The Water Cycle

A Science A–Z Earth Series

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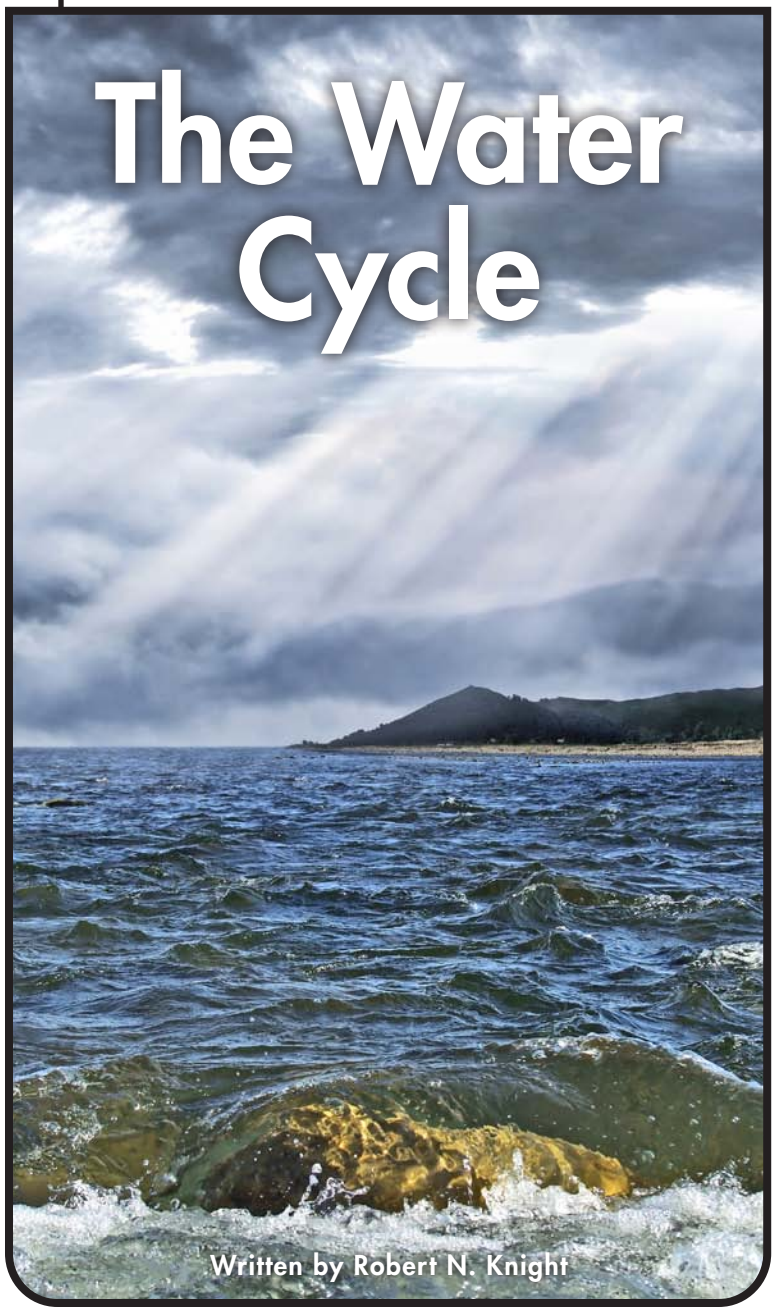

