



## Lesson 3 - Hydrologic Cycle

### *Hydrologic Cycle*

*Estimated Lesson Time: 20 minutes*

#### *Introduction*

The hydrological cycle involves the continuous circulation of water in the Earth-Atmosphere system. At its core, the water cycle is the motion of the water from the ground, to the atmosphere, and back again. Of the many processes involved in the hydrologic cycle the most important are:

- Evaporation (number 1 on next page) - Transformation of liquid into gas, in this case water into water vapor. When solids (snow/ice) are converted directly to gas (water vapor), this process is called sublimation (number 3).
- Transpiration (number 2) – Water that moves through the leaves of plants. Water evaporates from leaves.
- Condensation (number 4) – Conversion of water vapor into water droplets. Most common are clouds and rain (also fog, mist, dew, or frost).
- Precipitation (number 6) – Coalescence (sticking together) of tiny water droplets creates larger drops which fall to Earth.
- Infiltration (number 8) – Precipitation that moves into the soil.
- Runoff (number 9) – Precipitation that does not infiltrate into the soil, and runs off into streams, lakes, rivers, and oceans.

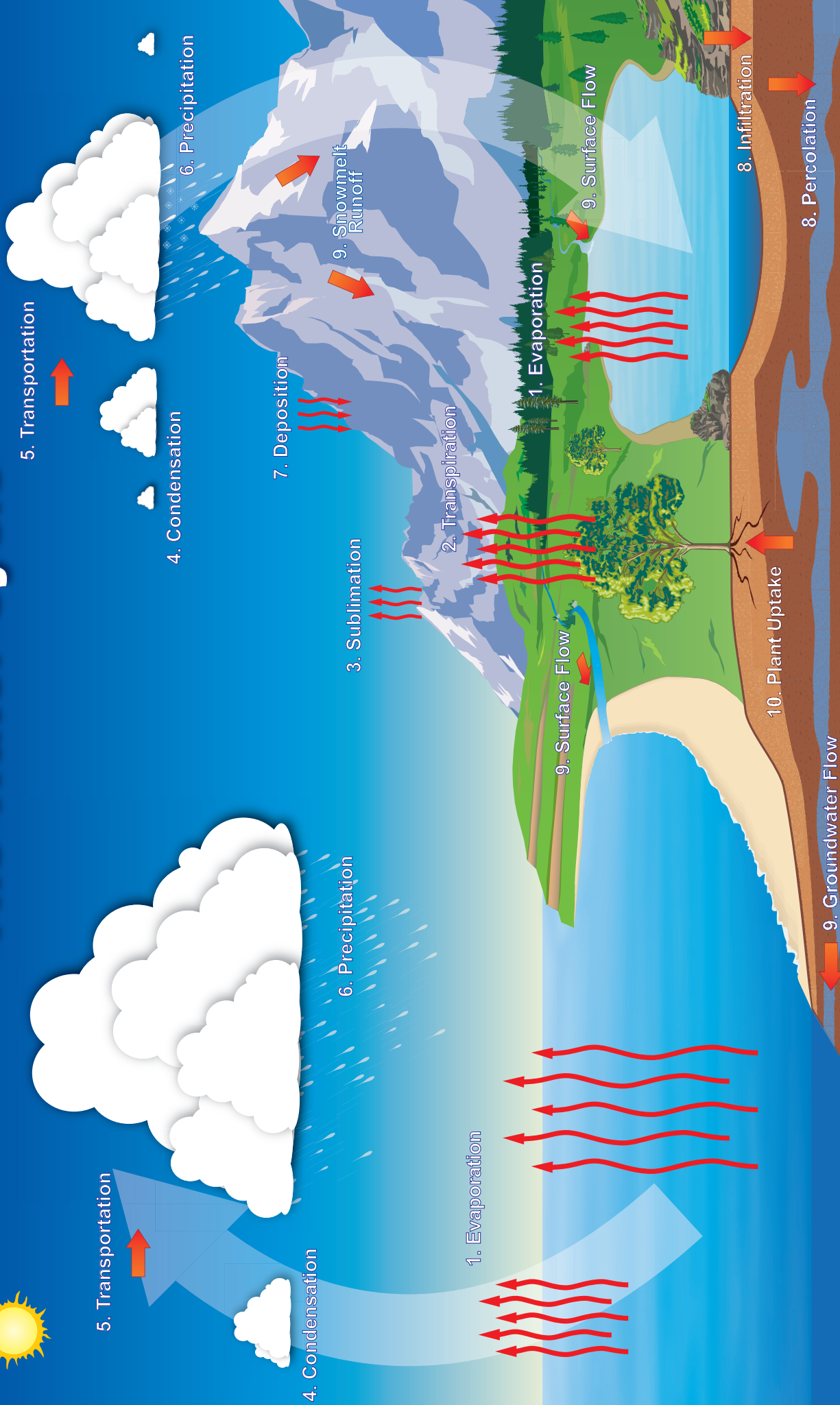
*Prepared by:*

Stephanie Bowen, Extension Assistant,  
Oklahoma Mesonet  
Oklahoma State University

