4th Grade Pre-Visit Activity #1

The Water Cycle

Overview — Earth's water molecules circulate among air, plants, animals, and soil by way of the water cycle. This activity uses a game to introduce students to the water cycle and will help them see how water in the atmosphere can end up underground.

Objectives — Students will describe the water cycle and the journey a water molecule might take on its way through this cycle after participating in a simulation.

Subjects — Science

Social Studies

Language Arts

TEKS — **(4.8) Earth and space. The student knows that there are recognizable patterns in the natural world and among the Sun, Earth, and Moon system. The student is expected to:**

B. describe and illustrate the continuous movement of water above and on the surface of Earth through the water cycle and explain the role of the Sun as a major source of energy in this process.

Materials — Nine dice

Student notebooks

Cycle Station Sheets

Background

When children think of the water cycle, they often imagine a circle of water, flowing from a stream to an ocean, evaporating to the clouds, raining down on a mountaintop, and flowing back into a stream. Role-playing a water molecule helps students to conceptualize the water cycle as more than a predictable two-dimensional path.

While water does circulate from one point or state to another in the water cycle, the paths it can take are variable. Heat energy directly influences the rate of motion of water molecules. When the motion of the molecule increases because of an increase in heat energy, water will change from solid to liquid to gas. With each change in state, physical movement from one location to another usually follows. Glaciers melt to pools which overflow to streams, where water may evaporate into the atmosphere.

Gravity further influences the ability of water to travel over, under, and above Earth's surface. Water as a solid, liquid, or gas has mass and is subject to gravitational force. Snow on mountaintops melts and descends through watersheds to the oceans of the world.

One of the most visible states in which water moves is the liquid form. Water is seen flowing in streams and rivers and tumbling in ocean waves. Water travels slowly underground, seeping and filtering through particles of soil and pores within rocks.

Although unseen, water's most dramatic movements take place during its gaseous phase. Water is constantly evaporating, changing from a liquid to a gas. As a vapor, it can travel through the atmosphere above Earth's surface. In fact, water vapor surrounds us all the time. Where it condenses and returns to Earth depends upon loss of heat energy, gravity, and the structure of Earth's surface.

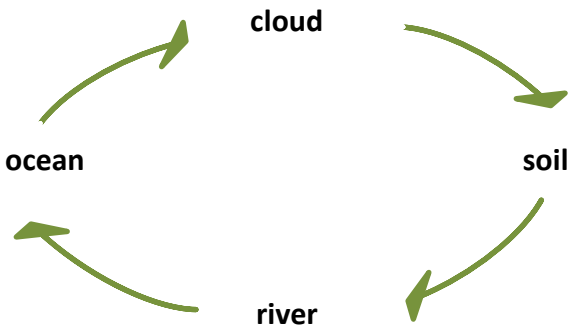
Water condensation can be seen as dew on plants or water droplets on the outside of a glass of cold water. In clouds, water molecules collect on tiny dust particles. Eventually, the water droplets become too heavy and gravity pulls the water to Earth.

Living organisms also help move water. Humans and other animals carry water within their bodies, transporting it from one location to another. Water is either directly consumed by animals or is removed from foods during digestion. Water is excreted as a liquid or leaves as a gas, usually through respiration. When water is present on the skin of an animal (for example, as perspiration), evaporation may occur.

The greatest movers of water among living organisms are plants. The roots of plants absorb water. Some of this water is used within the body of the plants, but most of it travels up through the plant to the leaf surface. When water reaches the leaves, it is exposed to the air and the sun's energy and is easily evaporated. This process is called transpiration.

All these processes work together to move water around, through, and over Earth.

Very Basic Water Cycle



Getting Ready

Make one copy of each of the "Water Cycle Stations" student pages.

Make a large label for each of the nine stations: Cloud, River, Soil, Plant, Animal, Lake, Ocean, Glacier, and Ground Water.