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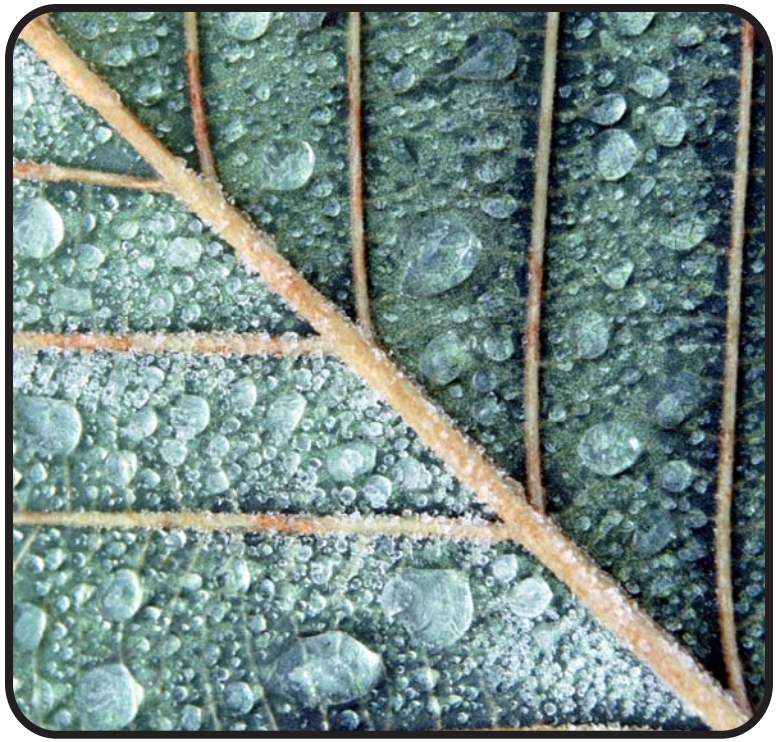

Written by Robert N. Knight

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KEY ELEMENTS USED IN THIS BOOK
The Big Idea: Understanding the water cycle is crucial to understanding how what we do—polluting, farming, damming, using, wasting, conserving—affects everyone's water.
Key words: cloud, condense, conservation, cycle, dam, delta, deposition, Earth, energy, erosion, evaporation, flow, freeze, fresh water, gas, glacier, groundwater, hail, ice, irrigation, lake, liquid, matter, melt, ocean, precipitation, rain, river, runoff, salt water, sandbar, sediment, sleet, snow, soil, solid, storm, stream, surface water, temperature, water, water cycle, water vapor, well **Key comprehension skill:** Cause and effect *Other suitable comprehension skills:* Sequence events, main idea and details, interpret charts, graphs, and diagrams, author's purpose **Key reading strategy:** Summarize *Other suitable reading strategies:* Visualize, connect the text to prior knowledge, retell, ask and answer questions

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Cirrus clouds

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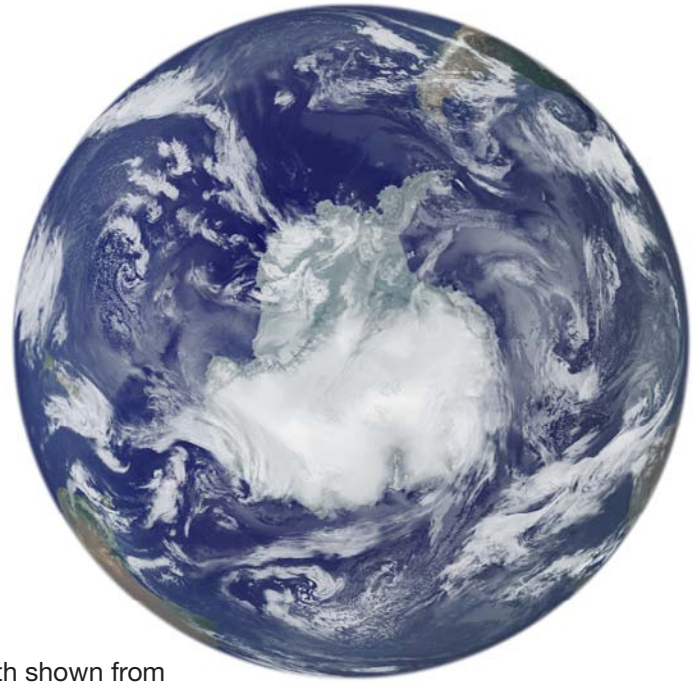
Introduction: Water Everywhere