*Reviewed by:*

Cathy Allen, Assistant Extension Specialist,  
4-H  
Oklahoma State University

# The Water Cycle



5. Transportation

4. Condensation

4. Condensation

6. Precipitation

5. Transportation

6. Precipitation

7. Deposition

9. Snowmelt Runoff

2. Transpiration

1. Evaporation

9. Surface Flow

1. Evaporation

9. Surface Flow

8. Infiltration

10. Plant Uptake

8. Percolation

9. Groundwater Flow

1. Evaporation is the change of state of water (a liquid) to water vapor (a gas). On average, about 47 inches (120 cm) is evaporated into the atmosphere from the ocean each year.

3. Sublimation is the process where ice and snow (a solid) changes into water vapor (a gas) without moving through the liquid phase.

4. Condensation is the process where water vapor (a gas) changes into water droplets (a liquid). This is when we begin to see clouds.

5. Transportation is the movement of solid, liquid and gaseous water through the atmosphere. Without this movement, the water evaporated over the ocean would not precipitate over land.

6. Precipitation is water that falls to the earth. Most precipitation falls as rain but includes snow, sleet, drizzle, and hail. On average, about 47 inches (120 cm) of rain or snow falls each year around the world.

7. Deposition is the reverse of sublimation. Water vapor (a gas) changes into ice (a solid) without going through the liquid phase. This is most common on cold nights when frost, sleet or snow forms on the ground.

8. Infiltration is the movement of water into the ground from the surface. Percolation is the movement of water past the soil going down to the groundwater.

9. Surface flow is the river, lake, and stream transport of water to the oceans. Groundwater is the flow of water underground in aquifers. The water may return to the surface through springs, eventually seep into the oceans.

10. Plant uptake is water taken from the groundwater flow and soil moisture. Only 1% of water the plant draws up is used by the plant. 99% is passed back into the atmosphere.



# Activity - Sweatin' to the Coldies

## *Materials*

Glass cups or jars - 1 per person

Ice cubes

## *Objective and Overview*

Demonstrate the change from water vapor to liquid. Using some ice and a glass, students will chill the glass to the point where water from the atmosphere condenses on the outside of the glass.

## *Background*

There are three states of matter: gas, liquid and solid. Water in our atmosphere exists in these three states constantly. As the temperature of water vapor (a gas) decreases, it will reach the point at which it turns into a liquid (called the dewpoint or the point at which dew forms). This change of state from a gas to a liquid is called condensation.

## *Construction*

1. Fill the cups/jars half full with ice.
2. Add cold water to fill up the cups/jars to approximately half an inch below the rim.
3. Let the cups/jars sit for about 30 minutes.
4. Observe the outside of the glass.

## *Discussion*

Ask the students where the water on the outside of the glass came from. The answer is from the atmosphere. As the water vapor molecules come into contact with the cold side of the glass, the temperature lowered to the dewpoint, condensing into a liquid.

The amount of water on the side of the glass depends upon the humidity, which is the ratio of dry air to moist air. The higher the humidity, the more moisture that air contains. The greater the moisture, the greater the water that can condense.

Relative humidity has a big impact on farming and ranching. Higher humidity can cause leaf wetting from nighttime dews and lead to plant disease outbreaks. It also slows harvest and can make hay too wet to bale. Cattle and people's heat stress in the summer is increased by high humidity, and in the winter, it makes animals and people feel colder. On the other hand, low humidity can increase fire risk. Also, plants in low humidity lose more water from their leaves.

## *Fast Facts*

It takes about one million cloud droplets to provide enough water for one raindrop.

Greatest rainfall in a year was 1,041" in Assam, India (August 1880-1881).

World's one minute rainfall record is 1.23" which fell in Unionville, Maryland on July 4, 1956.

Greatest snowfall in a day is 75.8" which fell in Silver Lake, Colorado, April 14-15, 1921.