Draw a simplified water cycle on the board. (Cloud, Soil, River, Ocean, Cloud)

Optional: Cut out and tape together the provided dice at the end of this activity. (You will need nine)

Doing the Activity

1. Explain to your students that they are going to become water molecules moving through the water cycle.

2. Show students the basic water cycle you drew on the board. Point out that the actual process is more complex than this simple drawing. Talk through the different parts of this cycle. Discuss how water moves from one location to another and the form it is in. (Clouds rain onto the soil or oceans, plants absorb water, animals eat the plants, etc…)

3. Split your students up amongst all the stations and into single file lines. Have them identify all the different places water can go from their station in the water cycle. Discuss the conditions that cause the water to move. Explain that water movement depends on an input of energy (from the Sun, gravity, etc.). Sometimes water will not go anywhere.

4. Pass out the "Water Cycle Stations" sheets and the dice. Go over any transitions between the stations that your students did not think of.

5. Have each student roll the die and then read the statement at their station corresponding to that number. They should write in their notebooks the current station, what happens to them based on their number, and where they will go next.

Sample notebook entry:

Station	What Happens?	Where to Next?
Animal	*Water evaporates from the body in gaseous form due to the sun's energy.*	*Cloud*

6. Once they roll the die, students should go to the next station as directed on the card. If the directions have them stay at the same station, the student will go to the end of the line and take another turn at that station.

7. Repeat steps #6 and #7 12-15 more times.

8. Discuss the following:

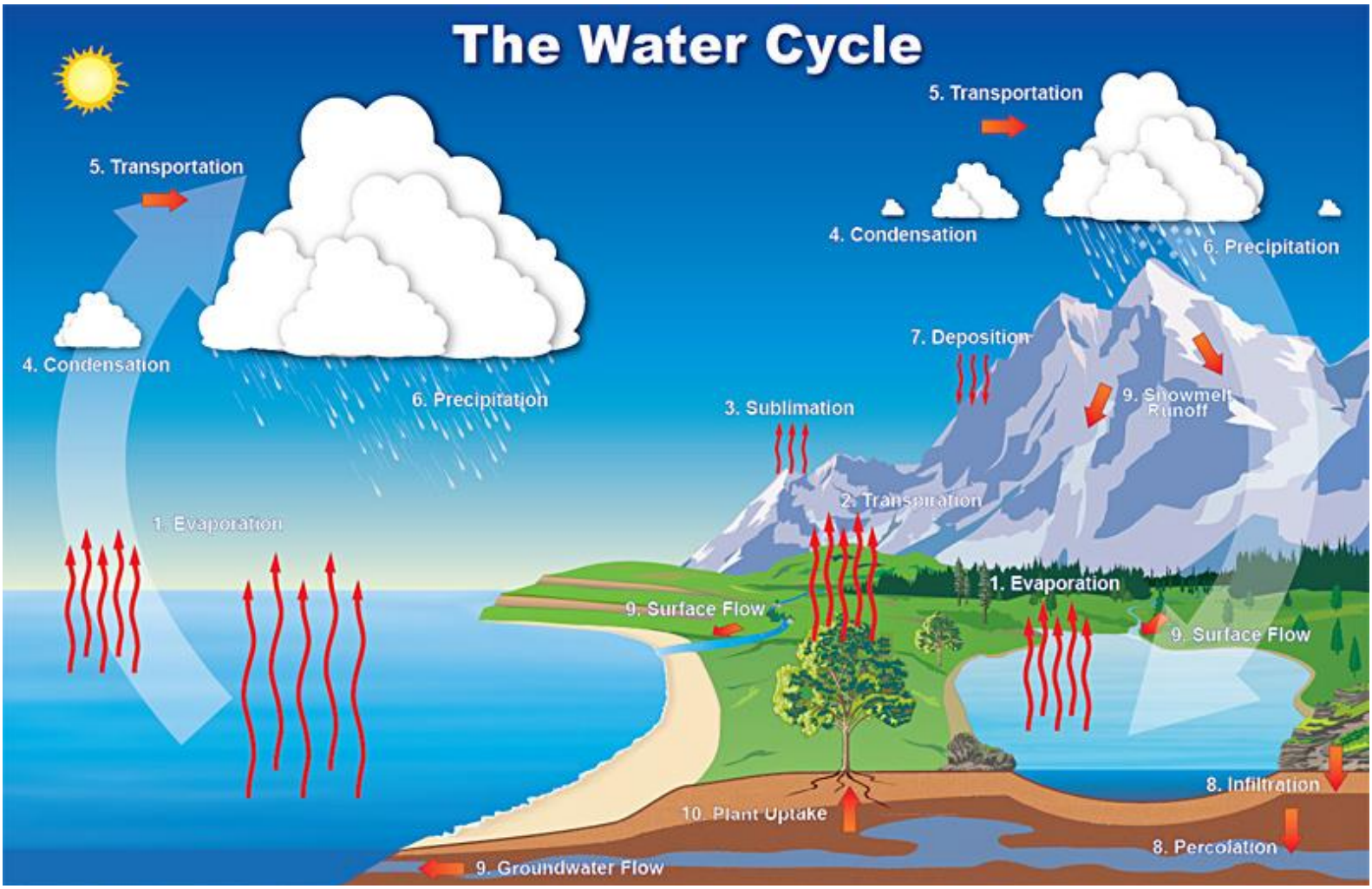
   At which station did you spend the most time? At which station did you spend the least amount of time?

