

Science Activity 3: To the Extremes: Water Habitability

Educator Preview

Activity Snapshot

Learners explore how different living things need liquid water to survive.



Timing | 70 minutes

- Get Ready & Team Up 10 min.
- Investigating Habitability 25 min.
- Reflect 10 min.
- Total 45 min.**
- Level Up Activities** 5–45 min. each



Prep Snapshot*

- Prep Time 40 min.**
- Cut out cards.
- *See Materials & Preparation for full info.*



21st Century Skills

- Connection**
- Critical Thinking
- Science Practices**
- Engaging in Argument from Evidence



Guiding Question

What kind of things live in or need water?

Learners Will Do

Identify features of water that affect its habitability.

Learners Will Know

Scientists seek and study water because all living things need liquid water to survive.



Connecting Across Activities

Activity 2: Water on Earth	Activity 3: Water Habitability	Activity 4: Exploring the Solar System
Last time , learners explored the different reservoirs of water on Earth.	Today , learners explore how different living things need liquid water to survive.	Next time , learners will explore the physical properties of planetary bodies in the solar system.

Activity Resources

Access videos and digital resources using the link or QR code below. More information for teaching this curriculum is available in the [Educator Guide Introduction, pgs. iii-xxv](#). Access more PLANETS units, research, and pathways at <https://planets-stem.org/>.



weblink: <https://hov.to/5e178b31>

Materials and Preparation

Materials

For the whole group

- *Our Ideas* poster (on paper or a shared digital document)
[Examples](#) & [Templates](#)
- [Science Activity 3 Temperature and Salinity Signs, pgs. 42-43](#)
- tape

For each pair

- 1 living thing slip (cut from [Science Activity 3 Living Things Handout, pgs. 47-55](#))
- 1 copy of [Science Activity 3 Tabletop Grid Handout, pg. 44](#)
- 1 copy of [Science Activity 3 Find Your Water Handout, pg. 45](#)
- 1 copy of [Science Activity 3 Water Type Chart Handout, pg. 46](#)
- 1 object to attach to the wall, such as a sticky note or magnet

Activity 3 Materials Preparation (40 min.)

Ahead of Time

1. Review the “In-Use Example” in the online [Prep & Setup Guide \(PDF\)](#) to help you think about what to add to the *Our Ideas* poster during the discussions in this activity.
2. Print and cut out [Science Activity 3 Temperature and Salinity Signs, pgs. 42-43](#). If it will be useful for your learners, mark the signs in a tactile way so their meaning is clear from feeling the signs.
3. Print [Science Activity 3 Living Things Handout, pgs. 47-55](#), and cut out one slip for each pair of learners.



Support Learner Differences

To increase learner understanding and engagement, you can add living things from your local area on blank slips.



Level Up!

For a larger set of living things, you can use the [Science Activity 3 Additional Living Things Handout \(PDF\)](#) and [Science Activity 3 Additional Water Type Chart Handout \(PDF\)](#) as well.

- Print one copy each of [Science Activity 3 Tabletop Grid Handout, pg. 44](#), [Science Activity 3 Find Your Water Handout, pg. 45](#), and [Science Activity 3 Water Type Chart Handout, pg. 46](#), for each pair of learners. If it will be useful to your learners, add tactile elements to *Science Activity 3 Tabletop Grid Handout* so it can be navigated by feeling the papers.

In Your Space

- Place the *Our Ideas* poster in a visible place in your learning setting or prepare to share it digitally.
- Post the four temperature signs in ascending order up the side of a wall. Put the four salinity signs in ascending order horizontally to the right and above the temperature signs. Ensure the signs are in reach of all learners.
- Tape lines on the wall (or use string, rope, or some other item) to create a grid that can be felt by learners.



Teaching Tip

Lead this activity in a room with a large open area.

	Fresh	Semi-Salty	Salty	Very Salty
Hot				
Warm				
Cold				
Ice				



Teaching Tip

If you have a large, open space and it is appropriate for your learners, you can set up the large grid on the floor rather than on the wall. Instead of placing objects, pairs can place themselves in the grid during the activity.

Activity Guide

Get Ready & Team Up (10 min.)

