



mizuiku

Water Lessons

in partnership with

earthwatch
AUSTRALIA

Learning Intentions

Students will...

- ✓ Learn the different types and sources of water
- ✓ Learn about water use
- ✓ Learn about water equity
- ✓ Learn about water pollution
- ✓ Learn why it is so precious
- ✓ Learn about floods and droughts
- ✓ Learn about water conservation and preservation
- ✓ Learn about the Bremer River
- ✓ Learn about local mangroves

Success Criteria

Students can...

- ✓ Identify the types of water (salt and fresh)
- ✓ Explain why water is such a valuable resource
- ✓ Explain what water pollution is and give some solutions to it
- ✓ Explain where their tap water comes from and where it goes
- ✓ State some actions that individuals can take to conserve and recycle water
- ✓ Explain what droughts and floods are and how to mitigate them
- ✓ Explain what mangroves are and why they are so important
- ✓ Identify local flora and fauna around the Bremer River

Background Science

Water is a precious resource. We can't live without it. If you look at a map of the world you will see that much of our planet is covered in water. Our oceans are not the only source of water. **Water is also present under the ground and as vapour in the air.** Clouds formed by this vapour ensure that water falls back down to Earth as rain, sleet, snow or hail.

Water is essential to all life on Earth. 71% of the Earth's surface is covered in water, but the **vast majority of it (97%) is salt water.** Humans and nearly all land-dwelling animals and plants (and those in freshwater ecosystems) require fresh water to survive. The 3% of the Earth's water that is fresh water is located in the polar regions, underground, and in rivers, lakes and wetlands.

Oceans of Water

There is a lot of water all around us but most of this is not freshwater. Ocean water has too much salt in it for us to drink. Much of the water that falls back to Earth in one form or another becomes runoff. It travels some distance over land before making its way back to one of Earth's oceans. **As it travels over land, the water picks up salts and minerals from the rocks and soil** and washes them into the ocean. The deposits have built up over many years. That is why ocean water is so salty.

Freshwater

Approximately 97% of Earth's water is salt water. That leaves only about 3% that is freshwater for meeting the needs of people, plants and animals. **Only about a third of our freshwater is available for us to use.** The rest is frozen solid in glaciers, in the snow on high mountaintops and in the polar ice caps. **The freshwater we use comes from surface water and groundwater.** Surface water is water we can see in ponds, rivers, lakes and streams. Groundwater is water that seeps down into the ground and collects in the spaces between rocks and soil underground.

Water at Home

The majority of the water supplied to houses in Sydney, Melbourne, Brisbane and Adelaide comes from a network of reservoirs that surround each city. Adelaide and other parts of South Australia also draw water from the Murray River. Perth also has a reservoir network but relies heavily on groundwater sources. Each city also has a desalination plant that supplements the city's natural water supply. **Desalination plants remove the salt and other solid material from seawater,** making it safe for drinking and other household uses. The main drawback of desalination is that it requires a lot of energy.

After Antarctica, Australia is the driest continent on Earth, so it makes sense to harvest as much rainwater as possible. **Many people have rainwater tanks that collect water from the roof of their houses.** Some states have introduced rules that require new houses to be built with a rainwater tank included. Rainwater is then often used for garden watering or car washing. Some people get the rainwater tank connected to their plumbing so they can use it in the toilet, laundry or bathroom.

Greywater is water that has been used for washing in the kitchen, laundry and bathroom. It contains detergent, but can still be used for flushing toilets and on some parts of the garden (but not the vegetable patch). If not reused in the home, greywater, along with the water flushed down the toilet, leaves the house as sewage and is piped to a treatment plant, where soaps, detergents, human waste and other pollutants are removed. The purified water is known as 'recycled water' and can be used for most purposes (except drinking, although attitudes towards this are changing).

Stormwater is rainfall that flows firstly into gutters and drains, and then into creeks and rivers from roads and driveways. Stormwater is often collected by local councils and used in water parks and ovals.

Protecting Water


It is important to protect our water supplies from pollution. **Once the water becomes polluted, it can be difficult or even impossible to clean.**

Chemicals, like cleaning supplies, paints and other toxins, can seep into the ground and make the water unusable. People must dispose of their waste products appropriately so we will have plenty of freshwater in the future.

