their availability for future generations.

Ecosystem – A stable, naturally occurring system of interdependent

living and non-living things.

Habitat – The dwelling place of a living thing, chosen for its availability of suitable shelter, space, food and water.

Interdependence – The relationships among living and non-living elements of the environment.

Natural Resource – A portion of the environment that can be drawn upon to care for a need.

Pollution – Any substance deposited in air, water or land leading to a condition of impurity, unhealthiness or hazard.

Riparian – Relating to the bank of a waterway such as a river.

Stewardship – The wisdom and respect we demonstrate to all living organisms and the habitats entrusted to our care.

STUDENT CONCEPTS

Condense – The process of changing vapor into liquid.

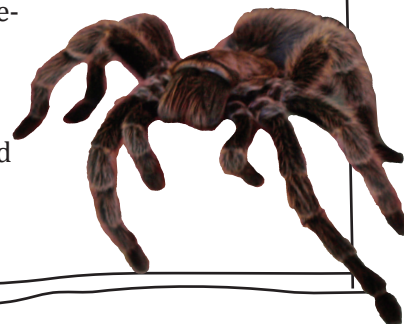
Evaporate – Changing liquid into vapor.

Living Organism – A thing that grows, reproduces, adapts and consumes or releases energy.

Precipitate – Mist, rain, snow, sleet or hail that falls from the sky.

Recycle – To make fit to be used again (reduce, reuse, recycle).

Water cycle – The continuous process whereby water evaporates, condenses and precipitates.



Theme: Water as a Natural Resource

Teacher Background

Living creatures need substances such as oxygen, minerals and clean water from their environment in order to survive. Such substances are returned to the soil and atmosphere through natural cycles like the water cycle. It takes 4,000 years for all the water on Earth to be recycled. That is one reason it is important to keep our water free from pollution. People must take great care in introducing manufactured substances such as pesticides, petroleum products and automobile emissions into the atmosphere, water and soil because they may harm ecosystems. Water ecosystems like the Rio Grande are especially vulnerable to pollution because anything that falls on the land may eventually make its way into the aquifers, rivers, lakes and oceans, affecting the living organisms that depend on the water for survival.

Water, Water, Everywhere

Explain the **water cycle**

Standards

Science: Identify plant and animal communities and factors that impact these communities.

Introduction

It isn't always clear what effect a substance that enters the air or water will have on plants and animals. We need to determine if a substance is harmful or safe before using it. Find out how much the children know about absorption in plants.

- Why do plants have leaves? Roots?
- How does water get into a plant?
- Is all water good for plants?
- What does a healthy plant look like?

In the Beginning...

Relate the importance of water quality to living things along the Rio Grande

Standards

Science: Identify plant and animal communities and factors that impact these communities.

Introduction

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- How does water get into a plant?
- Is all water good for plants?
- What does a healthy plant look like?



I can



Materials: Water, Water, Everywhere worksheet; pencils.

Procedure: Have students complete the worksheets.

Wrap up: Review the worksheets.

- How are they alike? Different?
- Can the students connect the water cycle to the importance of conserving water?

Materials: 8 plants 3" tall (sprout own seeds or purchase); 8 containers with soil; 4 empty containers; plain tap water; vinegar; baking soda; pH strips (optional)

Procedure: Divide plants into 4 experimental groups, 2 plants per group. Fill one empty container with plain tap water. Fill another empty container with a 1:1 solution of vinegar and tap water. Fill the third empty container with a 1:1 solution of baking soda and tap water, and fill the last empty container with equal parts water, vinegar, and baking soda. You may use pH strips to find the pH of each solution. The plain tap water and water-vinegar-baking soda solution should be neutral, the vinegar solution should be acidic, and the baking soda solution should be basic. During the experiment, the solutions should be covered and make sure they are clearly labeled!

Water the first group of plants with plain tap water, the second group of plants with the vinegar solution, the third group of plants with the baking soda solution, and the fourth group of plants with the vinegar-baking soda mixture. Do this step two days in a row. Have students make predictions and hypotheses beforehand, and have them record observations throughout.

Wrap up: In this experiment, the effects of pollution are apparent.

- How did the vinegar affect the plant?
- What other water solutions might harm the plant? Help the plant?

