Lesson Number: MS.NR.3.2

My Water's Been Where? Understanding the Water Cycle.

Middle School Food and Agricultural Literacy Curriculum

Precepts

I. Professional Growth

I2. Make clear decisions in my professional life.

National Standards

NRS.02.06.01.a. Identify biogeochemical cycles.

NL-ENG.K-12.4 – Communication Skills

NL-ENG.K-12.12 – Applying Language Skills

NS.5-8.2 – Physical Science

Student Learning Objectives

As a result of this **unit** the students will…

Explain the role of clean water in sustaining life.

As a result of this **lesson** the students will …

Illustrate the water cycle.

Content Outline

Objective 1. Illustrate the water cycle

I. What is the water cycle?

A. Water is in continuous path throughout the earth.

B. Water is recycled by moving through the earth's environment and the water cycle.

II. How does water move through the water cycle?

A. Water travels from the earth's surface to the atmosphere through evaporation. ***Evaporation*** is the conversion of water from liquid to gas form by the exposure to heat.

B. Water is released as water vapor by plants into the atmosphere through transpiration. Transpiration is the process of plants releasing water from their leaves.

C. As water vapor rises in the atmosphere, it begins to cool and turn back into water. This process if called condensation.

D. As water vapor condenses, clouds are formed. As the vapor droplets become large, rain is formed and falls to the earth's surface as precipitation.

E. When water reaches the ground, it enters waterways such as rivers, lakes, and oceans. Precipitation can also enter the ground and become a part of the groundwater system.

F. Water is then brought to the earth's surface, and the process is started again through ***evaporation*** or transpiration.

Time

Instruction time for this lesson: 45 minutes.

Resources

Lee, Jasper (2006). Natural Resources (2nd ed.). Upper Saddle River, NJ: Pearson. — Perlman, H. (2009). Water Quality. Retrieved July 30, 2009, from United States Geological Survey, Water Science for Schools. Web site: http://ga.water.usgs.gov/edu/waterquality.html

Tools, Equipment, and Supplies

Overhead projector or LCD projector
Glass or clear plastic jar with lid
Hot water
Ice
MS.NR.3.2.TM.A-C – one per teacher
MS.NR.3.2.AS.A – one for every two students
MS.NR.3.2.ASSESS.A – one per student

Key Terms

The following terms are presented in this lesson and appear in ***bold italics:***

Evaporation

Condensation

Transpiration

Precipitation

Interest Approach

Before the class arrives, have **MS.NR.3.2.TM.A** ready to be displayed on a surface for students to see. Once all students arrive, acknowledge students for being prepared and on time for class.

Raise your hand if you have a routine every morning.

Wait for student response. Majority of students should raise their hand to agree with this statement.

Utilize the *Go-with-the Flow e-Moment®*

It is very typical to have a routine, a cycle that we do every day to make sure the important things we need to do get accomplished. Look at these symbols.

Display **MS.NR.3.2.TM.A**.

These symbols are often used in flowcharts that help explain a cycle or a process. Each symbol represents a specific step in the process. The rectangle represents a "process" step, or something that is accomplished in the cycle. The diamond represents a "decision" in your cycle, or which way you decided to go.

When I say MAP, take three minutes to chart your morning routine represented through a flowchart. Use the symbols we just discussed to show which things you accomplish, the rectangle, which decisions do you have to make, for example breakfast, and even which choices do you encounter, hair up or down? Represent your routine from the moment you wake up until the first bell at school. Just to get everyone off on the same foot, let's start our map together. Our first box will be a rectangle. Inside the rectangle simply write '"Wake Up."

Wait for students to complete this task.

Think to yourself, what do you normally do next? Is there a decision to make? You take it from here. OK, how much time do we have to complete the flowchart?

Wait for student response.

Great. What questions are there?

Wait for any questions students might have.

We will come back together at the end of three minutes and discuss our flowcharts together. Ready? MAP.

As students chart their morning routine, it is a good idea to go ahead and chart your morning routine as an example for the students. Keep it simple, but have your own example to include in the class discussion when the three minutes are complete.

Give verbal time reminders at one minute and two minutes to make sure students are practicing good time management. If students need additional time at the end of three minutes, adding one or two additional minutes is acceptable. At the completion of the activity, regain the students' attention.

Who will share their morning routine with us quickly?

Quickly is important – do not spend too much time on this activity, but have a few students review their morning routine. You may also review your morning routine with the students at this time as well.

