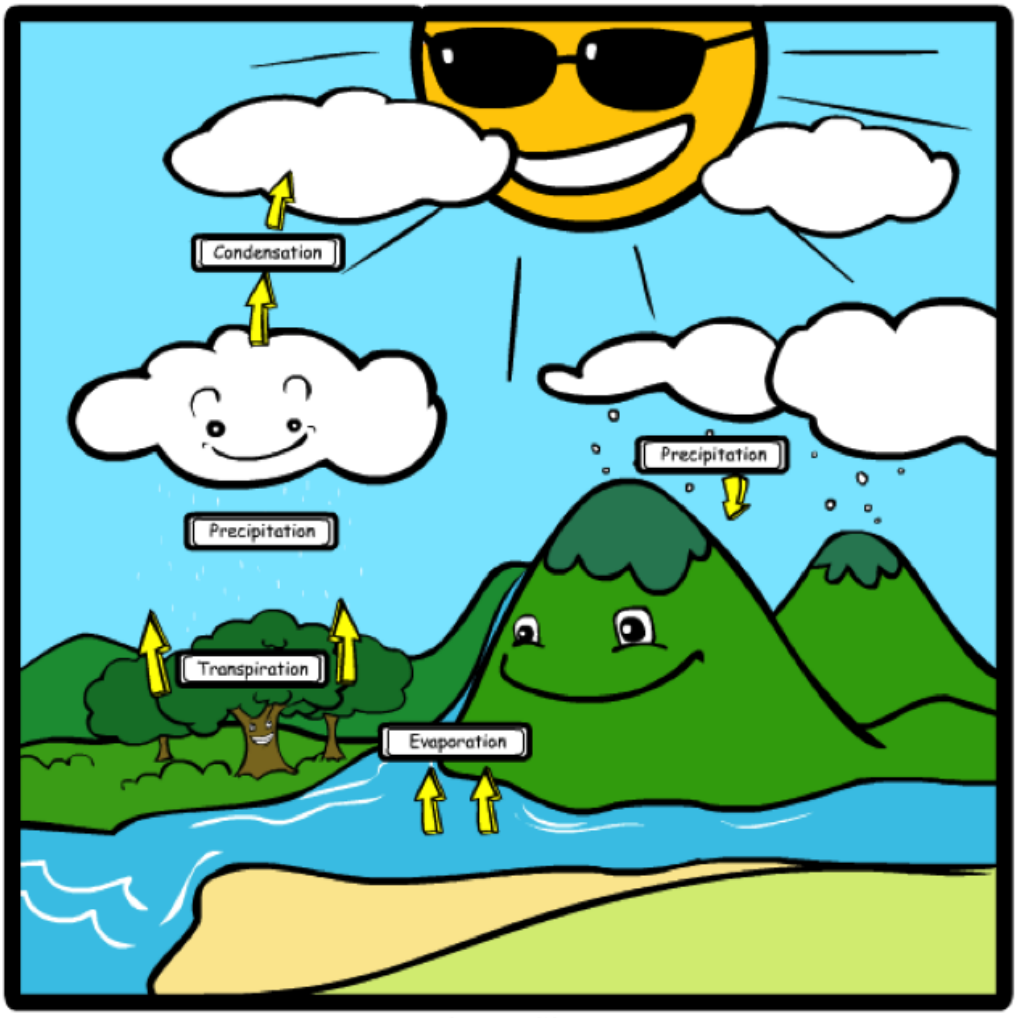
IDAHO BOTANICAL GARDEN

# WONDERS OF THE WATER CYCLE

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## IDAHO BOTANICAL GARDEN

**INSTRUCTIONAL OBJECTIVE: To help students understand different parts and the importance of the water cycle system.**

# INTRODUCTION

*Dear Teachers / Group Leaders,*

*Enclosed are vocabulary terms, and pre- and post- visit activities to share with your students. In order to make your field trip experience at the Idaho Botanical Garden more rewarding we suggest that you determine that your students understand, in a general way, what is meant by the terms "solid, liquid, and gas." The pre-visit activities will help the students understand these concepts, but the field trip will still be successful even if the students did not do them.*

*During the tour introduction, a garden teacher will discuss with the group why gardeners need to understand local weather. The students will be divided into groups by class for the remainder of the tour. They will:*