Streams, rivers and lakes provide habitat for certain types of aquatic plants, fish, insects and birds. Some of these organisms need very pure freshwater.

Almost all organisms on Earth today contain at least 50% water in their bodies. Living things use water to transport nutrients, hormones and oxygen to their cells, cleanse waste from their systems and cool their bodies.





Module 1: Water: what is it?

Teacher Content Information

Water is the most common substance found on Earth and is an important resource we depend on every day. But have you ever thought about what water really is? What makes water, water? We can describe water by its characteristics and properties. Characteristics are features that distinguishes one thing from another, for example hair and eye colour. To describe characteristics of water we look at many things like colour, odour, taste and clarity.

Water can also do some amazing things. It has properties which include:

- being the only substance that naturally exists in three different forms – solid (ice), liquid (water) and gas (water vapour)
- holding and transferring heat which is great for maintaining temperature
- ability to stick together and onto other surfaces
- being an amazing solvent, this means it dissolves things. It dissolves soaps to clean with, seasonings that flavour our food and even makes our favourite cup of cordial, tea or coffee.
- ability, like many materials, to change when combined or mixed for a particular purpose.

Without water's amazing properties we couldn't do the simplest things like cook, clean or even breathe. Water in its purest form is colourless, clear, odourless, and tasteless. But water is never really pure. Wherever it travels, water dissolves and carries chemicals, minerals and nutrients with it. This means water is more than what we can see and not all water is safe to drink.

Lesson 1:

Introduction / Immersion

Instruction:

Watch the video with students.

www.youtube.com/watch?v=rEJ5yuFR3f8

Resources:

- AV equipment

Student Activity

Instruction:

Students complete the worksheet: What is water?

Give students two small white circles and one larger red circle of paper (or students can draw their own and cut out) and ask them to label the circles hydrogen (red) and oxygen (white) and use glue to create a water molecule for display in the classroom.

Resources:

- Mizuiku Water: What is It? worksheet
- Red and white paper circles
- Glue

Conclusion / Reflection

Instruction:

Discuss as a class the answers to the student worksheet: Water: What is it?

Address any misconceptions.

Module 2: Water: Where does it come from?

Teacher Content Information

Does water really disappear? Is rain new water? How does water get in clouds? Water is a fascinating and critical part of Earth's processes called the natural water cycle.

The water we have today, is all that we have. It's the same water that existed on Earth billions of years ago. It is used and re-used as it continuously moves from the Earth to the atmosphere and back again.

During its journey through the cycle, water changes states as it falls as rain, snow, sleet or hail (**precipitation**). Water is heated by the sun, **evaporates** into the atmosphere as water vapour, condenses into tiny droplets and forms clouds (**condensation**). Eventually, it falls back to earth. Water seeps into the ground (**infiltration**) and moves slowly as groundwater (**percolation**) to nearby lakes, streams or oceans. Some groundwater is taken up by plants, travels through plants and evaporates back into the atmosphere as water vapour (**transpiration**) and the journey begins again.

The urban water cycle is when we change and manage the natural water cycle. We change the cycle to capture, collect and store water. This means we can stay in one spot (our home) and have enough clean, safe water delivered every day. We also remove and clean our used water to re-use or return to the environment.

Together, the natural and urban water cycle can be called the water cycle.

In Australia, and in many countries too, freshwater can be scarce. To meet the challenges of growing vibrant cities with a secure water supply, we rely on a mix of water supply options such as dams, rivers, rain water tanks and options which are less rainfall dependent including oceans, recycled water and groundwater.

Our used water is removed through pipes to treatment plants where it is cleaned for reuse or returned to the environment as part of the water cycle. Our used water is a valuable resource, by applying technology we are speeding up nature's cleaning process and using our precious water wisely.

Lesson 2:

Introduction / Immersion

Instruction:

Use a wonder wall to get students thinking, questioning and sharing to understand their level of knowledge and interests. Let students reflect on the following questions. Have you ever wondered...

Does water disappear? Have you ever seen a puddle dry?

Where did the water go?

How are clouds made? How does water get in clouds?

Is rain new water?

How does water move from the Earth to the clouds and back?

Either the teacher or students record statements and questions on cards and place on the wonder wall.