1. Ask: **If you did the last activity, what did you do and why?** (*We thought of places with water on Earth and put water in cups to understand the amount of water in different reservoirs.*) Draw learners' attention to their work on the *Our Ideas* poster and the terms *reservoir*, *surface*, *subsurface*, and *atmosphere*.
2. Ask: **What is the big question we are trying to answer?** (*Where in the solar system should NASA search for life?*) Display and describe NASA's [Eyes on the Solar System app](#) to remind learners about the solar system. As needed, use [NISE's Exploring the Solar System: Pocket Solar System](#) or [Solar System in Sound](#) instead.
3. Say: **Today we will try to answer our questions about the water that living things can use.** Share the Guiding Question or a similar question from the *Our Ideas* poster with learners aloud and in writing (using multiple languages as needed): **What kind of things live in or need water?**
4. Organize learners into pairs.

Investigating Habitability (25 min.)

5. Say: **Today, each pair is going to represent one living thing. Your goal will be to help your living thing survive by finding water that it can use.** Give each pair of learners a slip from *Science Activity 3 Living Things Handout*, pgs. 47-55, and read it aloud to them.
6. Give each pair a stickable object, such as a sticky note or magnet, a copy of *Science Activity 3 Tabletop Grid Handout*, pg. 44, and a copy of *Science Activity 3 Find Your Water Handout*, pg. 45. Say: **This page gives instructions to figure out where your living thing should go. As a pair, you have about 10 minutes to follow the instructions.**



Support Learner Differences

If new learners are joining you, lead an [inclusion activity](#) (pgs. xx-xxi) and use other [engagement strategies as necessary](#) (pgs. viii-xviii).



Level Up!

As pairs receive their living things, you can have them come up with ways to act their living things out or have them practice the [American Sign Language for their living things](#) (PPTX).



Support Thinking

- Following the instructions on [Science Activity 3 Find Your Water Handout](#), pg. 45, pairs will be trying to figure out the temperature and salinity of the water their living things need. Ask questions to prompt learner thinking, such as **What habitat do you think this living thing is from? What do you think the temperature and salt are like in that habitat?**
- You can use the [website Map of Life](#) to help learners visualize where specific living things are found.

7. Give learners 10 minutes to place their objects on their grids according to the temperature and salinity of the water they think their living things need.
8. Once pairs have all placed their objects, have them discuss the following question with others nearby: **Why did you choose to place your object where you did? What do you think it is like to be your living thing?**
9. Say: **Now you will get information on where these living things actually live and use it to organize yourselves again. This time, instead of placing your object on a small grid, we will all place our objects on this larger version of the grid on the wall.** Indicate the wall grid and give learners time to examine it if necessary.
10. Give each pair a copy of *Science Activity 3 Water Type Chart Handout*, pg. 46, and give them another 5 minutes to place their objects on the wall grid using the information on the chart.
11. After all pairs have found the correct locations, have each pair share with the group what their living thing is and what type of water they are located in.
12. Have learners discuss the following question with others nearby: **What do you notice about the temperature of water where these things live?** (*They almost all need liquid water that is warm but not too hot or too cold. Only a few can live in extremely hot or extremely cold water.*) Say: **All living things live in, or otherwise need, liquid water.** Write the word *liquid* on the *Our Ideas* poster. You can have learners add translations, drawings, or related images to the poster as well.
13. Have learners discuss the following question with others nearby: **What do you notice about the saltiness of water where these things live?** (*Different living things need different amounts of salt in the water. Only a few can live in extremely salty water.*) Say: **Scientists use the word *salinity* to describe how salty water is.** Write the word *salinity* on the *Our Ideas* poster. You can have learners add translations, drawings, or related images to the poster as well.



Support Thinking

To help learners understand the organization system, have a few volunteers place their objects on the wall grid and explain what the locations mean in terms of temperature and salinity.



Level Up!

★ To share more information about temperature, show the video [Tiny Extremophiles Living in Rocks!](#) (until 1:48). If necessary, you can turn on captions, slow down the playback speed, and break the video into chunks: 0:00–1:21 (Cold Environments), 1:21–1:48 (Hot Environments). Afterward, ask: **What do the extremophiles that live in hot and cold environments have in common? Can you think of other places on Earth or space where extremophiles could exist?** (5+ min.)



★ To share more information about salinity, show the video [Salinity](#) (6:21). If necessary, you can turn on captions, slow down the playback speed, and break the video into chunks: 0:00–1:22 (Salinity), 1:22–3:34 (Osmosis), 3:34–5:40 (Fish Adaptations). Afterward, ask: **Can you think of other examples of how osmosis might work? For example: a water filter.** (10 min.)