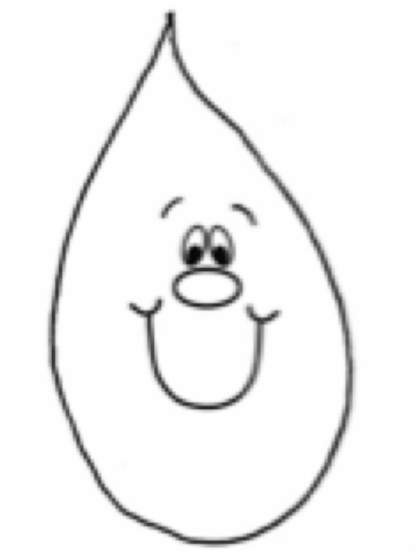
- *Learn how water moves through the water cycle and then dance to the "Water Cycle Boogie," by the Banana Slug String Band.*
- *See what happens when water's hydrogen bonds are broken by dropping soapy water in a pan of diluted white paint that has had drops of food coloring placed in four spots. (The water moves, mixing the colors together.)*
- *Tour the grounds, finding places where water evaporates into the atmosphere, and see plants which benefit from water going into the ground.*

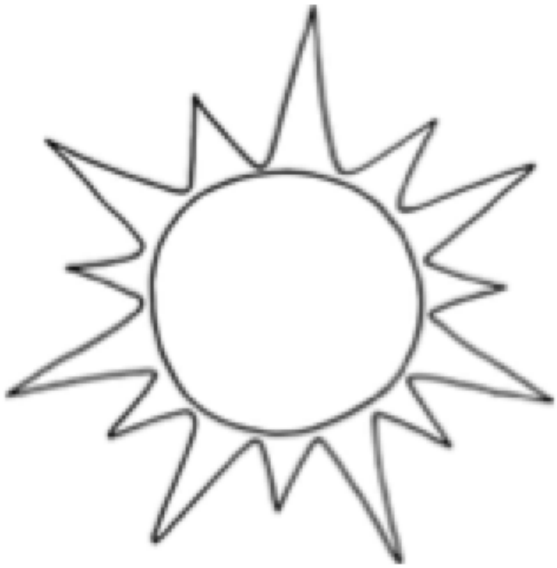
***DO THE FOLLOWING ACTIVITIES BEFORE YOUR VISIT TO THE GARDEN***

## CREATE A NAME TAG

Please create a name tag to wear on your tour of the Idaho Botanical Garden. Your tour guide will need to know who you are!

Cut a piece of index paper (file card stock) measuring approximately four inches by three inches. Cut out one of the pictures on the next page, and color. Paste the colored picture to your name tag, leaving room for your first name. Write your first name on the name tag. Use a safety pin to pin on your name tag just before you leave school to go to the Garden.





# VOCABULARY

The children do not need to be able to give a definition of the words, but should be familiar with what they mean. Many will be explained during the tour.

**Condensation** – When water gas (vapor) turns into liquid water. Water vapor molecules get close enough together that they stick to each other and turn into liquid water.

**Evaporation** – When liquid water turns into water gas (vapor). The liquid water molecules get so much energy that they break their hydrogen bonds and move far apart as vapor.

**Hydrogen Bonding** – The name of when water molecules are attracted to each other and stick to one another.

**Ice** – Solid water. The water molecules are very close together and have so little energy that they cannot move around each other.

**Leaves** – The part of the plant from which water usually escapes as it goes into the air.

**Liquid Water** – The kind of water we drink. The water molecules stick together but can move around each other.

**Precipitation** – When water falls from the sky. It can be rain, hail, snow, sleet, or snow.

**Roots** – Part of the plant that pulls water from the ground.

**Transpiration** – How water leaves the plants through the leaves.

**Water Cycle** – How water travels around the earth.

**Water Gas or Vapor** – The water molecules are far apart and have a lot of energy. You usually cannot see this type of water, but it is all around you.

**Water Molecule** – The smallest amount of water you can have.

## WHY SHOULD PEOPLE LEARN ABOUT WEATHER AND THE SEASONS?

Discuss this question with the class. There should be a wide variety of answers, which may include:

So you understand what is happening around you.
So you'll know how to what kinds of clothes you should put on in the morning.
So you can plan for a variety of activities, for example:

- Would you go on a picnic when you knew it was going to rain?
- Would you go swimming outside when the temperature is 40 degrees F.?
- How does a farmer decide when it is time to plant seeds?

**Questions to Think About Before the Field Trip**

- What are clouds? What are they made of?
- What is rain?
- What does the sky look like when it rains?
- Why does it rain?
- Where does the rain go after it falls?
- What happens to puddles after it rains?

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# WATER AND ICE

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## Purpose:

This activity, from Science NetLinks, explores what happens to water as it goes from a solid to liquid and back again.

## Materials:

One per group of 3 students

- Ice
- Clear plastic cups
- Clear plastic container of a different shape or size

One of each

- Ice cube tray
- Access to a freezer
- Timer

## Introduction

Distribute an ice cube in a clear plastic cup to each group. Explain that ice is solid water. Have the students draw a picture of what they see. Use the following questions to discuss with the class what they see.