Watch the video: www.abc.net.au/education/the-water-cycle/103601246?utm_campaign=abc_education&utm_content=link&utm_medium=content_shared&utm_source=abc_education

Ask students if the video has answered any of their questions, which one and how?

Resources:

- Large paper
- Markers
- AV equipment

Student Activity

Instruction:

Students create a miniature water cycle of "rain" in a bowl, demonstrating that it is a closed system in which water becomes part of our daily lives and that no part of the water is lost.

EXPERIMENT STEPS:

Put enough hot water in the bowl to fill it about 1/3 of the way.

Stretch a layer of clear plastic wrap over the top of the bowl, smooth it down on all sides so that the bowl is airtight, and secure the plastic with the rubber band.

Watch as the water begins to evaporate and rise. Soon it will begin to drip back down from the clear plastic wrap ... it is "raining."

Place several ice cubes on top of the clear plastic wrap, and watch the "raindrops" form and fall more rapidly.

WHAT IS HAPPENING?

Water vapor in our atmosphere gets cold and changes back into liquid, forming clouds. This is called "condensation." If the air is really cold, raindrops turn to snowflakes or ice (hail or sleet).

Optional extension:

On a hot day, pour cold water into a glass. Watch what happens: drops of water form on the outside of the glass.

WHAT IS HAPPENING?

The water did not leak through the glass, but came from the air. Water vapor in warm air turns back into liquid when it touches the cold glass.

Resources:

Per group:

- 1 large clear plastic or glass bowl
- Hot water (not boiling)
- Clear plastic wrap / Cellophane, or a piece of a clear plastic bag (large enough to cover the top of the bowl)
- 1 large rubber band
- Several ice cubes

Optional Extension Resources:

- 1 glass and cold water
- Mizuiku Water Cycle Experiment sheet

Instruction:

Choose students for parts to play in the Reader's Theatre Water Cycle play. Read the play as a class.

Resources:

- Reader's Theatre Water Cycle Play



Module 3: WWW...World Wide Water

Teacher Content Information

Why are the oceans salty?

Oceans cover about 70% of the Earth's surface. The oceans contain roughly 97% of the Earth's water supply. As water flows through rivers, it picks up small amounts of mineral salts from the rocks and soil of the river beds. This very-slightly salty water flows into the oceans and seas. The water in the oceans only leaves by evaporating (and the freezing of polar ice), but the salt remains dissolved in the ocean - it does not evaporate. So, the remaining water gets saltier and saltier as time passes.



Lesson 3:

Introduction / Immersion

Instruction:

Discuss the resource pages: 1. Water: Who needs it? and 2. Freshwater: What is it?

Put a map of the world up on the board and ask students to write down an answer for the following questions:

1. How much of the earth is covered in water?
2. What types of water bodies are there on the earth?
3. What are the three forms of water?
4. How much of the water on Earth is freshwater?
5. How much of the water on Earth is saltwater?

Keep these answers for the reflection/conclusion of the lesson.

Place page 3 up and students can answer the question: Which of these water sources are freshwater. Page 4 has the answers.

Resources:

- Mizuiku WWW: World Wide Water Resources.
- Map of the world.
- List of questions

Student Activity

Instruction:

Students use Mizuiku: Drinking Water Activity sheet.

In small groups students conduct the following experiment:

How much water in the world is drinkable?

ACTIVITY:

Work through the following steps with your students. Explain what each measurement represents as you work through the activity.

1. Measure 4 litres (16 cups) of water into the bucket. This represents all the water on earth.
2. From the water in the bucket, remove $\frac{1}{4}$ cup of water and set aside. Replace it with 8 ice cubes. These represent the earth's frozen water such as glaciers and ice sheets.
3. From the water in the bucket, measure 2 tablespoons into an extra container. This represents the Earth's fresh groundwater.
4. From the water in the bucket, use an eyedropper to measure 8 drops of water into an extra container. This represents all the surface water on earth, such as streams and lakes.
5. From the water in the bucket, use an eyedropper to measure 1 drop of water into an extra container. The amount of water vapour in our atmosphere at any time is represented by slightly less than this amount!
6. Look at the water remaining in the bucket. This represents the saltwater on earth, mostly water in our oceans but also including salty groundwater near coasts and saltwater lakes, ponds, and marshes.

