

MISSION BRIEFING

Activity: Water, A Journey Through Time

Prep Time: 30 minutes 

Activity Length: 60 minutes 

Task: Participants observe data on Earth's water resources. They learn about how a macroinvertebrate assessment can be used to better understand fresh water ecology, making connections to availability of quality freshwater to their communities



Activating Prior Knowledge:

Ask participants:

- What is most of their body made of? (water)
- What makes Earth unique among all the other planets? (Water in all three states of matter)

NASA Science Connections

In Dec. 2022, NASA launched the Surface Water and Ocean Topography (SWOT) satellite into Earth's orbit to survey water on more than 90% of the planet's surface. SWOT will survey nearly all water on Earth's surface for the first time, helping to track how fresh and saltwater bodies change over time.


By providing us with a highly detailed 3D view of rivers, lakes, and oceans, SWOT promises to improve our understanding of Earth's water cycle and the role oceans play in climate change, as well as help us better respond to drought and flooding. SWOT will provide scientists with measurements of water volume change and movement to inform our understanding of freshwater availability, flood hazards, and the mechanisms of climate change.

By the end of this activity participants will

- Make a plan for water conservation for themselves, their families, and their community.
- Make a plan to reduce water pollution for themselves, their families, and their communities.

Materials

- Computers with internet capability
- Student handouts
- Writing utensils
- Crayons, markers, colored pencils
- Review GLOBE Water Wonders Activity and if planning to complete macroinvertebrate observations, prepare the following:
 - Aquarium with a lid or many large clear jars with lids
 - 5-10-gallon sample of fresh water from a local pond, stream, or lake. (If you do not have a body of water nearby, you can collect soil, non-poisonous plants, and harmless invertebrates.) The sample should include bottom debris, plant life from the water, water, and macroorganisms.
 - You may need a net to scoop bottom debris and skim through the water for macroorganisms (NO VERTEBRATES).
 - The water can be put into an aquarium or divided into a few large jars with lids so that it is easier for multiple people to observe.
 - Magnifying glass (optional)
 - Digital camera with magnifying option (optional)

 **Safety Consideration:** Teachers/facilitators should be responsible for acquisition of samples and return of samples. Be sure to comply with regulations in your local area about plant and animal collections. An alternative option is to order macroinvertebrates as described in "Water Wonders."

MISSION GUIDANCE

GO

- Review introduction to Macroinvertebrates in Water Wonders activity.
- Follow local safety protocols if collecting samples in advance from local water sources.
- Encourage participants to learn more about water-focused missions, like SWOT.

AYBE

- Have participants research and create an enclosed ecosystem, such as the aquarium activity in Water Wonders.

NO GO

- Do not use vertebrates in sample collection.
- For safety reasons, do not encourage students to collect their own samples.

Preparation

1. Gather and prepare all listed supplies.
2. Read the Elementary GLOBE storybook "[Discoveries at Willow Creek](#)" before the activity, either as a class or individually.
3. Be sure videos are downloaded and ready.
4. Review [Water Wonders](#) and if applicable, have freshwater sample ready at least 24 hours prior to the lesson, so that debris can settle.
5. Make sure students have a basic knowledge of percentages. For example, 80% means 80 parts out of 100, or 32% means 32 parts out of 100.

Procedure

1. Take a nice long drink of water (in a clear cup or bottle).
2. Ask participants some discussion questions.
 - What is water used for?
 - Where does it come from?
 - What are the parts of the water cycle?
3. Watch [The Water Cycle](#)
4. Have participants complete The Water Cycle graphic.
 - Word bank: Evaporation, Condensation, Runoff, Transpiration, Precipitation, Groundwater.
5. Regroup and discuss the graphic.
6. Ask the participants the following discussion questions.
 - If there is a water CYCLE, where did it start?
 - When we drink water, we drink FRESH water. What is FRESH water?
7. Let the participants know that "fresh" does not mean "new." There is a finite or limited amount of water on Earth. No water will be made or removed from Earth, but it could become polluted and unusable. The water that we drink is 3.8 BILLION years old. It was created as Earth began to cool.
8. Watch:
 - [Earth's Water Budget](#)
 - [KSNN: Did You Know NASA Astronauts Will Recycle Water In Space?](#)
9. Have participants complete the pie chart worksheet. You may want to play the video again and stop it in certain spots so that the participants can write in the percentages on the charts. For lower grades or students who are having difficulties, you may want to walk through this activity together.
10. Regroup and discuss the pie charts. Ask the participants what they have



Storybook:
[Discoveries at Willow Creek](#)