   While each of your journeys was different, was there anything similar about them?

   At which stations does water filter down to become ground water? (Explain that ground water is not water that is on the ground, like lakes and rivers, but water that is *inside* it. Water can be stored far beneath our feet in areas of rock called aquifers.)

Assessment

Ask your students to either illustrate and label or write a brief story from a water molecule's point of view that describes the journey they just took through the water cycle. For example, a student might start a story, "I was a frozen water molecule in a glacier. Energy from the sun changed me to a liquid and I flowed down into a river. From there, I was absorbed through the roots of a tree…"



Station: Soil

Number rolled on die	Next station	Reason for move
1	Plant	Water is absorbed by plant roots.
2	River	The soil is saturated, so water runs off into a river.
3	Ground Water	Water is pulled by gravity; it filters into the soil.
4	Cloud	Heat energy is added to the water, so the water evaporates and goes to the clouds.
5	Cloud	Heat energy is added to the water, so the water evaporates and goes to the clouds.
6	Stay	Water remains on the surface (perhaps in a puddle, or adhering to a soil particle.)

Station: Plant

Number rolled on die	Next station	Reason for move
1	Cloud	Water leaves the plant through the process of transpiration.
2	Cloud	Water leaves the plant through the process of transpiration.
3	Animal	Water is transported to an animal that has consumed the plant.
4	Animal	Water is transported to an animal that has consumed the plant.
5	Stay	Water is used by the plant and stays in the cells.
6	Stay	Water is used by the plant and stays in the cells.

Station: River

Number rolled on die	Next station	Reason for move
1	Lake	Water flows into a lake.
2	Ground Water	Water is pulled by gravity; it filters into the soil.
3	Ocean	Water flows into the ocean.
4	Animal	An animal drinks water.
5	Clouds	Heat energy is added to the water, so the water evaporates and goes to the clouds.
6	Stay	Water remains in the current of the river.

Station: Clouds

Number rolled on die	Next station	Reason for move
1	Soil	Water condenses and falls on soil.
2	Glacier	Water condenses and falls onto a glacier.
3	Lake	Water condenses and falls into a lake.
4	Ocean	Water condenses and falls into the ocean.
5	Ocean	Water condenses and falls into the ocean.
6	Stay	Water remains as a water droplet clinging to a dust particle.