STUDENTS ANSWER THE QUESTION:

Why is water a precious resource? Groups share answers with the class.

Resources:

- Mizuiku: Drinking Water Activity Sheet
- ~4 litres of water
- Large see-through buckets or containers
- Liquid measuring cups
- Tablespoons
- 8 ice cubes per group
- Teaspoons
- Eye droppers
- Extra containers to hold water

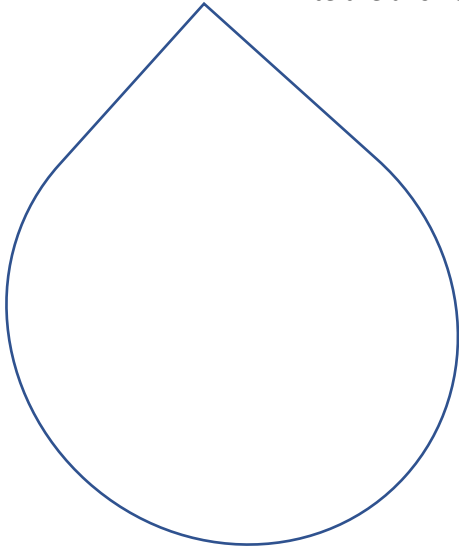
Instruction:

Discuss the answers to the questions posed at the beginning of the lesson and allow students to adjust their answers accordingly.

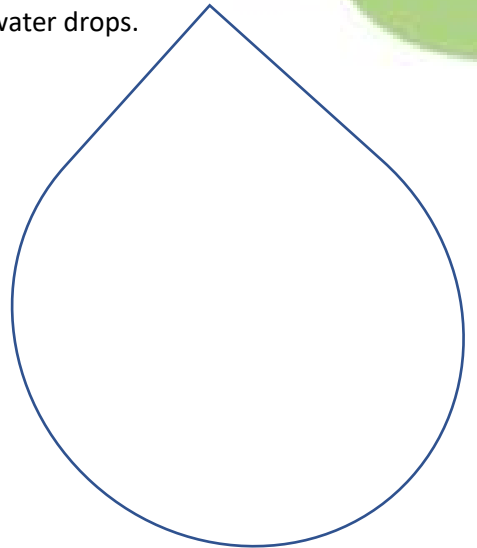


WATER: WHAT IS IT?

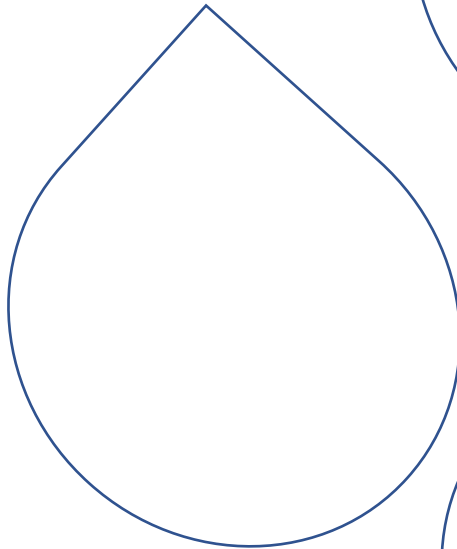
Write the answers to the questions inside of the water drops.



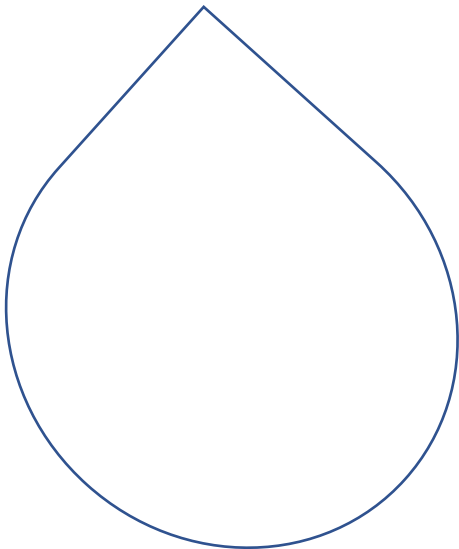
What does water look like?



