

Water in the Air

Recall

97.5 % of water on earth is salt water and 2.5% is fresh water. Only 0.3% of the fresh is of liquid form.

Nearly all of the water is located in the lowest layer of the atmosphere, the troposphere.

Water is present in variable amounts in the atmosphere, from 0 % to 4 %.

Unlike oxygen and nitrogen, the concentration of oxygen depends on local weather conditions and changes greatly from place to place on Earth.

Clouds form preferentially over dark vegetation and just downwind of mountain ranges.

The water in the atmosphere makes up only a very small percentage of the total water on Earth.

In the atmosphere, water exists as a gas (water vapor from evaporation), as a liquid (droplets of rain and liquid water that coats solid particles), and as a solid (snow and ice). Its structure depends on its state.

[Water in the Atmosphere | Precipitation Education \(nasa.gov\)](#)

[https://gpm.nasa.gov/education/sites/default/files/
lesson_plan_files/water%20cycle/
The%20Water%20Cycle%20SCS.pdf](https://gpm.nasa.gov/education/sites/default/files/lesson_plan_files/water%20cycle/The%20Water%20Cycle%20SCS.pdf)

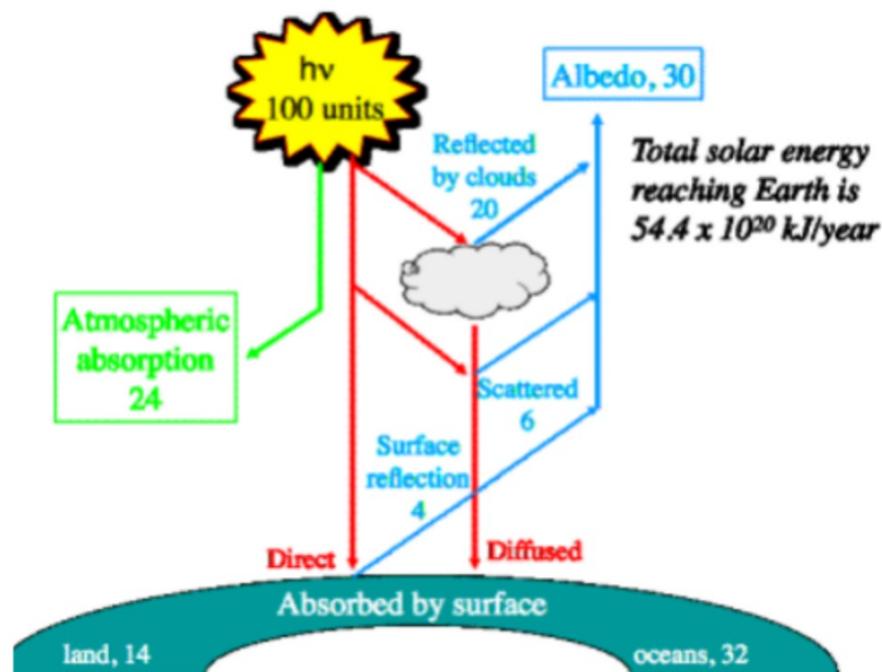
Water and Solar Energy

Water vapor is a clear, colorless gas. It does not absorb visible light so it is unaffected by most of the solar radiation in the troposphere. However, water vapor is a greenhouse gas. It absorbs heat energy from the Earth.

Clouds and fog are not gas-phase water. These consist of particles of liquid and solid water that reflect approximately 20 percent of the incoming solar radiation in the troposphere. This makes the atmosphere and the Earth's surface cooler than it would be otherwise.

Albedo is the amount of solar radiation that is reflected by some surface.

- It can be calculated and represented with a decimal with 1 being a perfect reflector and 0 absorbing all incoming light
- It can also be calculated as a percent