Station: Ocean

Number rolled on die	Next station	Reason for move
1	Clouds	Heat energy is added to the water, so the water evaporates and goes to the clouds.
2	Clouds	Heat energy is added to the water, so the water evaporates and goes to the clouds.
3	Stay	Water remains in the ocean.
4	Stay	Water remains in the ocean.
5	Stay	Water remains in the ocean.
6	Stay	Water remains in the ocean.

Station: Lake

Number rolled on die	Next station	Reason for move
1	Ground Water	Water is pulled by gravity; it filters into the soil.
2	Animal	An animal drinks water.
3	River	Water flows into a river.
4	Cloud	Heat energy is added to the water, so the water evaporates and goes to the clouds.
5	Stay	Water remains in the lake.
6	Stay	Water remains in the lake.

Station: Animal

Number rolled on die	Next station	Reason for move
1	Soil	Water is excreted through feces and urine.
2	Soil	Water is excreted through feces and urine.
3	Soil	Water is excreted through feces and urine.
4	Cloud	Water is respired or evaporated from the body.
5	Cloud	Water is respired or evaporated from the body.
6	Stay	Water is incorporated into the body.

Station: Ground Water

Number rolled on die	Next station	Reason for move
1	River	Water filters into a river.
2	Lake	Water filters into a lake.
3	Lake	Water filters into a lake.
4	Stay	Water stays underground.
5	Stay	Water stays underground.
6	Stay	Water stays underground.

Station: Glacier

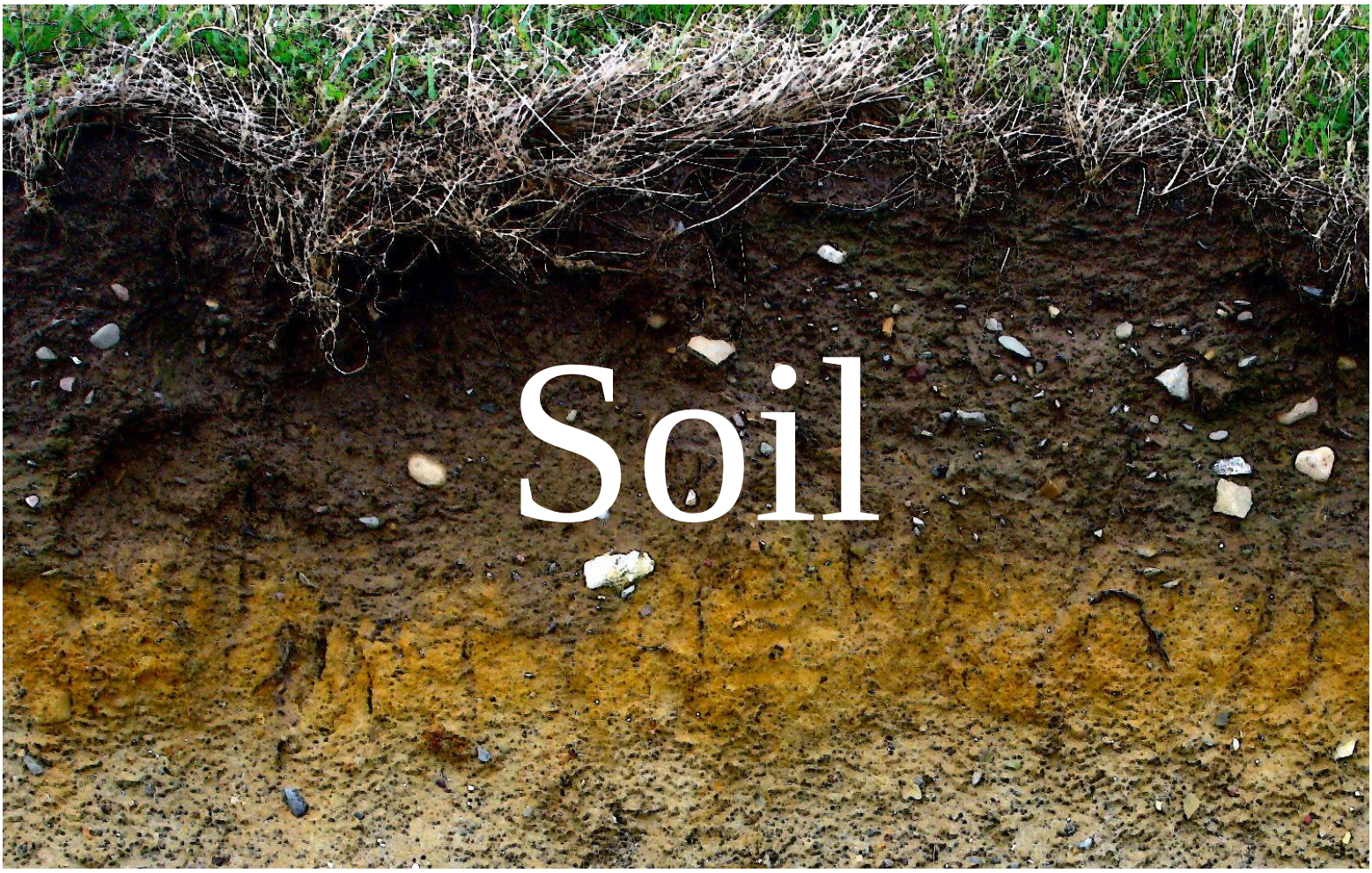
Number rolled on die	Next station	Reason for move
1	Ground Water	Ice melts and water filters into the ground.
2	Clouds	Ice evaporates and water goes into the clouds (sublimation).
3	River	Ice melts and water flows into a river.
4	Stay	Ice stays frozen in the glacier.
5	Stay	Ice stays frozen in the glacier.
6	Stay	Ice stays frozen in the glacier.