- What is in the cup?
- Describe the ice. What does it look like? What does it feel like?
- What is ice made of?
- How is ice made?
- Pour the ice into a container of a different shape or size. Does it look the same or different? Has the shape of the ice changed? Why do you think that is?
- What will happen if we leave the ice out on the desk/table? How do you know? How long do you think it will take?

Tell the students that they will be observing the ice over time to see what changes take place.

## Activity

Have the students check the ice every 15 minutes, or as appropriate, while you conduct other activities. They should draw what the ice cube looks like each time they observe it.

When the ice has completely melted, allow the students to draw their final picture. Ask the students:

- What happened to the ice cube? Why?
- What is in the cup?
- How is it like ice? How is it different from the ice?
- Explain that the ice has turned into liquid water. What does it look like? Feel like? Pour the water into container of a different shape or size. What does it look like now? Does it look

the same or different? How has the shape of the water changed? Why do you think that is?
- Did the ice change its shape when you poured it into this container? Why or why not?
- Can you think of something else that we can pour into this container that will take the shape of the container?
- Return the water to the glass. Is there any way that we could change this water back to ice? How? How long might this take?

Have students place one of more of the cups of water in a freezer. If possible, repeat the procedure used to observe change in the melting ice. Allow students to check on the water at regular intervals of your choice. When the water is frozen and the final illustration has been made, you can place a finished series of drawings up on the wall, in sequence, so that students can see the change in water temperature.

### Ask students:

- Change is happening all around us. There are some changes that happen so quickly or slowly that we cannot see them. Did the change in the water happen slowly or quickly?
- How long did it take for the ice to turn into water? So you think that there is any way to speed up the change? How? If time permits, allow students to share and test their ideas.
- Is there any way to slow down this change?

## DISAPPEARING WATER

### Purpose:

This activity, from Science Netlinks, has students observe the amount of water in an open container and a closed container over time. Students will compare and contrast their observations.

### Materials

- 2 soup cans per group of students
- 2 craft sticks per group of students, one with a dot on top, the other blank.
- 1 waterproof marker per group of students
- Label for each can
- Some way to cover half of the cans, plastic wrap held in place with rubber bands, for example.
- Construction paper, glue

### Introduction

Show students a sponge that is wet with water. Move around the room and let students look at it closely.

### Ask the students:

- What will happen to this wet sponge if I let it sit out in the air for a long time?
- What will happen to the water?
- Have you ever played in puddles outside on the sidewalk? Have you ever gone back later to where they were? Were the puddles there?
- If you get your clothes wet at the drinking fountain, what happens to your clothes? Do they stay wet forever?
- Can you think of any other things like this that have happened around you?

Explain to the students that they will be looking at water to try to see what happens to the water over time.

## Activity:

Show students a can filled halfway with water. Tell the students: "Each group will have two cans with water. We will cover one can and let the other sit open. We are going to watch the cans. We are going to find out what will happen to the water over time. Your job is to record what you see happen over time. We will talk about what happens at the end of the study." Divide the students into groups of 2 to 4, and give each group two cans and two sticks, one stick blank and the other with a dot, labeled with their group number. You might want to record the group numbers somewhere in case the children forget theirs. Tell the students that they will measure the water level in the cans with the sticks. The one with the dot is for measuring the water in the can with the covering.

- Fill each can with the same amount of water. Show them which one will be covered.
- Have the students measure the water levels by dipping the appropriate sticks into each can so that the end of the stick touches the bottom of the can. They should draw a thin line on each stick just above the wet mark.
- Cover one can of each pair and place them in a safe spot.
- Students should check the cans on a regular basis, daily or every other day. They will use the waterproof marker to record the water levels on the sticks. Caution them about being careful to not spill any of the water, and to be sure to cover the correct can well, before returning it to the safe area.
- Have each group glue its marked sticks side by side, to a piece of construction paper.

## At the end of the study, ask the students:

- What happened to the level of the water in the closed can?
- What happened to the level of the water in the open can?
- Is there a difference in what we saw happen between the two cans? What is the difference?
- What did we do that was different with the cans?
- Why did the water not disappear from the can with the cover?
- Where did the water that was in the open can go?
- What if we used jars instead of cans? Do you think our result would be different? Why not?

***DO THE FOLLOWING ACTIVITIES AFTER YOUR VISIT TO THE GARDEN***

# CLOUD IN A BOTTLE

This activity demonstrates how clouds form. As water cools high in the atmosphere it condenses around dust particles, forming clouds.

## Materials

- A glass gallon jar. Perhaps you could share dill pickles with the class one day.
- Warm water
- A plastic bag of ice that fits over the jar opening
- A sheet of black paper
- Matches
- Flashlight

## Preparation

Tape the black piece of paper on the back of the jar so you cannot see through it. Fill the jar one-third full of warm water. Fill the bag with ice and close the top of the bag. Have the matches ready.