Thank you, everyone, for sharing! What is the commonality in all of these routines?

Wait for student response. Students might dig deeper than needed. Have them think very generally – that we all participate in some type of cycle.

Our routine every morning resembles a cycle, a process where things take place and decisions are made. There are many other things in our lives that are on cycles that we may not realize. We actually encounter cycles every day. Did you know that water participates in a cycle? Water travels through many steps and completes what we call the Water Cycle.

Use if you are giving the lessons in order: Last time we met, we talked about the importance of water quality not only to us, but also to plant and animal life.

As we prepare today, reflect on your morning routine – how can we relate that to the water cycle? Let's take a closer look at the importance of the water cycle and follow what decisions water makes on a daily basis.

Summary of Content and Teaching Strategies

Content outline can be found on **MS.NR.3.2.TM.B**. If you would like this to aid in instruction, have an overhead or writing surface available to display information. If technology is available, such as an LCD projector or a SMART board, prepare **MS.NR.3.2.TM.B** and **C** on presentation software. This will take an extended amount of time and should be done prior to teaching the lesson.

My Water's Been Where? Understanding the Water Cycle.

Objective 1. Illustrate the water cycle

Let's test your knowledge. How is water made?

Wait for student responses. Typically students will be stumped at this statement because most have not thought about it before.

This is probably something you have not thought about in the past. Water is a natural resource that is found throughout the earth. Once water enters our natural resources, it is constantly recycled throughout the earth in a process called the water cycle. The water you drink, wash a car with, or give to your animals at home has gone through this recycling process. The water cycle is important because it helps filter that water, making it renewed and refreshed for future use.

Instruct students to write down information from **MS.NR.3.2.TM.B** explaining what the water cycle is for future reference. At this time, only show Roman Numeral I., a and b.

I. What is the water cycle?

A. Water is in continuous path throughout the earth,

B. Water is recycled by moving through the earth's environment and the water cycle.

I know this sounds crazy! But water moves through this cycle and is continuously recycled to be used for different purposes.

Have you ever been outside right after it rains on a summer day and noticed that water just disappears? Where does it go? Water goes through a process called ***evaporation***, or when the liquid form of water changes to water vapor due to heat. Instruct students to write down the definition of ***evaporation*** for future reference.

Without talking, take 10 seconds and brainstorm one idea where you have seen ***evaporation*** before.

Allow students to brainstorm quietly for 10 seconds.

Before we share our thoughts, turn to your neighbor, take 15 seconds and share the idea that you just brainstormed.

Allow for classroom discussion for 15 seconds.

Great job! Who will be first to share an example you thought of ***evaporation***?

Allow several students to share their ideas.

Excellent! As you can see, we experience ***evaporation*** every day – maybe it's through drying your hair or the sweat drying on your forehead after you've been outside. As water evaporates, it travels to the earth's atmosphere where it changes to water vapor.

II. How does water move through the water cycle?

A. Water travels from the earth's surface to the atmosphere through ***evaporation***. ***Evaporation*** is the conversion of water from liquid to gas form by the exposure to heat.

The sun provides the energy that drives the water cycle. Heat from the sun evaporates water from the oceans, from lakes and rivers, from moist soil surfaces, from leaves of plants, and the bodies of other organisms. When you come out of the water from swimming and sit in the sun, what happens? Do you stay wet or do you begin to dry? Right! You begin to dry through a form of ***evaporation***. Water travels from the earth's surface to the atmosphere through ***evaporation***. Water is evaporated primarily from the oceans. Remember, ***evaporation*** is the conversion of water from liquid to gas form by the exposure of heat, in this case, the sun

For the next illustration, gather the following supplies: a glass or clear jar, hot water, and ice. Fill the jar about 1/3 full of the hot water. Turn the lid upside down and cover the top of the jar. Place ice in the lid.

To help us better understand a few of the steps of the water cycle, let's take a look at this jar. In the jar I poured hot water and then turned the lid over and placed ice in the lid. Observe what is happening inside the jar – do you see steam rising from the water? Walk the jar around the room to make sure all students can see the steam rising from the water. This is what we call condensation, or when water vapor rises in the atmosphere and begins to cool and turn back into water. Instruct students to write down the definition of condensation.

Utilize the *Me-You-Us e-Moment®*

Without talking, take 10 seconds and think of one time or place where you have seen ***condensation*** occur, similar to what just occurred in this jar.