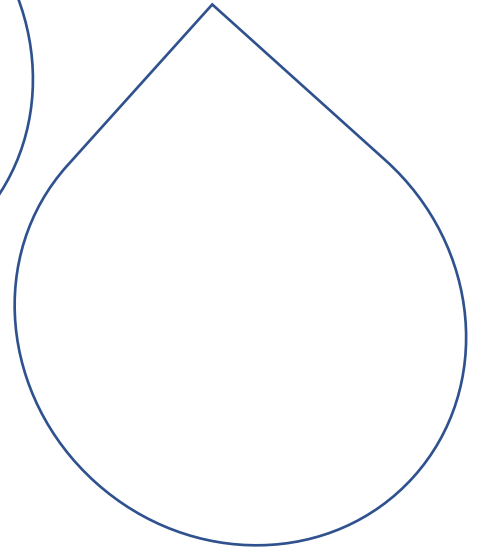
What does water smell like?



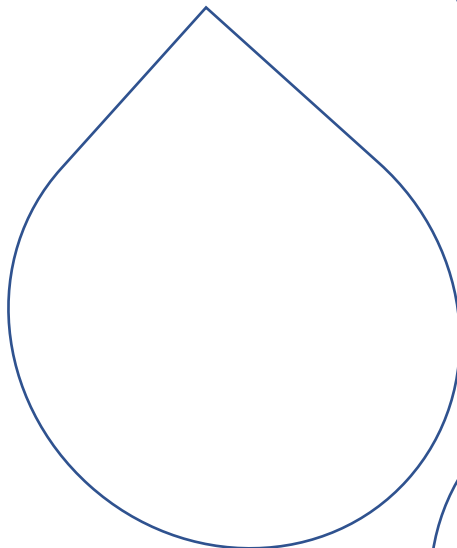
How does water feel?



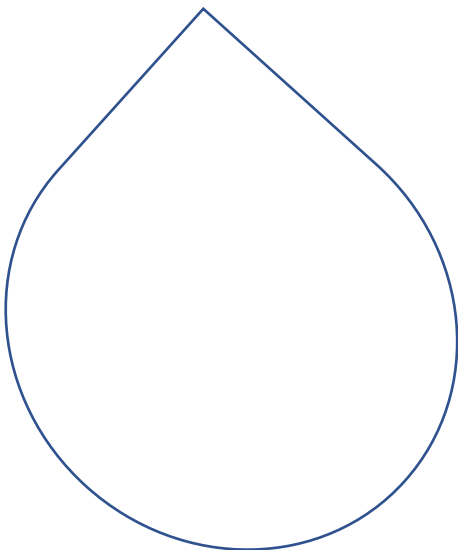
What does water taste like?



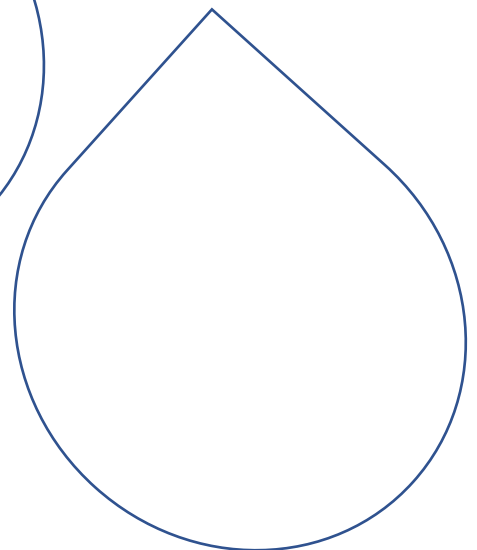
What does water sound like?



What are the three states of water?



What are the two types of water?



What other facts do you know about water?

Water: Where does it come from?

Water Cycle Experiment

EXPERIMENT STEPS:

1. Put enough hot water in the bowl to fill it about 1/3 of the way.
2. Stretch a layer of clear plastic wrap over the top of the bowl, smooth it down on all sides so that the bowl is airtight, and secure the plastic with the rubber band.
3. Watch as the water begins to evaporate and rise. Soon it will begin to drip back down from the clear plastic wrap ... it is "raining."
4. Place several ice cubes on top of the clear plastic wrap, and watch the "raindrops" form and fall more rapidly.

WHAT IS HAPPENING?

Water vapor in our atmosphere gets cold and changes back into liquid, forming clouds. This is called "condensation." If the air is really cold, raindrops turn to snowflakes or ice (hail or sleet).