When we pollute the water cycle or the Rio Grande, we harm many living things, including ourselves.

Theme: The Rio Grande as an Ecosystem

Teacher Background

A river system like the Rio Grande is made up of both non-living (abiotic) and living (biotic) components. Non-living substances and conditions such as sunlight, soil, wind, water, and temperature are vital to living organisms in every ecosystem. Over a period of time, the non-living characteristics of a region may change slowly, allowing the organisms living there time to adapt to new conditions. When the non-living components of an ecosystem change to swiftly, the living organisms may die off. Such changes in a river ecosystem may occur as a result of human structures and activities like dams, development, sewage, agriculture and many kinds of pollution.



In It Together

Recognize similarities and differences among the plants and animals supported by the Rio Grande

Standards

Science: Describe characteristics of living and non-living things.

Art: Develop teamwork skills through cooperative art experiences.

Introduction

Create an awareness of living and non-living factors that affect living things.

- What different environments exist along the Rio Grande and the Gulf Coast? (Examples: trout stream, marsh, desert, *bosque* woodlands, sand dunes.)
- How do non-living factors differ in each of these environments?
- What kinds of plants and animals live in these environments?
- Within a given environment, what **adaptations** help a plant or animal to survive?

Materials: Construction paper; glue; tape; leaves; sticks; shells and assorted craft materials.

Procedure: List a variety of Rio Grande, Gulf of Mexico and Atlantic Ocean environments on the board. Ask teams of students to list the living and non-living factors that influence the survival of these environments. Next student can construct a model of a plant or animal that would live there using the materials listed above.

The students should have access to the reference materials to research the environments they choose.

Wrap Up: Determine what the children have learned by asking each group to give a presentation of their model plant or animal.

Plants Beat the Heat

Demonstrate one way in which plants along the Rio Grande fit into their environment.

Standards

Science: Classify related plants into groups. Identify plants and animal communities and factors that impact these communities.

Introduction: Plants are important living components of ecosystems. They serve as food and shelter for other plants, wildlife and people. Leaves on plants come in all shapes and sizes for a reason. Help the children discover why.

- Why do plants have leaves?
- How are the leaves the same or different from each other?
- Why do you think leaves come in all shapes and sizes?

worksheet

Materials: *Plants Beat the Heat* worksheet; 3 wet paper towels; waxed paper; paper clips; a place to put wet "leaves".

Procedure: Prepare the paper towels as described on the worksheet. The paper towels should be moist, but not dripping wet. After a day, the "cottonwood leaf" should be dry, the "pine needle" should be damp inside and the "cactus" when unwrapped, should still be wet.

Wrap Up:

- Do the plants represented here grow in different habitats?
- What would happen if plants that needed a lot of water were planted in a desert?
- Would desert plants survive in a marsh?

important info

Aspen trees grow in moist mountain areas where water evaporated from its leaves is soon replaced. Pine trees, growing at lower altitudes and under drier conditions, have needle-like leaves that slow water loss with their small surface area, waxy coating and small pores. Cacti survive in the desert with little moisture. To prevent water loss they have spines instead of leaves and store moisture for future use in a stem which has a thick, tough outer skin with a waxy coating.

Theme: Stewardship



Teacher Background

A river system like the Rio Grande is made up of both non-living (abiotic) and living (biotic) components. Non-living substances and conditions such as sunlight, soil, wind, water, and temperature are vital to living organisms in every ecosystem. Over a period of time, the non-living characteristics of a region may change slowly, allowing the organisms living there time to adapt to new conditions. When the non-living components of an ecosystem change too swiftly, the living organisms may die off. Such changes in a river ecosystem may occur as a result of human structures and activities like dams, development, sewage, agriculture and many kinds of pollution.

It's My Job

Explore how jobs and technology affect the ecosystems of the Rio Grande and the Gulf of Mexico

Standards

Science: Explore the role of science in the world of work.

Social Studies: Describe jobs in communities and how they relate to geography and resources.

Introduction

Talk to students about different jobs of people living along the Rio Grande (farmer, teacher, parent, miner, shrimper, car mechanic).