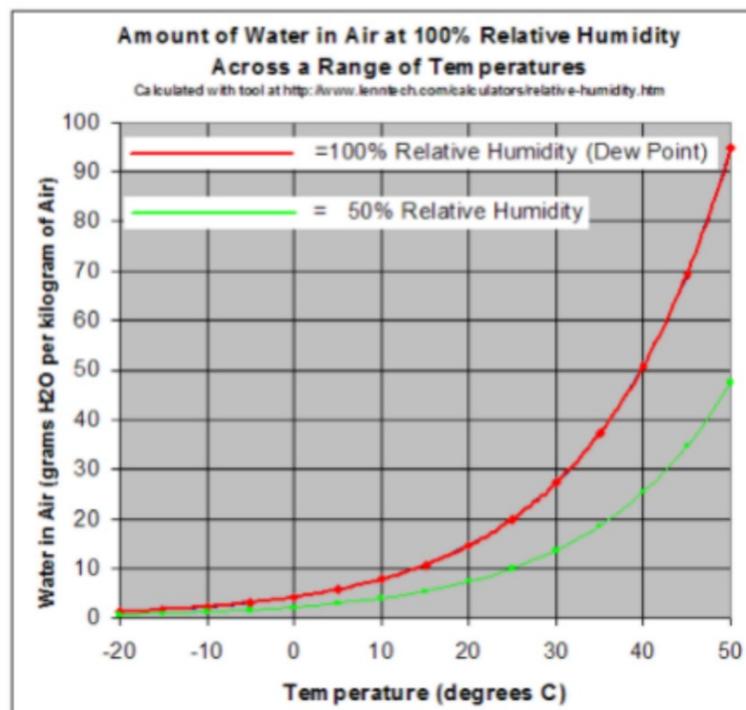


The troposphere is like a very large container. It can take a long time for the equilibrium condition to become established, but the maximum amount of water(g) present in the will depend on temperature and pressure.

The **relative humidity** is the ratio of the actual water vapor pressure to the saturation water vapor pressure (equilibrium value) at the prevailing temperature and is expressed as a percentage. At 100% relative humidity, the water(l)-water(g) system is at equilibrium.

The **dew point** is the temperature to which the air must be cooled before water condenses from it.

Note that the values in the graph at right are not true concentration values but relate the mass of water per mass of all gas molecules.



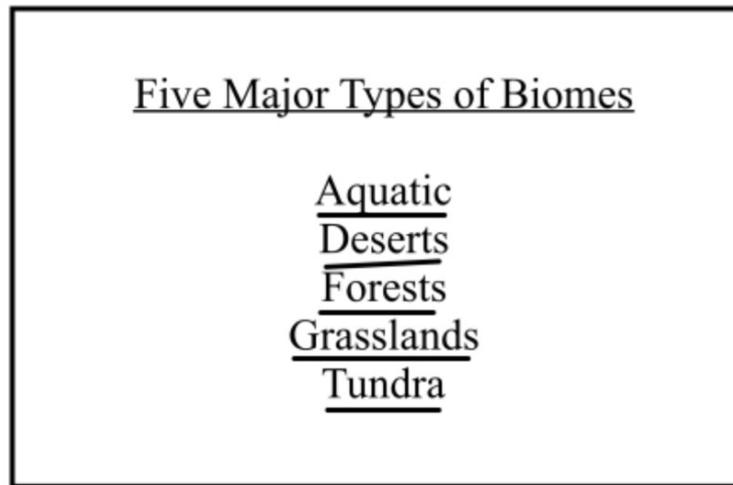
Biosphere

Bio means “life.” The biosphere is made up of all the living things on Earth and it includes fish, birds, plants, and even people.

The living portion of the Earth interacts with all the other spheres. Living things need water (hydrosphere), chemicals from the atmosphere, and nutrients gained by eating things in the biosphere.



biome - a group of terrestrial communities that covers a large area and is characterized by certain soil and climate conditions and particular plants and animals



Add to notes

To understand a world biome, you need to know:

- What the climate of the region is like.
- Where each biome is found and what its geography is like.
- The special adaptations of the vegetation.
- The types of animals found in the biome and their physical and behavioral adaptations to their environment.