Optional Extension



On a hot day, pour cold water into a glass. Watch what happens: drops of water form on the outside of the glass.



WHAT IS HAPPENING?

The water did not leak through the glass, but came from the air. Water vapor in warm air turns back into liquid when it touches the cold glass.



Readers' Theatre Script: Water Cycle Adventure

This 10-minute play traces water in its never-ending cycle. Students read the script as they perform the play. Neither props nor scenery is necessary. There are 19 characters, but in a small class, students can easily play more than one part. The students could even write their own water cycle adventure.

Cast:		
Sun (who is also the narrator)	Snowflake 2	Reservoir water 1
Ocean water drop 1	Glacier ice 1	Reservoir water 2
Ocean water drop 2	Glacier ice 2	Tap water 1
Water vapour 1	Stream water 1	Tap water 2
Water vapour 2	Stream water 2	Water in drain pipe
Cloud	River water 1	Sewage processing plant
Snowflake 1	River water 2	

The Sun: Our story starts in the ocean. We are watching two drops of water.

Ocean water drop 1: It's getting hot here in the ocean - I don't think I can swim any more. I'm feeling light and airy! I think the Sun's doing it to me.

The Sun: I can't help it - I'm hot and full of energy. That's what I do, and I do it so well, don't I?

Ocean water drop 2: Yes, you do, but I think I'm getting dizzy and there isn't even a whirlpool here. I'm feeling so strange! I think I'll just float for a while - no more swimming for me.

Ocean water drop 1: Uh oh! You're not floating in the water anymore, you're floating in the air - you're not a drop of water either - you're water vapor now.

Water Vapour 1: What's water vapor?



Water Vapour 2: It's water, but it's a gas. You've evaporated and turned into a gas – and so have I. Let's fly up high!

Water Vapour 1: I feel like joining the others and forming a crowd.

Water Vapour 2: I think you mean a cloud, not a crowd. Okay, let's condense.

Water Vapour 1: What does that mean?

Water Vapour 2: Condensing means that we'll change back into a liquid (water, of course). Then we'll be part of a cloud.

Cloud: Okay, now we're a beautiful, fluffy cloud. Let's fly over the land and watch the goats. Take a look at those beautiful mountains! But now I'm feeling heavy and cold. I think I'm going to snow!

Snowflake 1: Hey, what's got six arms and there's nothing exactly like it in the whole world?

Snowflake 2: Me – I'm so special. You, too, of course. We're both snowflakes. Hey, where are you going now?

Snowflake 1: I can't stop falling – you're falling too. But where are we going?

Snowflake 2: Down.

Snowflake 1: Thanks – I knew that. It looks like we're taking a trip to the mountains. I hope you know how to ski.

Snowflake 2: Well, it looks like we're stuck on a glacier – I wonder why they're called rivers of ice.

Glacier Ice 1: I'm getting crushed here. Now I'm ice – this is NOT my favourite part of the water cycle.



Glacier Ice 2: We're only moving at about one foot a year. This is going to be soooooo boring – it's a long way to the bottom.

Glacier Ice 1: You'd better get used to it, we're stuck on this glacier for a while.

The Sun: A long, long, long time later, two very bored drops of water emerge from the bottom of the glacier. I haven't been much help to them lately.

Stream water 1: Wow, I've finally melted!

Stream water 2: Me too – I'm free at last. What a change, we were practically standing still, and now we're shooting the rapids.

Stream water 1: Watch out for that rock! And that waterfall!

Stream water 2: Ouch! I've had enough of this. Can we go home now?

Stream water 1: We don't have a home. At least we're out of the mountains. The water's getting deeper. What's going on here?

River water 1: You can slow down now – we're in a river. And we're getting warmer.

River water 2: I like this. Not too fast and not too slow.

River water 1: Let's go down this side stream – it looks clear and clean.

Reservoir water 1: Okay. We're in a reservoir now – we'll be flowing through huge pipes soon – I've been here before.

Reservoir water 2: Here they are. It's dark and spooky in these pipes. How do we get out of here?



Reservoir water 1: Just go with the flow.

Tapwater 1: There's a light at the end of the tap – we're in a sink.
Eew – that kid is brushing her teeth!