- What effects might the job have on the Rio? harmful effects?
- Does the work use oil or gasoline, either directly or indirectly?
- Can you think of ways to prevent damage to the environment?

Everyone does some kind of work in life. No matter what the work is, there is always the possibility of harming the environment. Most of us today depend on petroleum products in some way. Transporting oil and gasoline must be done carefully to avoid spills. There are many ways of protecting the environment is people only work hard enough to discover them.

Map It Out

Determine factors that impact a Rio ecosystem.

Standards

Social studies: Explore reasons to care for natural resources and the environment. Use the grid system to find landmarks on a map.

Math: Justify answer and solution process.

Language Arts: Speak clearly in complete thoughts.

Introduction

Assess how much students know about natural resources and conservation in regard to the Rio Grande.

- How do people use the Rio Grande?
- How do people misuse the Rio Grande?
- What are some things locally people can do to keep the Rio clean?
- What could you do?



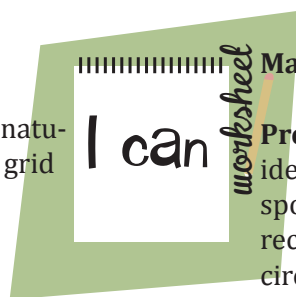
Materials: Vegetable oil; 1 package of feathers from a arts & crafts shop; a teaspoon; hand soap; laundry detergent; dishwashing detergent; cotton balls; tissue; paper towels; water; bowls.

Procedure: Divide the class into teams, giving each team one of the three different cleaning solutions. Drip ¼ teaspoon of oil on a feather or two for each of them. Have them clean the feather without damage.

Wrap up: Students should be able to connect the experiment to the concept of stewardship.

- Which solution most efficiently cleaned the feather and without damage?
- What might happen to a bird exposed to oil? When oil drains into the river or spills into the ocean it may harm the animals that live there. Oil spills are especially harmful to water birds because the thick, sticky oil coats their feathers, making it difficult or impossible to feed or fly. Specially trained people capture animals that have been soiled, safely clean them and release them in an area free of pollution.

What can you do in the future to help keep rivers and oceans healthy and free of pollution?



Materials: Map It Out worksheet; pencils; crayons.

Procedure: Students read the description of river usage and identify those actions in the picture. They find the corresponding letter on the grid that the action takes place in and records the coordinates in the designated space. Then they circle whether it is healthy or unhealthy.

The answers for this activity are:

- | | |
|-------------------|---------------------|
| 1. C1 - unhealthy | 3. A3 - healthy |
| 2. D1 - healthy | 4. D1, B2 - healthy |

Wrap Up: Discuss with students their answers on the worksheet. Have them support the choices as to whether the answers were healthy or unhealthy use of the river. Accept all reasonable positions. What other uses of the Rio can be drawn on the map?