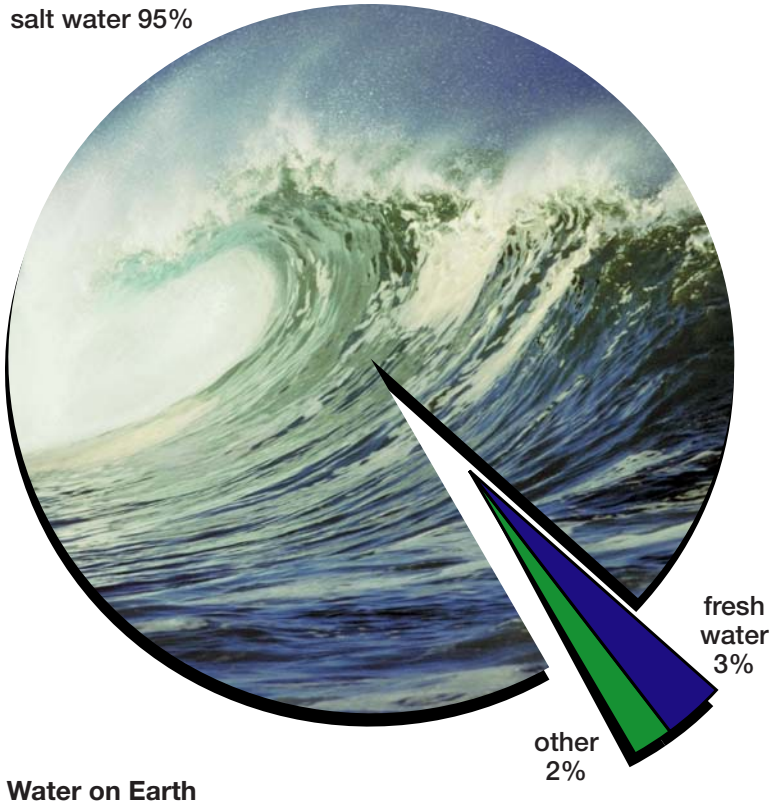
Water covers three-fourths of Earth's surface. This is why Earth is called the water planet.

Each year, more and more people live on Earth. They use more and more water. They cause dirt to get into Earth's water. This makes clean water more precious.

This book will teach you about how Earth's water moves and changes. It will teach you how we use water and how we can conserve it.



Earth shown from above Antarctica



Water on Earth

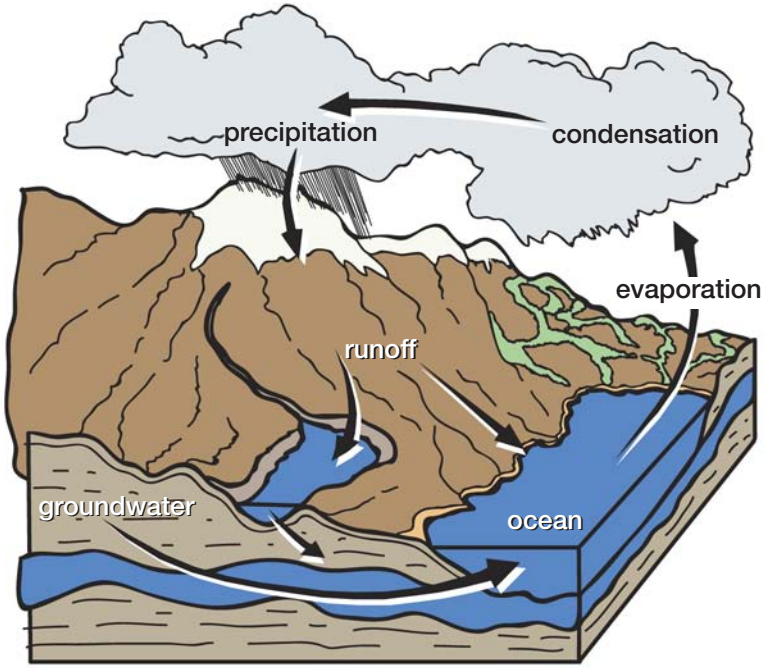
The world's oceans hold most of Earth's water. However, this water is salt water. Salt water is not good to drink or water plants with.