Video: [The Water Cycle](#)



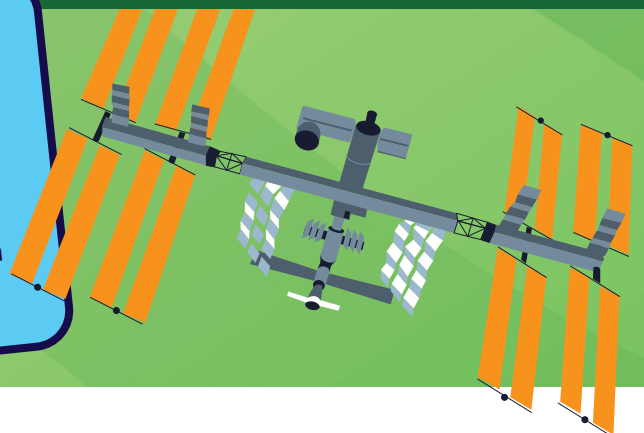
Video: [Earth's Water Budget](#)



Video: [Did You Know NASA Astronauts Will Recycle Water In Space?](#)

**ISS
FUN
FACT!**

Did you know that more than 93% of the water on the space station is recycled? The water the astronauts drink is recycled from their sweat, breath, and even urine! Technologies that were developed to filter and recycle water on station now benefit life here on Earth!



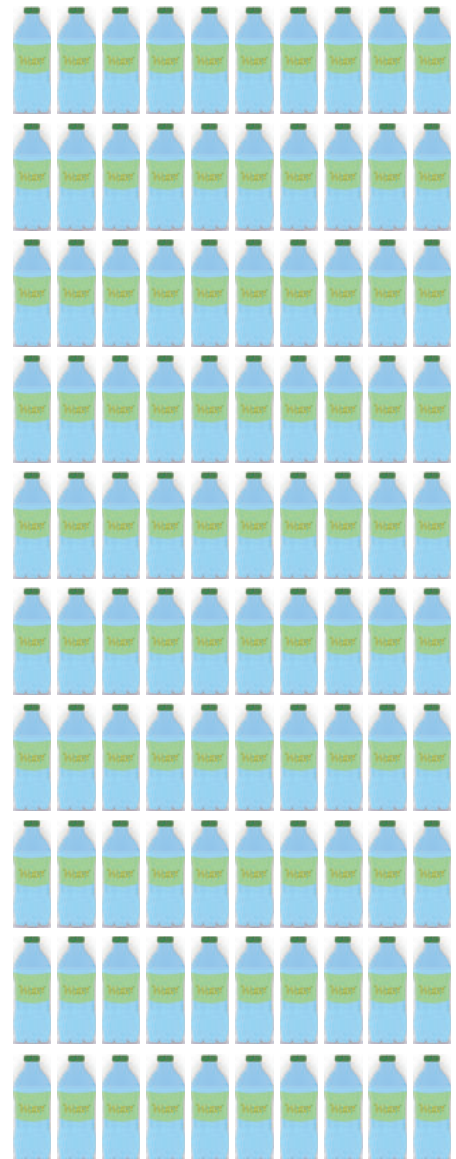
learned about the amount of fresh water available.

- To help them understand, use the visual aid “if all the world’s water were to equal 100 liters.”
- Ask why it is important to protect and keep the water free from pollution.
- With whom do we share our water?

11. Conduct Part 1 of the GLOBE Activity **Water Wonders** to provide an introduction to macroinvertebrates and what participants can learn from them about their local water sources.
12. If water samples have been safely collected from local sources, complete this step: Let the participants take a look at the water samples from the local area.
 - They may need to use magnifying glasses or a digital camera with the magnification increased.
 - Have participants fill out the My First Macroinvertebrate worksheet.
 - Participants can use the Water Wonders activity to identify macroinvertebrates they might see.
13. In small groups, have participants make plans, slogans, posters, or information pamphlets about:
 - Conserving water as an:
 - Individual
 - Family
 - Community
 - Reducing water pollution as an:
 - Individual
 - Family
 - Community



Water Wonders



Challenge Questions

- Macroinvertebrates can tell us a lot about the conditions within a water body. What does the presence of these critters tell you about the water quality?
- What do you think the macroinvertebrates eat?
- What can you do to help limit water pollution in your community?

Extensions

- Have participants use the computer to make their own pie charts.
- Have students try to identify the plant material in their sample.
- Observe the water sample over time; record and discuss the changes.
- Do not give participants a word bank for the water cycle worksheet.
- Have participants research and share about one of the macroorganisms.
- Other optional **GLOBE activities**



GLOBE Activities

If all the world's water were to equal 100 liters (26 gallons).....
The amount of drinkable fresh water would = .003 of a liter (1/2 teaspoon).