Biome Project

See next page for list

In groups you will design a poster board



Rubric on next page

Five Major Types of Biomes

- Aquatic
- Deserts
- Forests
- Grasslands
- Tundra

Biome Project RUBRIC

Criteria	4 Points	3 Points	2 Points	1 Point	0 Points
5 Facts about Animals	Includes 5 accurate facts about animals in the biome.	Includes 4 accurate facts about animals in the biome.	Includes 3 accurate facts about animals in the biome.	Includes 2 accurate facts about animals in the biome.	Includes less than 2 accurate facts about animals in the biome.
5 Pictures of Animals	Includes 5 clear and relevant pictures of animals in the biome.	Includes 4 clear and relevant pictures of animals in the biome.	Includes 3 clear and relevant pictures of animals in the biome.	Includes 2 clear and relevant pictures of animals in the biome.	Includes less than 2 clear and relevant pictures of animals in the biome.
Characteristics for Animal Survival	Provides a thorough explanation of how animals in the biome have adapted to survive.	Provides a good explanation of how animals in the biome have adapted to survive.	Provides a basic explanation of how animals in the biome have adapted to survive.	Provides a limited explanation of how animals in the biome have adapted to survive.	Does not provide an explanation of how animals in the biome have adapted to survive.
5 Facts about Weather	Includes 5 accurate facts about the weather in the biome (season, precipitation).	Includes 4 accurate facts about the weather in the biome (season, precipitation).	Includes 3 accurate facts about the weather in the biome (season, precipitation).	Includes 2 accurate facts about the weather in the biome (season, precipitation).	Includes less than 2 accurate facts about the weather in the biome (season, precipitation).
5 Facts about Plants/Vegetation	Includes 5 accurate facts about the plants/vegetation of the biome.	Includes 4 accurate facts about the plants/vegetation of the biome.	Includes 3 accurate facts about the plants/vegetation of the biome.	Includes 2 accurate facts about the plants/vegetation of the biome.	Includes less than 2 accurate facts about the plants/vegetation of the biome.
Location on World Map	Correctly identifies and labels the location of the biome on a world map.	Identifies and labels the location of the biome on a world map with minor errors.	Identifies and labels the location of the biome on a world map with some errors.	Attempts to identify and label the location of the biome on a world map with major errors.	Does not identify or label the location of the biome on a world map.
2 Potential Environmental Problems	Identifies and elaborates on two potential environmental problems within the biome.	Identifies and briefly describes two potential environmental problems within the biome.	Identifies and briefly describes one potential environmental problem within the biome.	Identifies one potential environmental problem within the biome with limited description.	Does not identify any potential environmental problems within the biome.
Neatness and Organization	The poster is neat, well-organized, and visually appealing with clear headings and sections.	The poster is mostly neat and well-organized with clear headings and sections.	The poster is somewhat neat and organized with some clear headings and sections.	The poster is messy or disorganized with unclear headings and sections.	The poster is extremely messy or disorganized with no clear headings or sections.

Biome Pamphlet Project

biosphere - contains all living things on portions of earth & the combined, including land, water, and air, or atmosphere.
- extends from about 8 km above Earth's surface to as far as 11 km below the surface of the ocean

Biosphere 2
Jayne Pointer



EXERCISE:

Can you identify the biome for each picture?



(ERASE to reveal)



[Build a Biome \(switchzoo.com\)](http://switchzoo.com)



Have you ever wondered what it would be like to live in a different part of the world?

What would the weather be like?

What kinds of plants and animals would I see there?

If you have, you were wondering about the biome of the new location.

Next

[Rainforests 101 | National Geographic \(youtube.com\)](https://www.youtube.com/watch?v=...)

YouTube CA

biomes documentary

Home

Shorts

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Earth's Biomes

Alan Scott

9 videos 34,124 views Last updated on...

Play all Shuffle

- 1  **Rainforests 101 | National Geographic**
National Geographic • 2.2M views • 4 years ago
- 2  **What Are Tundras? | National Geographic**
National Geographic • 778K views • 6 years ago
-  **The temperate deciduous forest biome**

Some terms we use with trees



Coniferous Forest

vs

Deciduous Forest

Deciduous = the dropping of a part that is no longer needed, in this case leaves

Coniferous = bearing pinecones, most of which are evergreen

Evergreen = retaining leaves year round, therefore remaining “forever green”

Broadleaf = a thin, broad leaf structure with a good deal of surface area

Needle = a thin, long modified leaf typical of conifers

Hardwood = another commonly used word for deciduous, broadleaf trees

Softwood = usually refers to coniferous trees

The spheres interact to effect Earth's systems and processes, and they are constantly changing each other.

For example, ocean currents (hydrosphere) affect air temperature (atmosphere): The Gulf Stream is a powerful water current in the Atlantic Ocean. It's warm water moderates the temperatures on the east coast of the USA.

Another example of how the spheres affect each other is through erosion. Erosion happens in the desert when wind (atmosphere) shapes the sand in the geosphere. Water (hydrosphere) can also shape land, such as in the formation of the Grand Canyon.