A very small amount of Earth's water is not salt water. Fresh water is in lakes, rivers, and streams. Some of it is found below the ground and high in mountains, too. But most fresh water is found in the form of ice around the North and South Poles.

The Movement of Water

Everything on Earth is matter. The three states of matter are solid, liquid, and gas. Earth's water is found in all three of these states. Solid water is called ice. Water that is a gas is called **water vapor**. You cannot see water vapor. Liquid water is the water you drink and see fall as rain.

Earth's water moves all around Earth. As it moves, it changes states. This movement is called the **water cycle**.



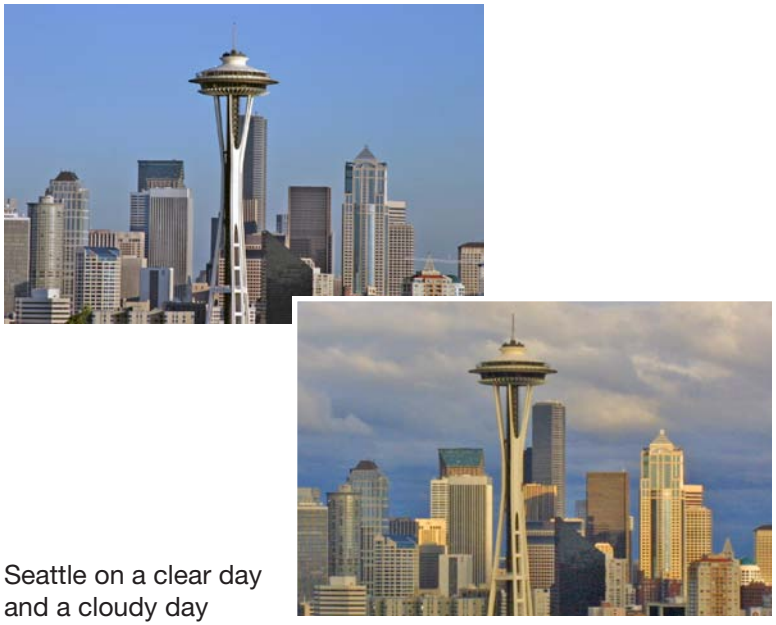
Water evaporates into the air, forms clouds, and precipitates down. On the ground, water flows downhill until it meets the ocean.

Evaporation and condensation

The first step in the water cycle is when the Sun shines on the water. This sunlight is energy. Some of that energy then passes to the tiny particles that make up water. The particles get more and more energy from the sunlight. They move faster and faster. When they move fast enough, they leave the water, and they move into the air above the water. This is called **evaporation**. Evaporation is when liquid water changes to water vapor.

Warm air near Earth's surface rises. As it rises, it cools. The tiny water particles in the cool air slow down and get closer together. They begin to gather on tiny bits of dust that are floating in the air. As water particles collect on the dust, they form water droplets. This is **condensation**. That's the next step in the water cycle.

When millions of these water droplets come together, they form clouds. The more water droplets that come together, the thicker the clouds become. When clouds become very, very, thick, they can form storm clouds.



Seattle on a clear day and a cloudy day

Word Wise

Different clouds have different names. The names of clouds come from Latin words. Here are some Latin words that are used to name clouds.

cirro = high
cirrus = feathery
cumulus = fluffy
alto = mid-level
stratus = layers
nimbus = rain or snow