14. Have learners discuss the following question with others nearby: **How would you describe the water where these living things live?** (*The water is the habitat or part of the habitat for these living things.*) Say: **Just like the name for where a living thing lives is its *habitat*, scientists use the word *habitable* to describe an environment that can support life. We've shown that many environments on Earth are habitable, but the same environments are not habitable for all living things.** Write the word *habitable* on the *Our Ideas* poster near the living things cards. You can have learners add translations, drawings, or related images to the poster as well.
15. Have learners discuss the following question with others nearby: **What do you notice about the limits of life?** (*Different living things need different kinds of water, but there are limits to the kind of water they can live in. Only a few living things can live in water that is extremely cold, hot, or salty.*) Say: **There are a few living things that can live in these conditions, which are extreme compared to the conditions that favor most life forms, and scientists use the word *extremophiles* to describe those living things.** Write the word *extremophile* on the *Our Ideas* poster near the living things cards. You can have learners add translations, drawings, or related images to the poster as well.



Level Up!

- ✦ To share more information about extremophiles, show the video: [Water and Habitability](#) (1:01). If necessary, you can turn on captions, slow down the playback speed, and break the videos into chunks: 0:00–0:22 (Human Needs), 0:22–1:01 (Extremophiles). After each chunk, ask: **Why might it be important to study life that looks very different from ours?** (10 min.)
- ✦ Have learners discuss where other living things would go on the temperature-salinity grid. (5 min.)

Reflect (10 min.)

16. Have learners revisit the Guiding Question in their pairs: **What kind of things live in or need water?** (*All living things live in or need liquid water. Different living things need different water temperatures and salinities.*) Ask: **What kind of water on other planetary bodies is most likely to have living things?** (*All living things on Earth need liquid water, so living things other places in the solar system will probably be in liquid water.*) As needed, remind learners of the terms *extremophile* and *habitable* on the *Our Ideas* poster.
17. Say: **We've been exploring water that is habitable on Earth. Next time, we'll explore water that is habitable in other places in the solar system.**



Level Up!

- ★ Ask this story prompt question: **Can you tell a story about a specific thing that lives in water—something you’ve observed or learned about in some other way?** (*Possible responses include stories about pets, wild animals, plants, diseases, and mythical creatures.*) Have learners share with a partner (note that the sharing can take forms other than speaking aloud). Consider returning to learners’ ideas at the start of the next activity. (20 min.)
- ★ Tell learners, if anyone asks them what they did today, they can tell them “We learned about what living things can live in different kinds of water.” (5 min.)
- ★ Get families or a community member involved to share relevant stories of science. Download customizable flyers and get ideas on the [Family and Community Connections weblink](#). (45 min.)

After the Activity

1. Clean up:
 - Save the *Our Ideas* poster for Activity 4.
 - Collect the signs, objects, slips, and handouts.
2. Plan for Science Activity 4. See [Science Activity 4 Preparation on pg. 59](#).
3. Take time to reflect on the following educator prompt. **How did learners use their prior knowledge to figure out the kinds of water different living things need?**

Water in Extreme Environments Additional Resources

Resources include All Downloads, All Videos, Family Connections, and more.



weblink: <https://hov.to/7cb5c428>

Temperature Signs

Hot

Warm

Cold

Ice

Salinity Signs

Fresh

Semi-Salty

Salty

Very Salty

Tabletop Grid

	Fresh	Semi-Salty	Salty	Very Salty
Hot				
Warm				
Cold				
Ice				

Find Your Water

1. Read about the living thing on your slip of paper.
2. Think about the kind of water this living thing would live in or use.
 - How warm or cold do you think the water is?
 - How much salt do you think the water has?
3. Put the object on your grid in the area that represents the kind of water you think your living thing needs.

Water Type Chart

Use this chart to figure out the temperature and saltiness of the water your living thing uses.

Living Thing	Temperature	Saltiness
American Alligator	Warm	Fresh
American Crocodile	Warm	Salty
American Crow	Warm	Fresh
Bald Eagle	Warm	Fresh
Blue Whale	Cold	Salty
Brine Shrimp	Warm	Very Salty
Bull Shark	Warm	Fresh, Semi-Salty, Salty
Common Haircap Moss	Warm	Fresh
Emperor Penguin	Cold, Cool	Fresh
Goldfish	Warm	Fresh
Monarch Butterfly	Warm	Fresh
Red Kangaroo	Warm	Fresh
Red Mangrove	Warm	Fresh, Semi-Salty, Salty
Saguaro Cactus	Warm	Fresh
Salt-Loving Bacterium	Warm, Hot	Very Salty
Sea Turtle	Warm	Salty
Sugar Maple	Warm	Fresh

Living Things

American Alligator



American alligators live in wetlands in the southeastern United States.