Humans have a huge impact on all spheres. Negative impacts, such as burning fossil fuels, pollute the atmosphere. Piling up our waste in landfills affects the geosphere. Pumping waste into the oceans harms the hydrosphere. And overfishing and habitat destruction can reduce the diversity of living things in the biosphere.

However, people everywhere are working to change things. Recycling efforts are increasing all over the world, and companies are finding new ways to reduce fossil fuels. In the US alone, people are recycling six times more than a generation ago.



EXAMPLES OF EARTH'S 4 SPHERES



Even though the island of Kauai in Hawaii gets more rain than almost any area on Earth, one side looks like a desert.

The shape of the land (geosphere) effect where it rains (hydrosphere).

[This Is Plastics: How Are Plastics Made?](#)



Every time you recycle, you are impacting all four spheres.

Efforts such as recycling are important to keep all four of our spheres healthy.

[How Plastic is Made \(youtube.com\)](#)



Erosion creates mushroom rocks when wind carries sand close to the ground.

This is another example of how the atmosphere affects the geosphere. Sand carried by wind carves the bottom of the rock more than the top.

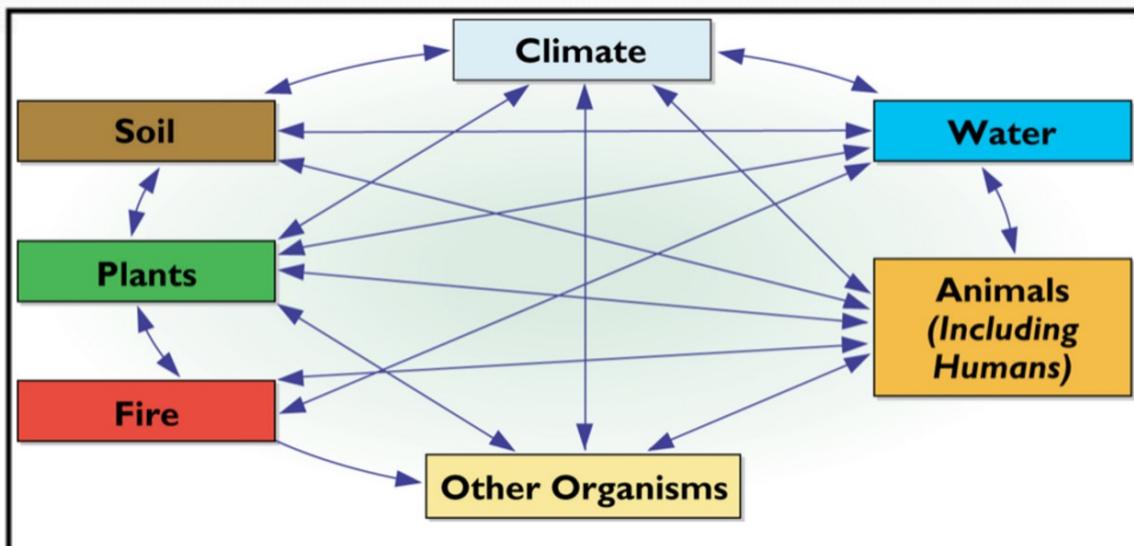
[How Paper Is Made \(youtube.com\)](#)

[New plastic material fully degrades in the ocean - Advanced Science News](#)

Ecosystems

- All of the organisms living in an area together with their physical environment.
 - There can be great variation from one ecosystem to another.
 - However, ecosystems overlap.
 - Requirements include energy, mineral nutrients, water, oxygen, and living organisms.

An ecosystem is made up of all of the living and nonliving things in an area. This includes all of the plants, animals, and other living things that make up the communities of life in an area. An ecosystem also includes nonliving materials—for example, water, rocks, soil, and sand.