Cumulonimbus:
large fluffy rain clouds

Nimbostratus:
thick layers of rain clouds

Altocumulus:
mid-level fluffy clouds

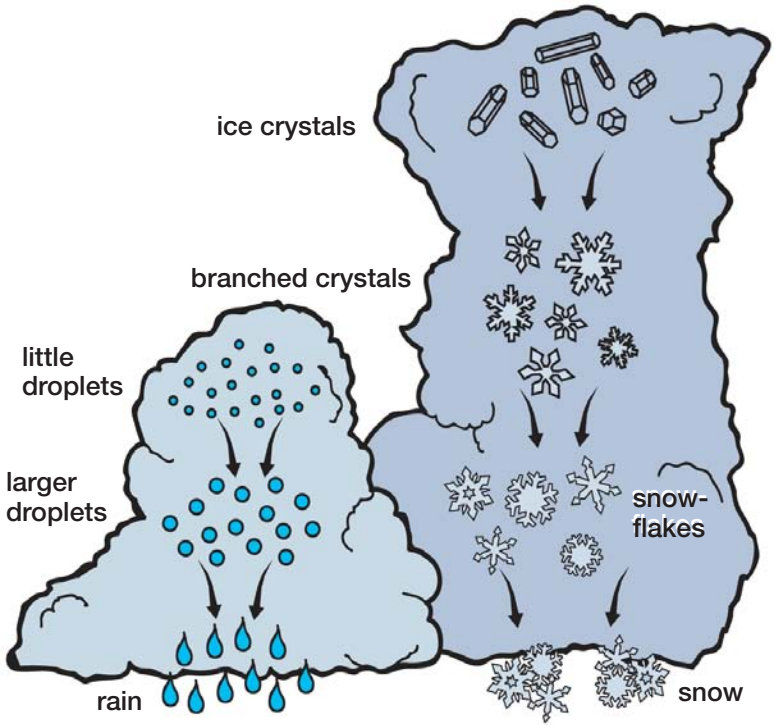
Cirrostratus:
high layers of clouds

Cirrus:
feathery clouds

Precipitation

Rain, snow, sleet, and hail come from clouds. They are called **precipitation**. That's the next step in the water cycle.

The kind of precipitation that falls depends on the temperature inside a cloud. If it is above freezing, raindrops will form. If it is below freezing, water droplets freeze into tiny pieces of ice. These pieces of ice join together to make snowflakes.

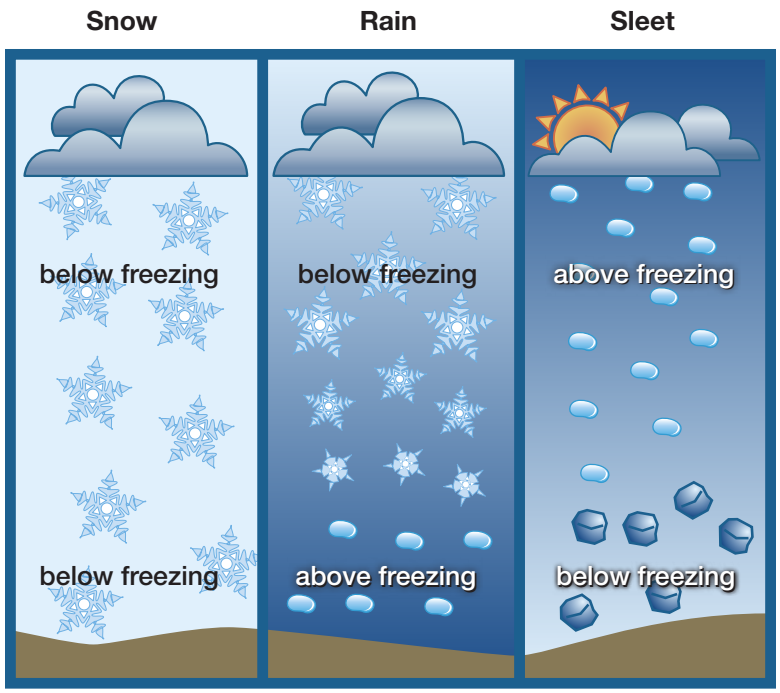


Conditions for rain and snow inside a cloud

Sometimes rain freezes as it falls to the ground. It then becomes sleet. Other times snow may melt as it falls to the ground. Then it becomes rain.

What happens to rain and snow depends on how cold it is below a cloud. The picture shows what happens with different temperatures inside and under a cloud.

Sometimes the ground is freezing. Then rain turns to ice after it falls.



The air temperature in and below the cloud, and above the ground, affects precipitation.