American Crocodile



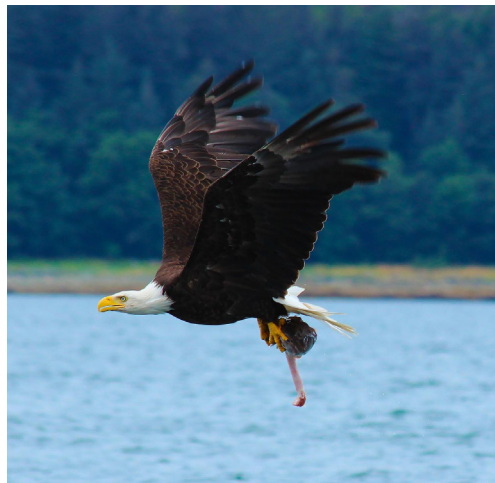
American crocodiles live along coasts in Florida, the Caribbean, Central America, and parts of South America.

American Crow



American crows live throughout much of North America.

Bald Eagle



Bald eagles live throughout much of North America.

Blue Whale



Blue whales live in oceans around the world.

Brine Shrimp



Brine shrimp can live in the Great Salt Lake in Utah.

Bull Shark



Bull sharks live along coasts and in rivers around the world.

Common Haircap Moss



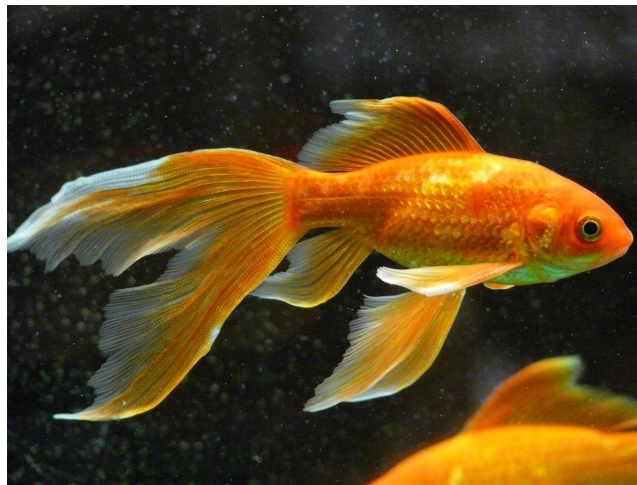
Common haircap moss lives in wet areas around the world.

Emperor Penguin



Emperor penguins live in Antarctica.

Goldfish



Goldfish are native to lakes, ponds, and rivers in East Asia.

Monarch Butterfly



Monarch butterflies live across North America.

Red Kangaroo



Red kangaroos live across most of Australia.

Red Mangrove



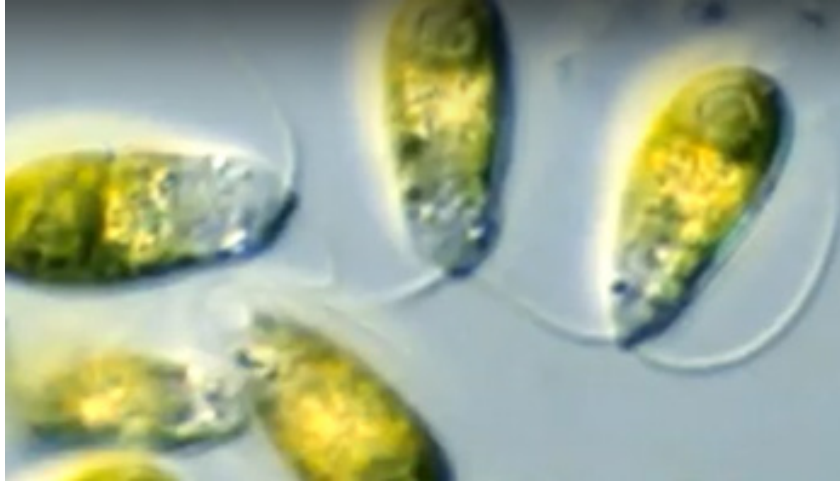
Red mangroves live along coasts around the world.

Saguaro Cactus



Saguaro cacti live in Mexico and the Southwest United States.

Salt-Loving Bacteria



Salt-loving bacteria can live in very salty water around the world.

Sea Turtle



Sea turtles live in all oceans, except in polar regions.

Sugar Maple



Sugar maples live in the Midwest and Northeast United States and parts of Canada.