Factors in Ecosystems

Biotic (living) factors include:

- Plants } organisms
- Animals }
- Dead organisms & Waste Products
(came from living at one time)

Abiotic (nonliving) factors include:

- Air
- Water
- Soil
- Rocks
- Light
- Temperature
- Climate

Water Cycle is Hydrologic Cycle

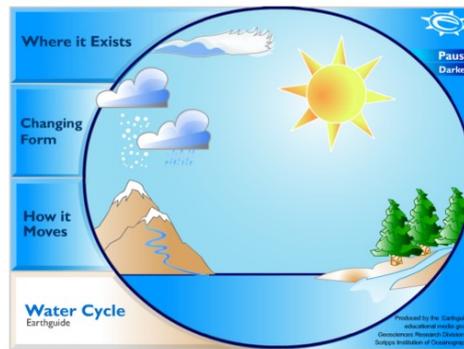
must know both names

*

*

Already did

Water cycle diagram



[Describe Nitrogen Cycle-Nitrogen cycle in simple terms \(youtube.com\)](#)

TEXT - Water and Nitrogen Cycles.pdf

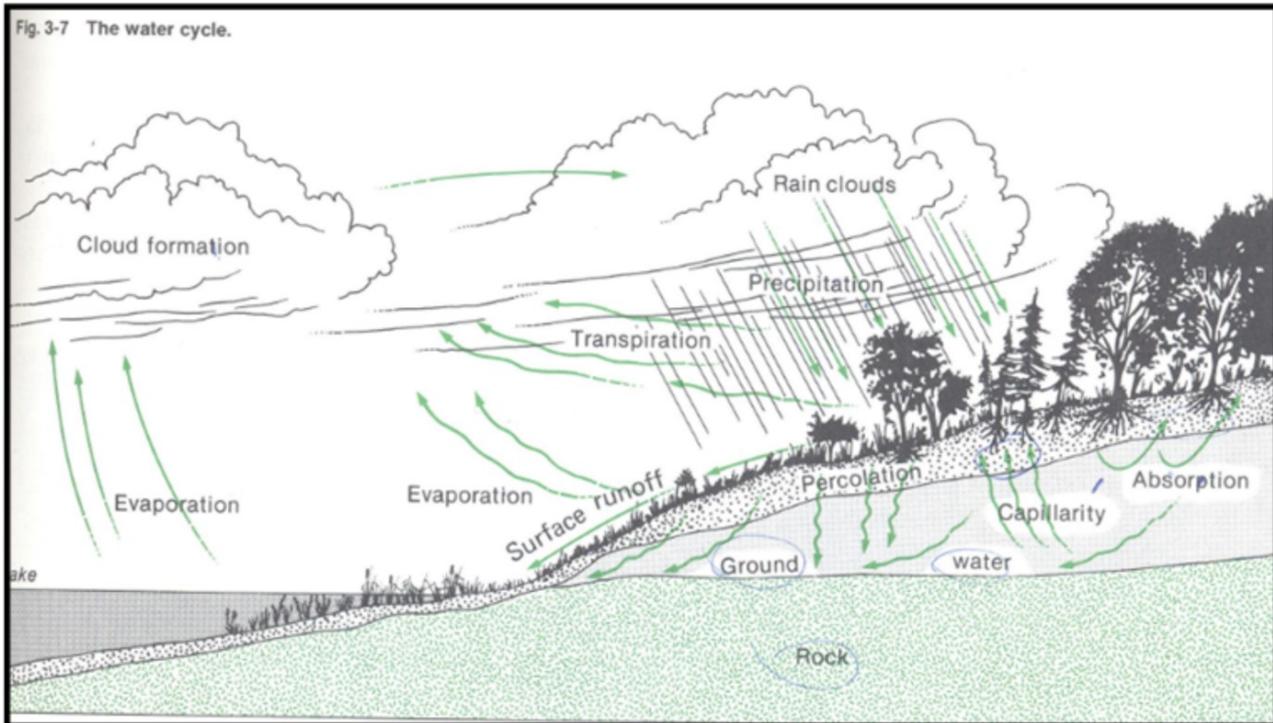
2 min

[The Carbon Cycle Process \(youtube.com\)](#)

3 min

*

1. **transpiration** - loss of water through the pores in the leaves of plants.
2. **evaporation** - water vaporizes into the air.
3. **condensation** - water forms into a liquid form.
4. **precipitation** - collects in clouds and falls to the ground as rain/snow.
5. **surface runoff** - water that travels on the ground to a stream, pond or other body of water.
6. **percolation/infiltration** - water soaks into the ground.
7. **ground water** - water found within bedrock.
8. **capillarity** - water movement from the soil up to the roots of a plant.