Water on the Ground

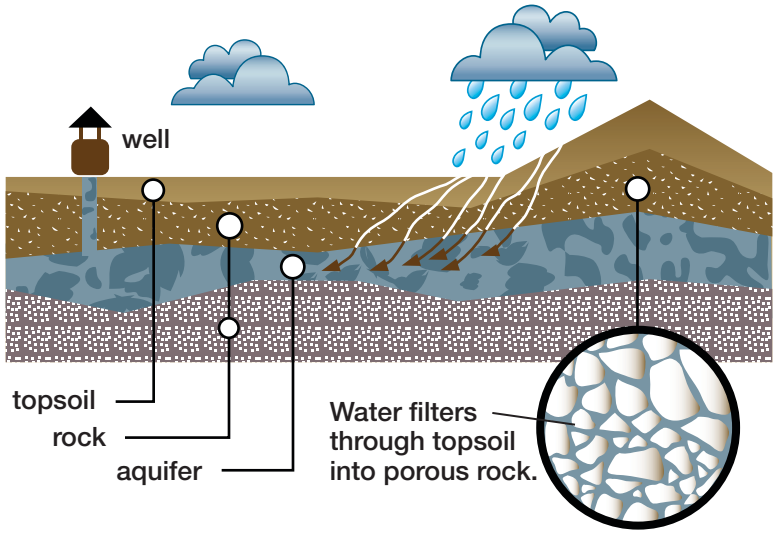
Rain and snow that fall to Earth will either soak into the ground or flow over it.

Water flowing over the ground is **surface water**. Much of it ends up in streams and rivers. The surface water that collects in rivers and streams is **runoff**. The streams and rivers carry this water to lakes and oceans.

The water that soaks into the ground is called **groundwater**. It fills up spaces between rocks, sand, and dirt.

Snow falling near the Poles and high in mountains piles up. If it does not melt over time, it forms huge ice sheets and glaciers.

Aerial view of water running off land into streams



Many people get the water they need from groundwater. Wells are drilled into the ground to get drinking water. These wells will go dry if the water is pumped out too fast. Rain and melting snow cannot always replace the water that is removed.

Chemicals dumped on the ground can seep into groundwater. It is impossible to get them out once they get into groundwater. We must stop this dumping.

WOWSER!

The human body is about 60% water. There wouldn't be much of you left if the water evaporated.

Erosion

Surface water can move over land with a lot of force and speed. The fast moving water can cut away rock and soil. This is called **erosion**. The rock and soil are dumped into streams and rivers.

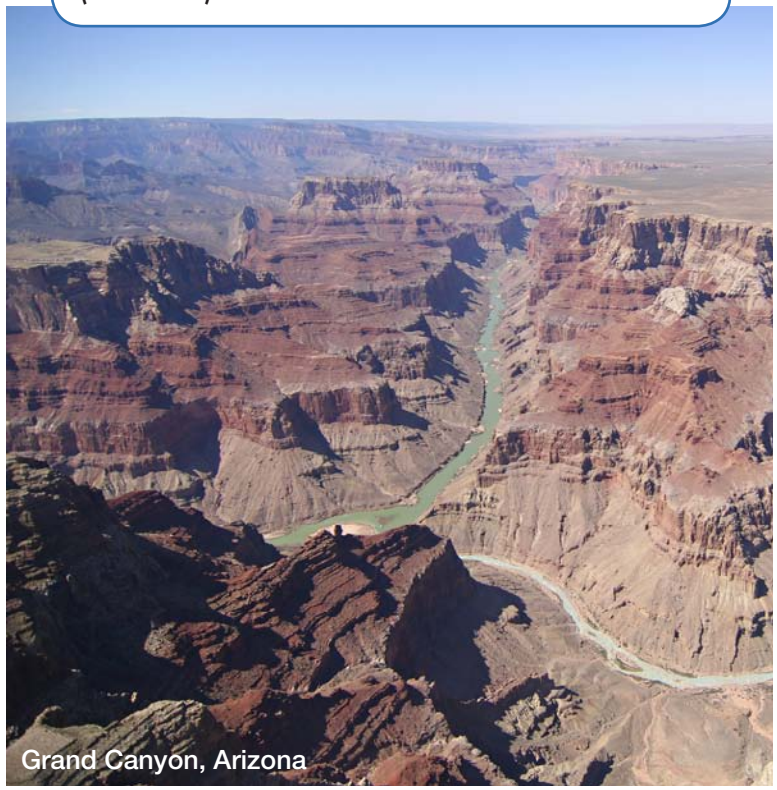
Erosion can rob land of rich topsoil needed to grow good crops. When farmers plow land, the soil is exposed. When fires burn down trees, forest soil is exposed. Heavy rain can wash away the exposed soil.