## Procedure

Light the match and hold it over the jar opening. After a few seconds, drop the match into the jar and cover the top of the jar with the bag of ice. Turn off the lights and shine the flashlight beam into the jar. Observe what happens in the jar.

## Discussion

- What formed in the jar?
- Why was the smoke from the match important to the formation of the cloud?
- Would cold water work?

# PRECIPITATION IN A JAR (SNOW GLOBES)

A fun craft, which vaguely demonstrates water going up into the sky and falling again.

## Materials

- One clean, empty baby food jar per student
- One plastic 2" figurine, or a piece of Christmas decoration fake pine cut to look like a tiny tree, per student
- Silicon glue found at craft or hardware stores. One tube should be enough for 24 students.
- Glitter
- Water

## Procedure

- Write each student's name or number on the top of the lids with a waterproof pen.
- Place a dab of silicon glue on the underside of each lid and have the students place their figurine or "tree" into the glue. Leave undisturbed for an hour to dry slightly. A longer drying time is better but not necessary.
- Place one teaspoon of glitter in each jar.
- Add water to the top.
- Screw on the lid.
- Turn jar over and swirl gently to observe the snow in action.

The jars tend to leak slightly. Be sure to store them lid side up. You may wish to seal the jars by putting silicon glue over the jar threads before screwing on the lid. This could be messy and not worth the effort.

# TERRARIUM

Review the water cycle by building a watching a terrarium.

## Materials

- Any clear, watertight container. Chose something large enough to accommodate the plants, and has a cover, lid or door to keep the moisture from escaping.
- Small gravel, enough to be ½ inch deep on the bottom of the container.
- Activated charcoal, enough to make a ½ inch layer, to help filter the water as it drains.
- Good quality, sterile, potting soil. Enough to make at least a two-inch layer.
- Plants. They should be slow growing ones which stay relatively small. Recommended ones include:
  - Aluminum Plant – Pilea
  - Nerve Plant – Fittonia
  - Very small ferns
  - Moss
  - Piggy-back Plant – Tolmiea menziesii
  - Spider Plant – Chlorophytum comosum "vittatum"
  - Variegated Ovalleaf Peperomia – Peperomia obtusifolis Verigata
  - Venus Fly Trap – Dionaea muscipula
- A water misting bottle
- Decorative material such as: rocks, figurines, wood pieces, sphagnum moss

## Planting Instructions

- Place a ½ inch layer of small gravel in the bottom of the container
- Place charcoal on top of the gravel in a level layer.
- Place potting soil evenly over the charcoal.
- Moisten the potting soil.
- Add the plants. Be sure to leave the plants room to grow. Push the soil aside, place a plant in the depression, and gently replace the soil around the roots of each plant.
- Mist the plants to remove any soil adhering to the leaves.
- Add decorations.

## Care

Place the terrarium in a bright area, but not in direct sunlight. The light should be bright enough to read by. A terrarium has been known to shatter because direct light made it too hot. When the plants get too big, pinch off the newest growth.

Water lightly only is the soil is dry. You should only need to water, at the most, every couple of weeks, depending on conditions.

Do not fertilize. As the nutrients in the potting soil get used up, the plant's growth will slow, helping to keep the plants from overgrowing the terrarium. Over time, the soil can be "refreshed" by scraping off the top layer of soil and adding some fresh potting soil.

## Classroom Discussion Questions

- Do you think that any water evaporated from the soil?
- If water evaporated, where did the evaporated water go?
- How did the water get on the lid?
- Why is the soil still wet?
- Did it rain in the terrarium?
- Where did the rain come from?

You might wish to make a connection between the water cycle on the terrarium and in the real world. Ask the students how water movement in the terrarium and outside are similar.

# IDAHO COMMON CORE STANDARDS

## Kindergarten:

PS: Physical Sciences

PS2-K-1. Make observations to determine the effect of sunlight on Earth's surface.
Examples of Earth's surface could include sand, soil, rocks, and water. Assessment of temperature is limited to relative measures such as warmer/cooler.

LS: Life Sciences

LS1-K-1. Use observations to describe patterns of what plants and animals (including humans) need to survive.
Examples of patterns could include that animals need to take in food but plants produce their own; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.

ESS: Earth and Space Sciences

ESS2.D: Weather and Climate
Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. (ESS1-K-1)
The four seasons occur in a specific order due to their weather patterns (ESS1-K-1)

ESS3.C: Human Impacts on Earth Systems
Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (ESS1-K-2)

## 1st Grade:

LS: Life Sciences

LS1.A: Structure and Function
All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (LS1-1-1)