My Water's Been Where? Understanding the Water Cycle.

Allow students to quietly think for 10 seconds.

Let's share. Take 15 seconds, turn to a new neighbor, and share your idea.

Allow 15 seconds for classroom discussion.

Great job, everyone! Who will be first to share their example or place where they have seen condensation?

Allow for several students to share their thoughts and ideas.

Great job sharing! One place we commonly see ***condensation*** is on a glass when you have ice-cold water in a glass sitting in a hot room.

C. As water vapor rises in the atmosphere, it begins to cool and turn back into water. This process if called condensation.

Now take a look at the inside of the lid. What is forming?

Wait for student responses. Again, walk around room and make sure all students can see the jar lid. Most will respond water.

Correct – there is water forming on the lid. This is called precipitation, or when water droplets are formed from water vapor and fall back to the earth. The water collecting on the bottom side of the lid has particles of water clinging to it. When the water clings to the lid it is similar to how a cloud forms. As the water vapor condenses, clouds are formed. When a water drop gets too heavy it will drop off the lid back into the water in the bottom of the jar, the same way when the water vapor in the cloud gets too heavy and falls from the cloud in the form of precipitation.

Instruct students to write down the definition of precipitation.

D. As water vapor condenses, clouds are formed. As the vapor droplets become large, rain is formed and falls to the earth's surface as precipitation.

Display **MS.NR.3.2.TM.C**, an illustration of the water cycle. It is a good idea to either allow the students a few minutes to sketch the drawing or make copies for the entire class. This will be important for them in the learning process to see an illustration of all the terms they are learning.

As the water travels to the ground as precipitation it lands in rivers, lakes, oceans, and on the ground.

Point out these illustrations in **MS.NR.3.2.TM.C**.

If the water enters the ground it becomes a part of our groundwater system.

E. When water reaches the ground, it enters waterways such as rivers, lakes, and oceans. Precipitation can also enter the ground and become a part of the groundwater system.

One common use for water in the ground is for plants. Plant roots take in groundwater and use it as a part of the process to make their own food. Any additional water the plant has is released through its leaves. Have you ever walked outside in the morning on the way to school and seen water on plant leaves and blades of grass? You probably refer to this as "dew." The plant is actually releasing water vapor to travel back up to the atmosphere. This process is called transpiration, bringing the cycle full circle to start again.

Instruct students to write down the definition of transpiration.

B. Water is released as water vapor by plants into the atmosphere through transpiration. Transpiration is the process of plants releasing water from their leaves.

F. Water is then brought to the earth's surface and the process is started again through ***evaporation*** or transpiration.

Utilize the *Me-You-Us e-Moment*.

Think back to your daily morning routine. Without talking, take 10 seconds and think of one similarity between your routine and the water cycle.

Allow students to think quietly for 10 seconds.

Great. Take 15 seconds, turn to your neighbor, and share your similarity.

Allow for 15 seconds of discussion.

Great job. Who will be first to share how their daily routine is similar to the water cycle?

Allow for several students to share their similarities. Students should see that water goes through a process, very similar to how they go through a process on a daily basis. Allow them to understand how this routine affects the rest of their day.

Thank you for sharing! It is amazing to think that the water we use on a daily basis has been around the world and existed for millions of years. The water cycle is an important part of the renewing and refreshing of our water resources throughout the earth. Each step in the process plays a vital role in ensuring that we have good water quality for not only us, but also the earth's plants and animals. Let's take a look back at what we have learned today.

Review/Summary

Let's take a few minutes to review what we've talked about today.

Pass out **MS.NR.3.2.AS.A** to pairs of students in the classroom. If you would like to partner up the students, do so before this activity. If not, just allow students to pick their partners to save time.

When I say GO, begin working on this activity sheet entitled "Cycle, Cycle, What's in this Cycle?" This will be our exit ticket for the day. Take four minutes to complete this activity sheet. Make sure to read the directions for each part carefully before starting! Part 1 - finish the illustration to show a complete water cycle. Part 2 - match the water cycle term with the proper definition. How long will you have to complete this activity sheet?

Wait for student responses.

Great. Feel free to work with a partner if you like. What questions are there? Answer any student questions. Ready? GO.

As students work on the activity sheet, monitor progress and determine if any re-teaching is necessary. Collect the activity sheet as students leave and make sure concepts were understood.