Planting plants to help hold down soil is the best way to stop erosion. This is especially important in places where there are lots of hills.


Erosion cuts away rock and soil.

WOWSER!

The Grand Canyon is over 1.6 kilometers (one mile) deep and up to 30 kilometers (18 miles) wide. That's a lot of erosion!



Grand Canyon, Arizona

This is a picture of the Grand Canyon. It is very deep. Fast-moving river water cut through rock and formed the canyon. The canyon took about a million years to form. The river is still working to make the canyon even deeper. Fast-moving water has formed canyons and valleys all around the world.

Deposition

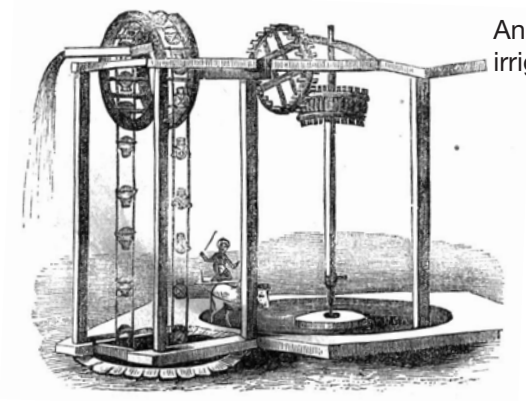
Streams and rivers carry **sediment** that runs off the land. When streams and rivers slow down, the sediment gets deposited. This is called **deposition.**

Rivers and streams twist and turn on their way to the ocean. Water slows down on the inside part of a turn. Sediment is deposited in the inside bank of the turn. This sediment makes a **sandbar.**

Rivers slow down when they go into the ocean. Sediments carried by a river are deposited. The sediment forms large areas of land called **deltas.** Deltas are good places to grow crops.

The Nile Delta in Egypt

delta farmland



An ancient irrigation system

A modern irrigation system

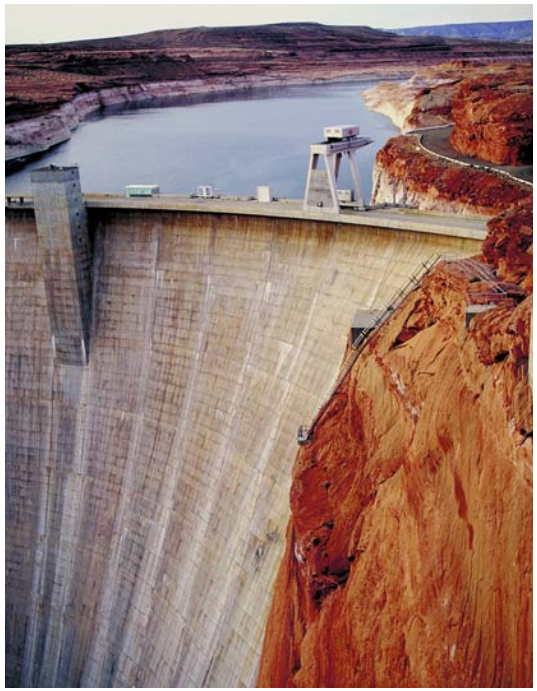
Controlling Water

If there is not enough water, people can dig ditches and canals. The ditches and canals bring water to the people. People can also build dams and ponds. Dams and ponds store water. Systems that channel and store water are called irrigation systems. Long ago, farmers built irrigation systems much like irrigation systems used today.