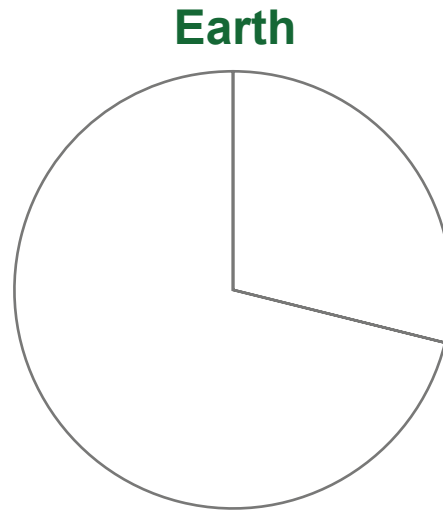
After reading the background information, activity summary, and watching [Earth's Water Budget](#), fill in the percentages and finish the pie charts.



Video: [Earth's Water Budget](#)

Land _____ %

Water _____ %



Oceans _____ %

Ice Caps _____ %

Groundwater _____ %

Other _____ %

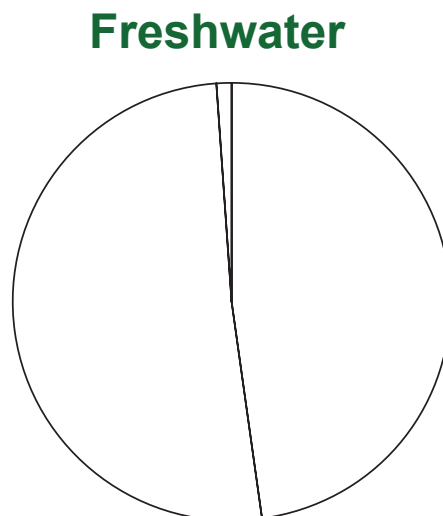


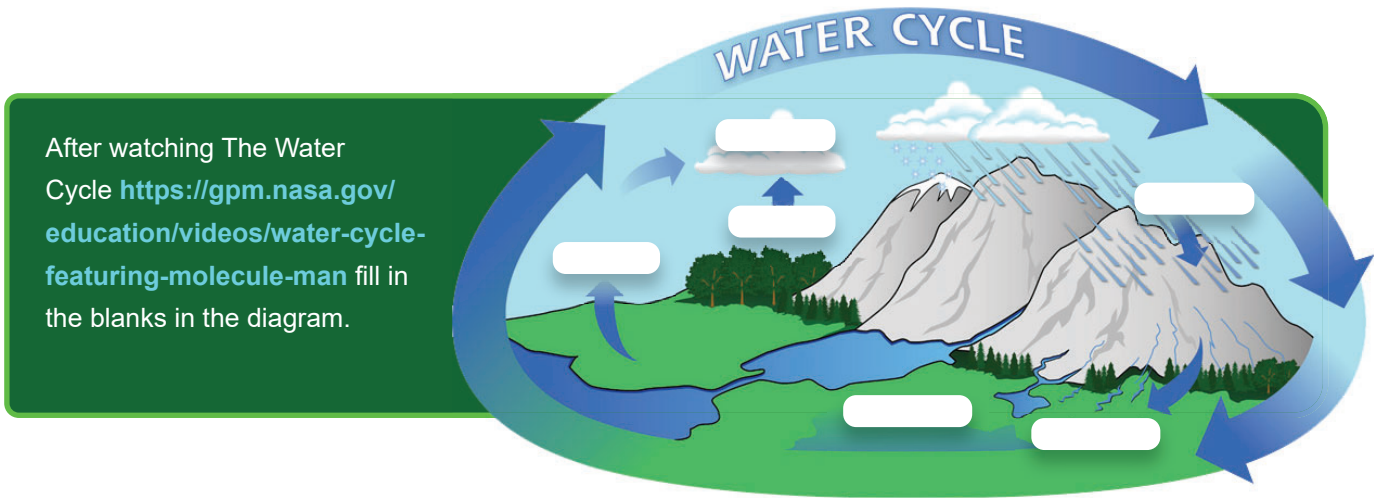
Why is there no section to color for "other"?

Ice Caps _____ %

Groundwater _____ %

Other _____ %





Name _____

My First Macroinvertebrate

Its name is _____

Here's a drawing of what it looks like.

This is where I think it lives: _____

This is how I think it moves: _____