Through ***evaporation***, ***condensation***, ***precipitation***, and ***transpiration***, water is recycled and used by many things as it travels through its continuous path. Tomorrow we will talk about how water can become an unusable resource. This topic will be challenging, so get ready to think outside the box! Great job today discovering how our water "moves"!

Application

Extended classroom activity:

A classroom terrarium can be set up and is a great way to further illustrate transpiration, condensation, precipitation, and ***evaporation***.

Students can also personify a drop of water and tell its story as it moves through the water cycle. Have students explain each process and how the water transforms and changes when it changes locations.

FFA activity:

FFA members can create educational posters on the water cycle and teach students at the elementary level the information as a part of the PALS program.

SAE activity:

FFA members can research ways to test the water cycle and determine how effective the process is with refreshing and renewing water.

Evaluation

MS.NR.3.2.AS.A

MS.NR.3.2.ASSESS.A

Answers to Evaluation

Answers from MS.NR.3.2.AS.A

Part 1: Illustrate the water cycle

(Answers will vary and will need to be added once the illustration is made)

Part 2: Match the Term

1. B
2. D
3. A
4. C

Answers from MS.NR.3.2.ASSESS.A

Part I: Fill in the Blank

1. Evaporation
2. Transpiration
3. Condensation
4. Precipitation

Part II: Short Answer

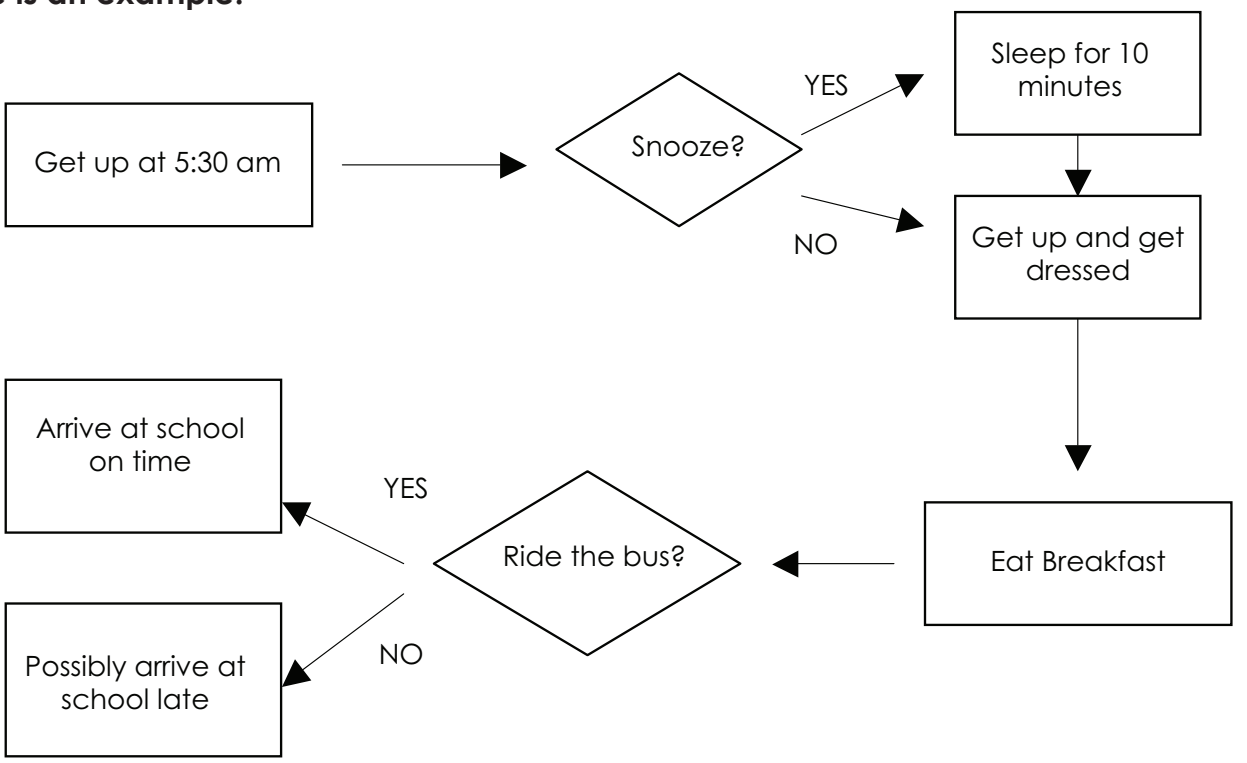
5. The water cycle is important because it helps filter the water to refresh and renew it for future use. (Answers may vary.)