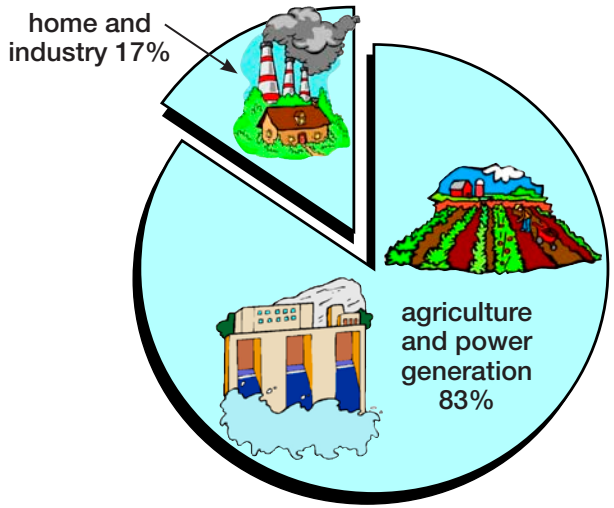
Today, water is used in many different ways. It is stored behind dams in lakes for use during times when there is not a lot of rain. It is carried long distances in pipes that have been placed into the ground.

Irrigation systems allow farmers to grow plants almost anywhere. We can even grow crops in the desert.

Water that has been used is sent to sewage treatment plants. Treatment plants clean the water and put it back into the water cycle.



Glen Canyon Dam at Lake Powell in Arizona



Water Uses

Most of Earth's fresh water is in polar ice and in mountain glaciers. It cannot be easily used. Only about one percent of Earth's fresh water is easy to get and to use.

Fresh water is important because it is used for many things. It is used to water crops. Industries also use a lot of fresh water when they make things.

People at home use fresh water to drink, to clean, to cook, and to water plants and lawns. The number of people on Earth is growing, so every day, more water is needed. But there is only so much fresh water on Earth.

Water Conservation

Where will we get our fresh water in the future? We can dig deeper wells. We can build factories that change salt water into fresh water.

Scientists and inventors can find ways to save water. They have invented toilets that use much less water. They also have invented showerheads that use less water. People can now put home irrigation systems on timers. These systems give the right amount of water directly to each plant.

People can learn how to save water. They can learn that there is only so much fresh water on Earth, so it must be used wisely.

A factory that removes salt from salt water

Things people can do to save water:

- Turn off the water when you're not using it.
- Don't run water when you brush your teeth.
- Take shorter showers.
- Fix leaking faucets.
- Wash dishes and clothes only when there is a full load.
- Store rainwater for plants.
- Water the lawn in the evening.
- Put lawn sprinklers on timers.

Conclusion

You have learned how important water is to life on Earth. You have learned about the water cycle and how water changes states as it move through this cycle. You have also learned that water changes the way Earth looks. It cuts canyons and valleys. It forms rivers and oceans.

Water is a very important resource. We must keep it clean, and we must not waste it.

Glossary

condensation the process by which water changes from a gas to a liquid state (p. 8)

delta an area of land formed by sediment at the mouth of a river (p. 16)

deposition the act or process by which wind or water sets down sediment (p. 16)

erosion the gradual wearing away of rock or soil by water, wind, or ice (p. 14)

evaporation the change of water from a liquid state to a gas state, due to an increase in temperature (p. 7)

groundwater water held underground in soil or rock, often feeding springs and wells (p. 12)

precipitation water that falls from clouds in the form of rain, snow, sleet, or hail (p. 10)

runoff excess water, not absorbed by the soil, that flows downhill (p. 12)

sandbar a long ridge of sand formed in a body of water by currents or tides (p. 16)

sediment particles of dirt and rock that are carried by water, wind, or ice and deposited elsewhere (p. 16)

surface water water found above ground, on land (p. 12)

water cycle the path water takes, and the changes it goes through, as it cycles through the environment (p. 6)

water vapor the gaseous state of water (p. 6)

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