Tapwater 2: I hope she doesn't drink us – it's really weird when that happens.

Tapwater 2: Whew, that was a close call. Looks like we're whirlpooling down the drain. Hold your nose!

Water in drain pipe: More dark pipes – but these pipes are really smelly. We must be in the sewer under the city. Boy do I need to take a bath.

Sewage processing plant: I heard that. I'm a sewage processing plant. You've come to the right place. I'm so amazing that I can even give bath water a bath! Now you're all filtered and clean – just take that pipe to the sea.

Ocean water drop 1: We're finally back in the ocean. You know, I've done this trip a million times, and every time it's different.

Ocean water drop 2: I was well water in Wales once.

Ocean water drop 1: I was in a typhoon in Thailand twice.

Ocean water drop 2: I was rain in Rwanda.

Ocean water drop 1: I was snow in Siberia.

Ocean water drop 2: We've all been snow in Siberia. But I was in a puddle in Pakistan.

Ocean water drop 1: I was in a lake in Libya.

Ocean water drop 2: I was in a swamp in Switzerland.



Ocean water drop 1: There are no swamps in Switzerland. But a long, long time ago, I was sleet that fell on the snout of a T. rex.

Ocean water drop 2: Showoff. I rained on a plain in Spain, and I seeped through the soil. and went into a cave, and was groundwater for 500 years.

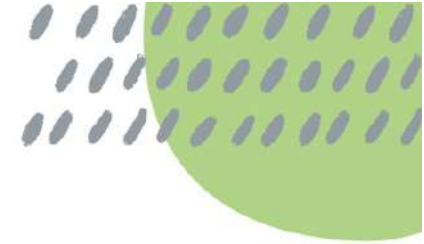
Ocean water drop 1: Boooooorrrring.

Sun: Hi there! It's me again. Did you miss me? I know you did.

Ocean water drop 1: I feel so hot and dizzy!

Ocean water drop 2: Oh no, it's starting all over again!

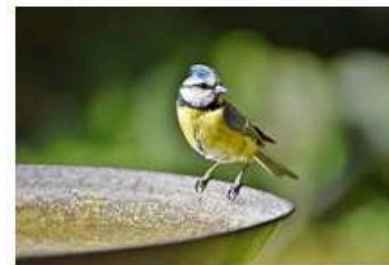
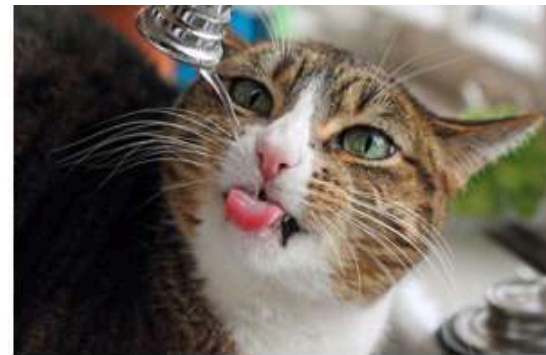
Ocean water drop 1: I wonder where we'll go this time?



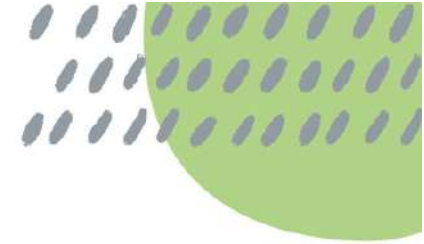
WWW: World Wide Water?

Water: Who needs it?

All living things need **fresh water** to survive - it is an essential resource, and the most important natural resource on Earth.



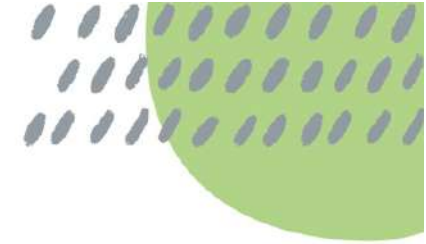
WWW: World Wide Water?



Although water covers about 70% of Earth's surface, only about 2.5% of water on Earth is **fresh water**.

Of this **fresh water**, about two thirds of it is frozen. This means less than 1% of fresh water is available to use.