EXPLORER'S NAME _____

1

2

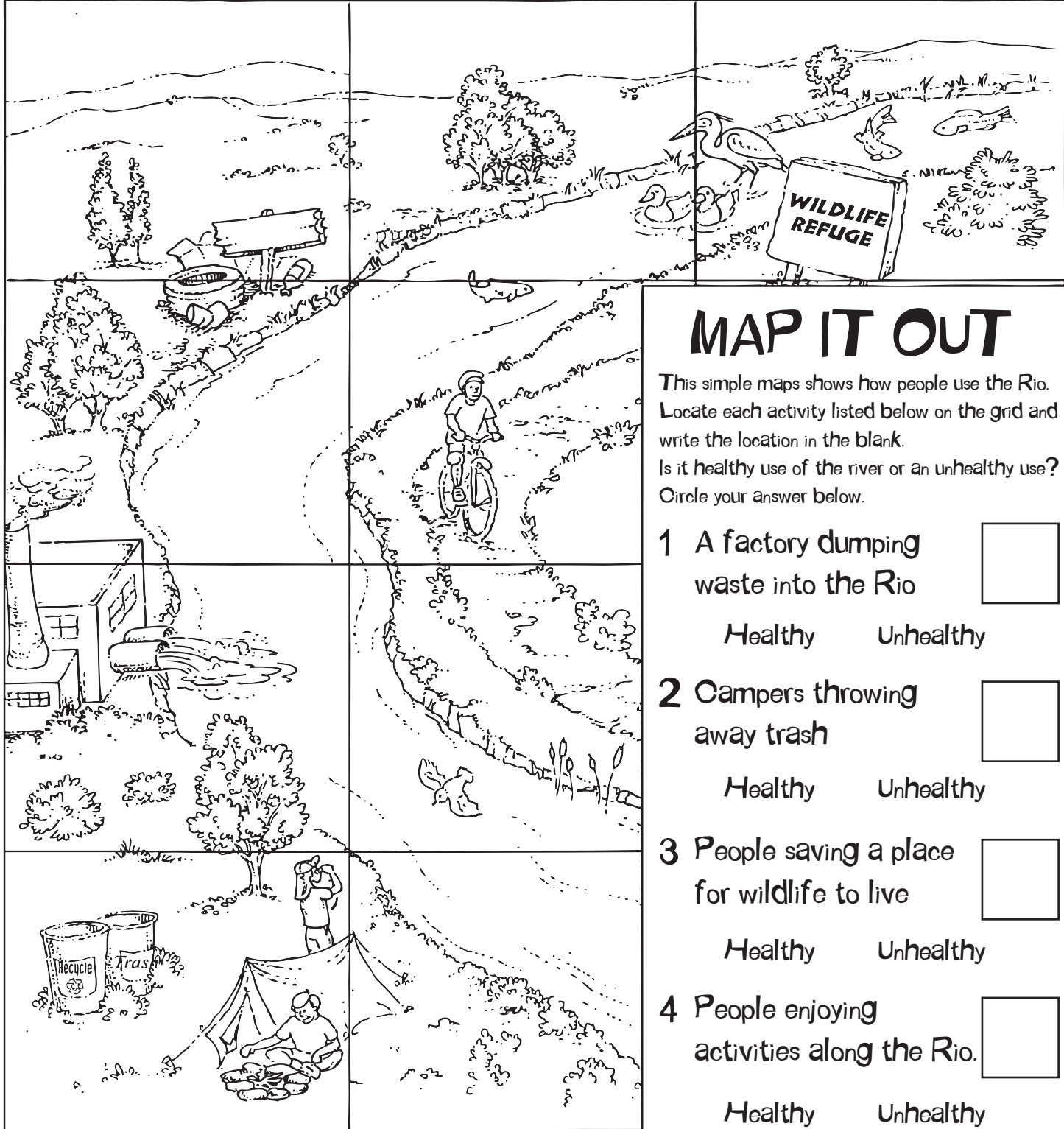
3

A

B

C

D



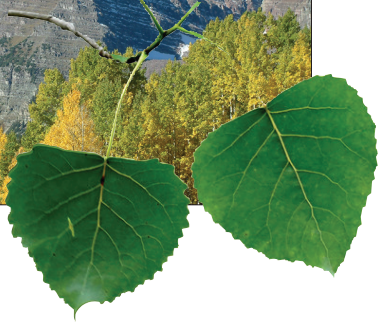
MAP IT OUT

This simple maps shows how people use the Rio. Locate each activity listed below on the grid and write the location in the blank. Is it healthy use of the river or an unhealthy use? Circle your answer below.

- 1 A factory dumping waste into the Rio
 Healthy Unhealthy
- 2 Campers throwing away trash
 Healthy Unhealthy
- 3 People saving a place for wildlife to live
 Healthy Unhealthy
- 4 People enjoying activities along the Rio.
 Healthy Unhealthy