Go with the Flow Moment

Have you ever thought of your morning routine as a process? From the time you wake up until you get to school, there are certain tasks and decisions you have to make every day. Create a flowchart illustrating your morning routine on an average day. Use arrows to show the order in which tasks are completed.

Examples of symbols you will use:

Here is an example:



What Is the Water Cycle?

Objective 1. Interpret the water cycle

I. What is the water cycle?

A. Water is in continuous path throughout the earth.

B. Water is recycled by moving through the earth's environment and the water cycle.

II. How does water move through the water cycle?

A. Water travels from the earth's surface to the atmosphere through ***evaporation***. ***Evaporation*** is the conversion of water from liquid to gas form by the exposure to heat.

B. Water is released as water vapor by plants into the atmosphere through ***transpiration***. ***Transpiration*** is the process of plants releasing water from their leaves.

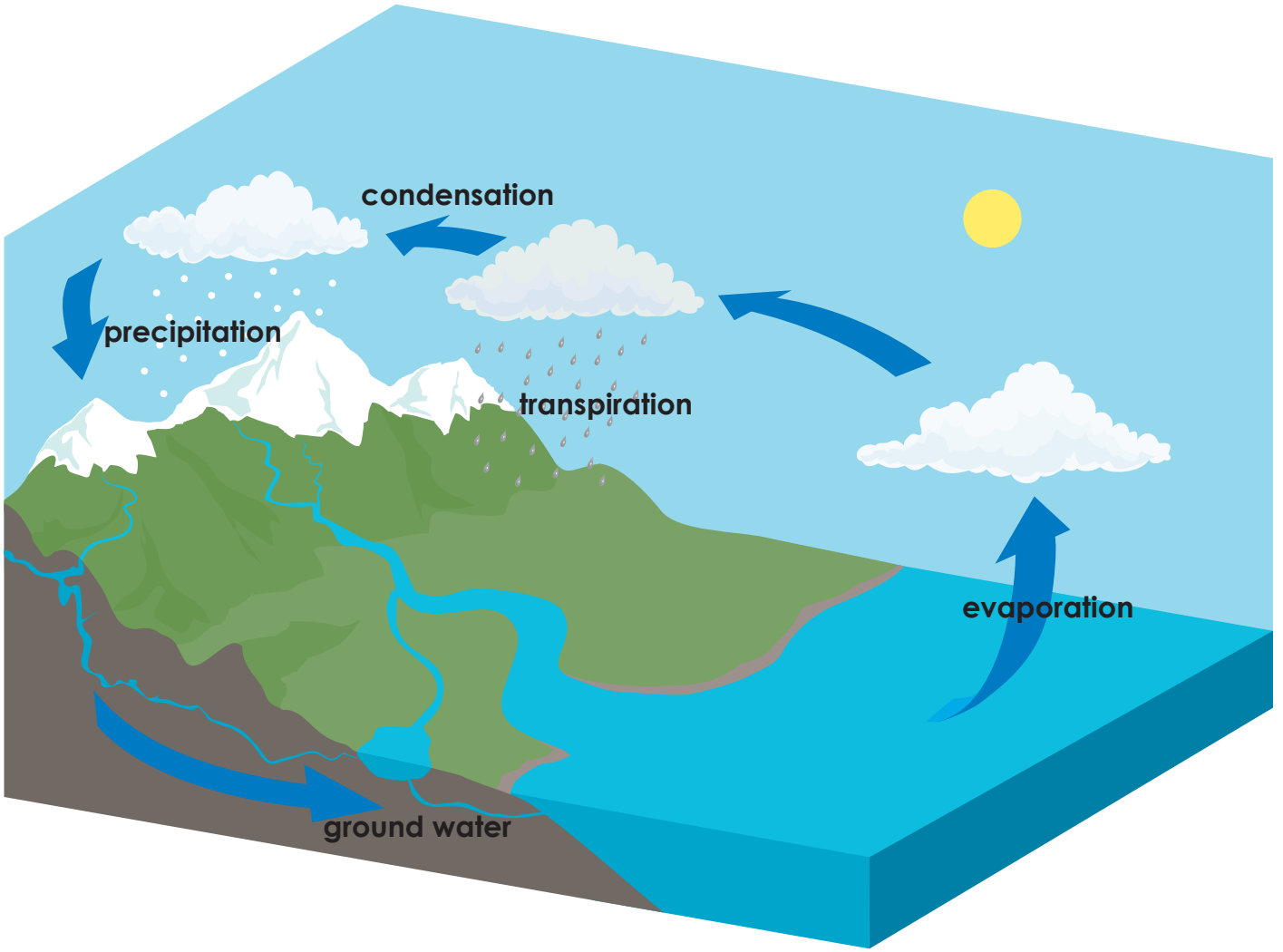
C. As water vapor rises in the atmosphere, it begins to cool and turn back into water. This process is called ***condensation***.