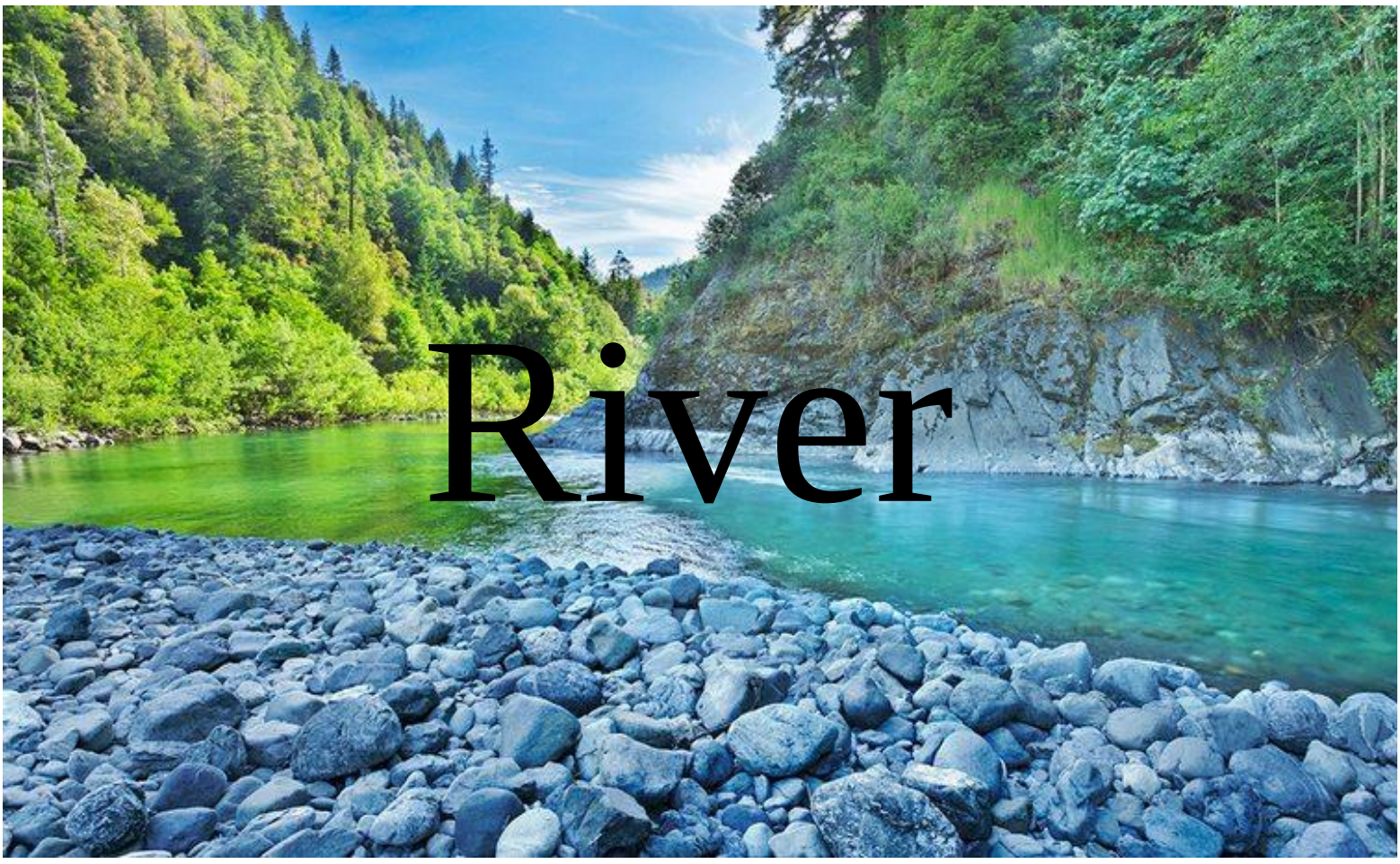

Glacier


Lake


Ocean


Clouds

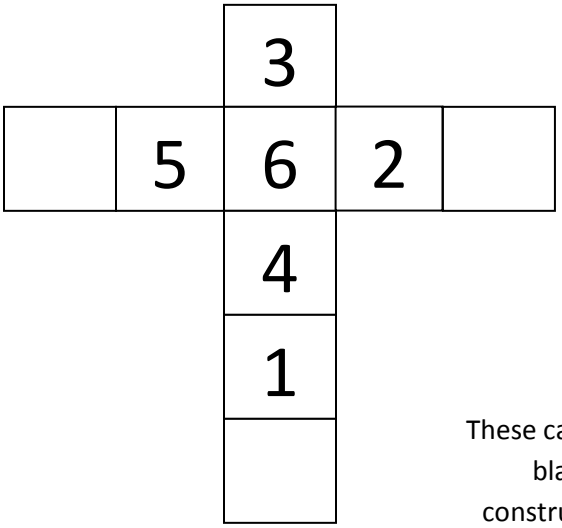

Soil

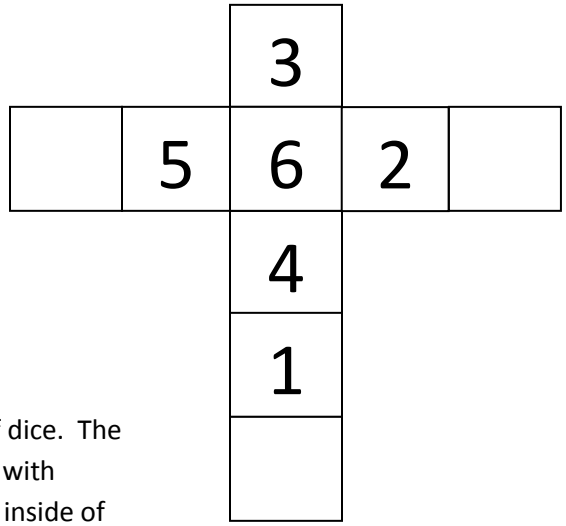

River


Plant


Animal


Ground Water





These can be used in place of dice. The blank boxes are to help with construction, and go on the inside of each die. The tab with the 3 should be folded last and taped in place.