pages 43-44

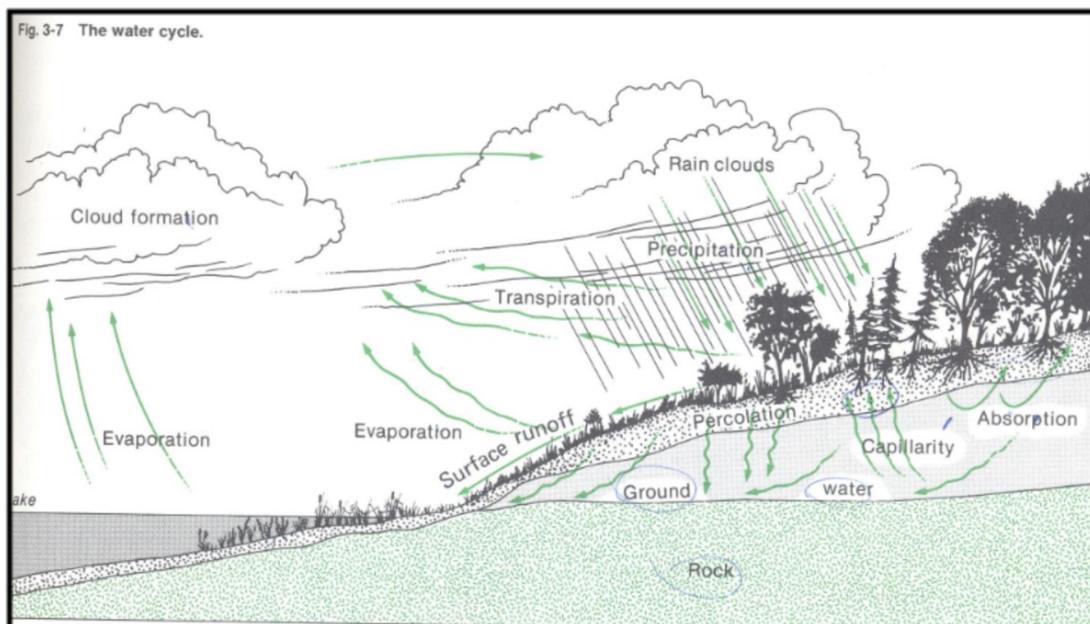
The Water Cycle

The hydrogen and oxygen atoms in water are nutrients organisms need. These nutrients are recycled through ecosystems as follows.

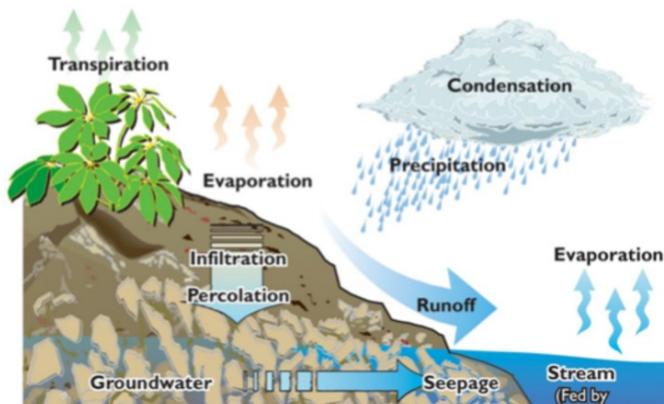
Water vapour enters the atmosphere through **transpiration** from vegetation. (Transpiration is the loss of water through pores in the leaves of plants.) It also enters the atmosphere by evaporating from bodies of water and the soil (Fig. 3-7). In the cool upper atmosphere this vapour condenses, forming clouds. In time, enough water collects in the clouds to cause **precipitation**. When this happens, some of the water that falls on the ground runs along the surface of the ground to a stream, pond, or other body of water. This water is called **surface runoff**. But some of the water also soaks into the ground by a process called **percolation**. Some water percolates down to the bedrock. Then it becomes **ground water** and gradually runs back to lakes and other bodies of water.

Some of the water in the soil moves up to the roots of plants by **capillarity**. The roots absorb the water. This is how most plants get the hydrogen and oxygen they need. Animals can obtain water by eating plants or by eating other animals. Of course, they can also obtain it by drinking water directly from a body of water.

Finally, when plants and animals die, they decompose. During this process, the water in their tissues is released back into the environment.