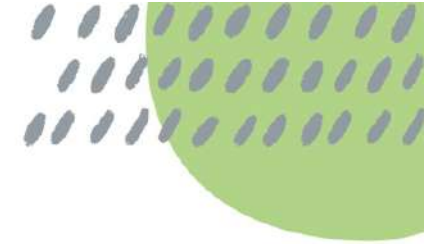




Fresh Water: what is it?

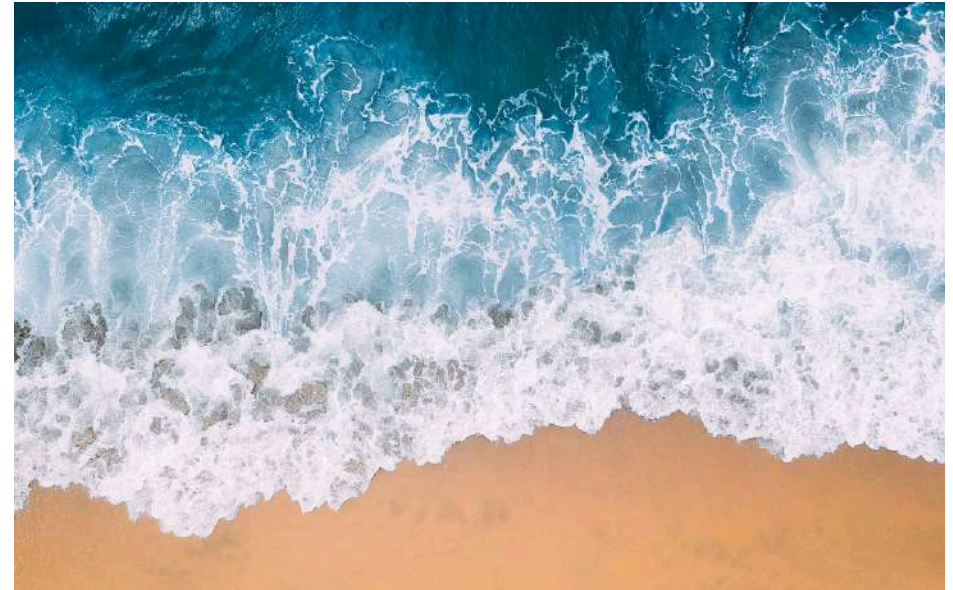
- **Fresh water** is naturally occurring water that is not salty, and, if it is clean, it is suitable for drinking.
- **Fresh water** exists on Earth's surface in lakes, rivers and ice, as well as below the surface as groundwater.
- Humans and most animals need **fresh water** to live.

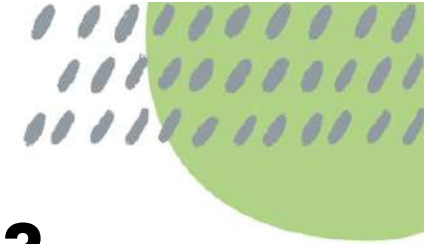




Salt Water: what is it?

- **Salt water** (or saline water) is water that has salt and other minerals dissolved in it, and it is not suitable for drinking.
- Almost all the water on Earth is salty (saline).
- **Salt water** exists on Earth's surface in oceans, seas, and some rivers..
Humans and most animals cannot drink **salt water**.





Water Sources: Which ones are which?

- Which of these are sources of **fresh water**?
- Which of these are sources of **salt water**?



ICE



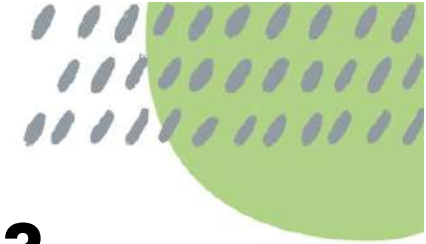
RIVERS



SEAS & OCEANS



LAKES



Water Sources: Which ones are which?

ANSWERS

- Which of these are sources of **fresh water**?
- Which of these are sources of **salt water**?



ICE IS
FRESH
WATER



RIVERS CAN
BE

OR
SALT WATER



SEAS & OCEANS
ARE
SALT WATER



LAKES CAN
BE
FRESH WATER
OR
SALTWATER

mizuiku

For more information or to register for the program go to
<https://earthwatch.org.au/education/school-programs/mizuiku-nature-and-water-school-program>