EXPLORER'S NAME _____

PLANTS BEAT THE HEAT



1 Spread out a wet paper towel.
This represents an aspen leaf



2 Tightly roll up another wet paper towel and wrap it in waxed paper. Poke holes in it. This is a pine needle.



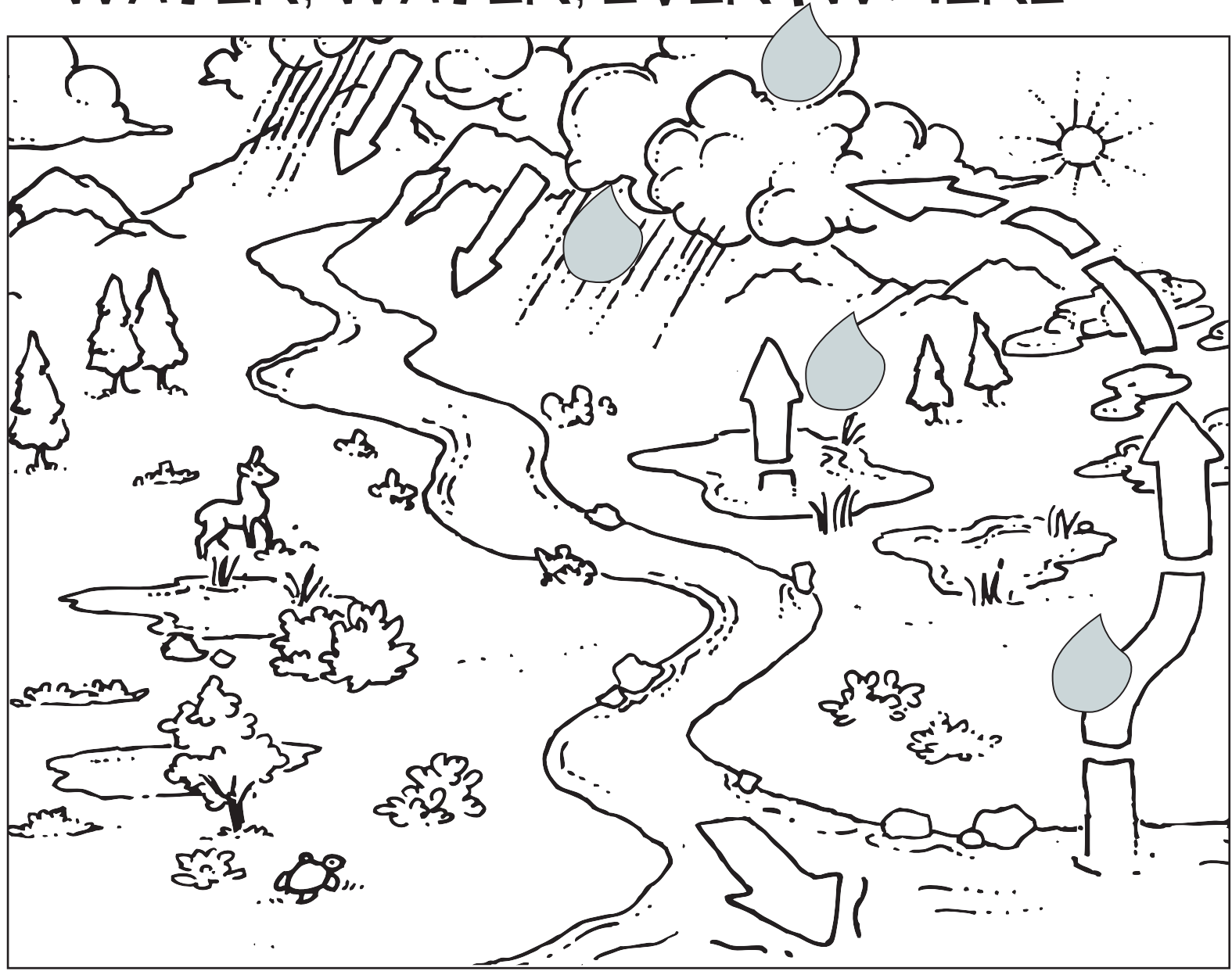
3 Roll up a third wet towel and wrap it in a sheet of waxed paper. Use a paper clip to keep each end closed. This is a cactus stem, which has taken over the job of most leaves.

4 Put the "leaves" in a warm, dry place.
Guess what will happen!


5 The following day, feel each "leaf."
How have they changed? Were your predictions correct? Why or why not?

EXPLORER'S NAME _____

WATER, WATER, EVERYWHERE



Complete the water cycle...

Fill in the  with the number of the correct term.

- 1 Precipitate** Mist, rain, snow, sleet or hail that falls from the sky.
- 2 Condense** The process of changing vapor into liquid.
- 3 Evaporate** Changing liquid into a vapor.

Briefly describe the water cycle using the numbered terms.