D. As water vapor condenses, clouds are formed. As the vapor droplets become large, rain is formed and falls to the earth's surface as ***precipitation***.

E. When water reaches the ground, it enters waterways such as rivers, lakes, and oceans. ***Precipitation*** can also enter the ground and become a part of the groundwater system.

F. Water is then brought to the earth's surface, and the process is started again through ***evaporation*** or ***transpiration***.

Illustration of the Water Cycle

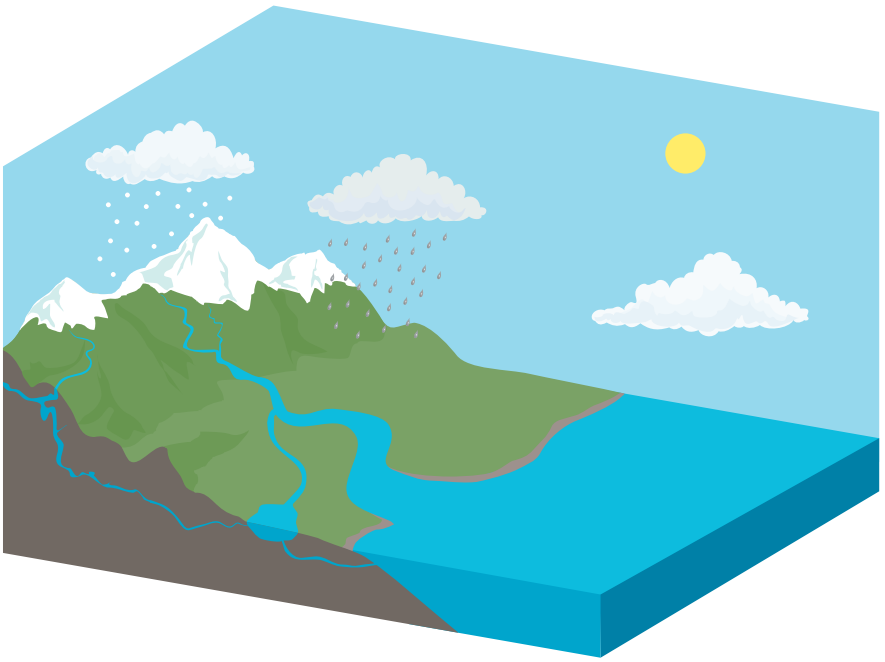


Cycle, Cycle, What's in this Cycle?

A review of the water cycle

Part 1: Label the Water Cycle

Directions: Look at the following illustration. Determine where the following terms belong: precipitation, transpiration, groundwater, evaporation, lakes & streams, and clouds (or water vapor). Once you have placed all the words in the correct places, place arrows showing in which direction water travels through the water cycle.



Part II: Match the Term

Directions: Choose which definition best suits the vocabulary term learned today.

1.	_____	The conversion of water from liquid to gas form by the exposure to heat.	a. Condensation
2.	_____	The process of plants releasing water from their leaves.	b. Evaporation
3.	_____	During this process, water vapor rises in the atmosphere, and as it begins to cool it turns back into water.	c. Precipitation
4.	_____	This process occurs when vapor droplets become large, rain forms and falls to the earth's surface.	d. Transpiration

Water Cycle

Name_____

Part I: Fill in the Blank

Directions: Complete the following statements.

1. **The conversion of water from liquid to gas formed by the exposure to heat is known as _____.**
2. **The process of plants releasing water from their leaves is known as _____.**
3. **During _____, water vapor rises in the atmosphere, and as it begins to cool it turns back into water.**
4. **_____ occurs when vapor droplets become large, rain forms and falls to the earth's surface.**

Part II: Short Answer

5. **Explain the importance of the water cycle.**

_____

_____

_____

_____

_____

_____