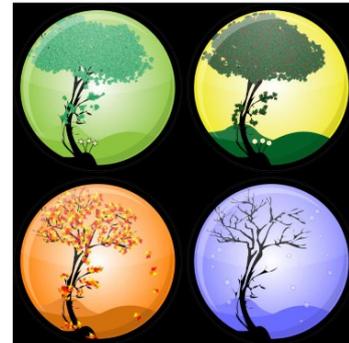


Water Cycle

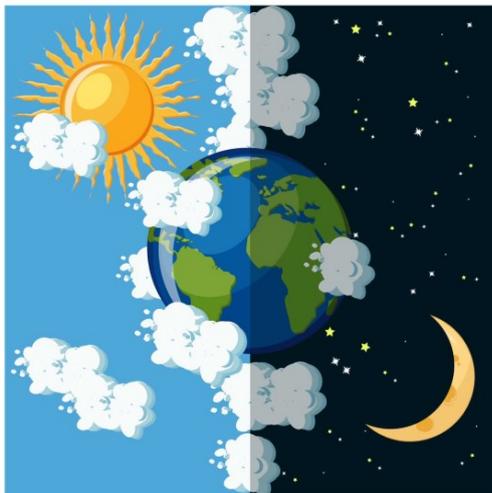


Did you know?

- A fixed amount of water recirculates around the Earth.
- Water moves in certain directions from place-to-place (reservoir-to-reservoir) by only certain processes and pathways.
- Some processes of transfer are rapid while others are much slower.
- A conceptual "reservoir" of water is not quite the same thing as a reservoir in which water is stored.
- When land-based glacial ice melts and runs off into the sea, sea level rises.
- When land-based glacial ice forms, sea level drops.
- When floating icebergs melt into the sea, sea level doesn't change.
- Glacial ice is made up of freshwater that had previously fallen as snow.
- Evaporation of seawater requires an input of energy; condensation of clouds releases energy.



Let's Look at the Earth and It's Cycles

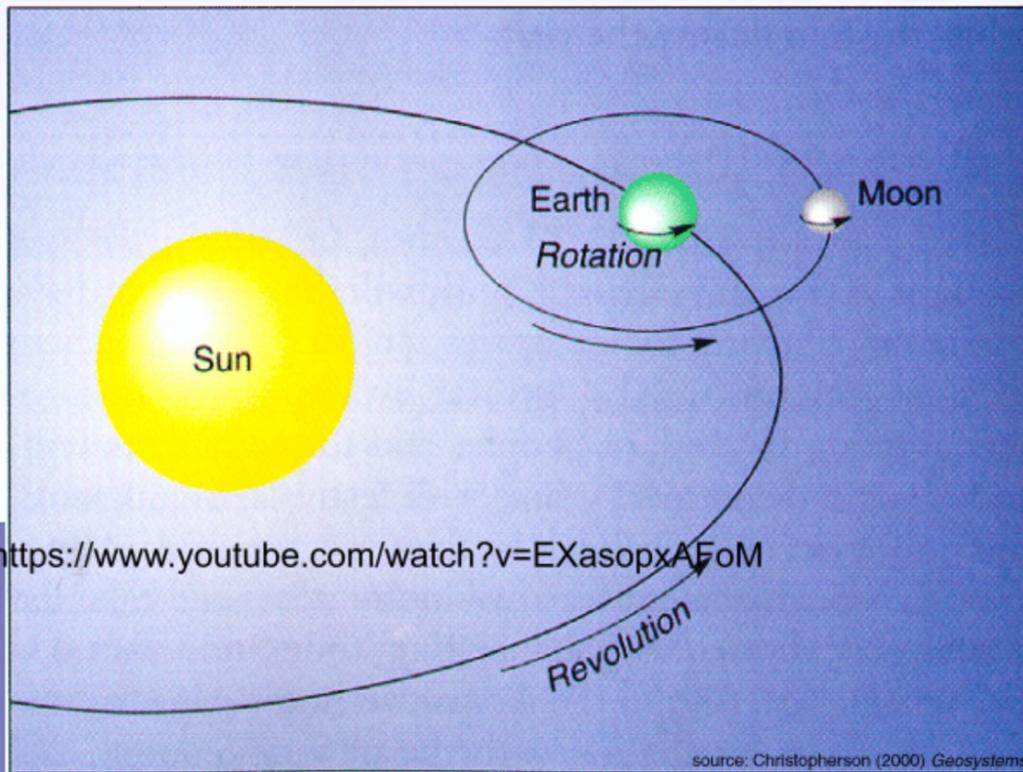


Revolution-The movement of an object around another.

earth (goes around sun)

↳ Earth takes 1 year = 365 days

↳ counter clockwise



<https://www.youtube.com/watch?v=EXasopxAf0M>

source: Christopherson (2000) Geosystems

The diagram illustrates the concept of Earth's axis tilt through three analogies and a definition:

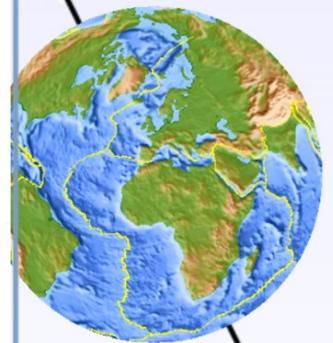
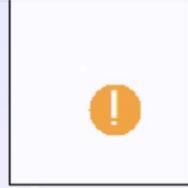
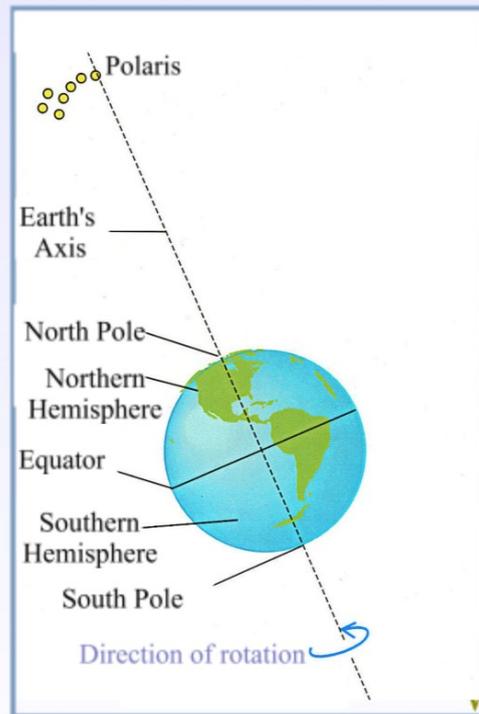
- SKATER:** A figure skater is shown spinning on ice with her arms raised. A vertical line passing through her center is labeled "Vertical Axis".
- EARTH:** A globe of Earth is shown tilted. A line passing through its center is labeled "Axis". The angle between this axis and a horizontal line labeled "Ecliptic" (pointing "To the Sun") is labeled "23.5° Angle".
- LOG:** A log is shown lying horizontally on a surface. A horizontal line passing through its center is labeled "Horizontal Axis".

A cartoon boy's head is shown with a speech bubble that says: "Look!!! The Earth is tilted on its axis". A dashed blue arrow points from the speech bubble to the Earth's axis.

A purple-bordered box contains the definition: **Axis- An imaginary line from the north pole to the south pole.**

Decorative elements include autumn leaves at the bottom and a small number "5" near the bottom right of the box.

(Spinning)
Rotation- The
movement of
an object
around its
axis.



What about the other planets?
[Click Here](#)

Earth rotates Counter clockwise--> It take 24 hours for 1 rotation

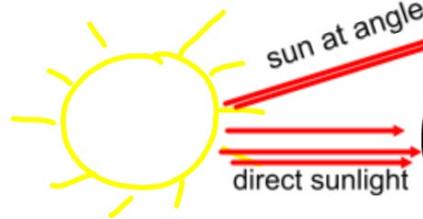
Cycles of Earth

Summer in NH because it is tilted towards the sun, so you get direct sunlight



Winter in SH because it is tilted away from sun, so you get indirect sunlight (light at an angle)

6 months



Winter in NH because it is tilted away from sun, so you get indirect sunlight (light at an angle)

Summer in SH because it is tilted towards the sun, so you get direct sunlight

6 months

*

The Revolution of the Earth and the tilt of the Earth both cause the Earth to have Seasons.

* Study

[Earth's Tilt 1: The Reason for the Seasons \(youtube.com\)](https://www.youtube.com/watch?v=...)



Rotation is the Reason for Day & Night



As the Earth spins, the side facing the sun is in the daylight.

The side away from the sun is night.