Chapter 2: The Ultimate Recyclable

Answers to reading questions: (only a few of these questions were on the learning guide, but all of this information was covered in class. Students should study the chapter, the learning guide, and their notes, not just the learning guide.)

1. a) Where does the water cycle start and where does it end? It starts anywhere water exists in any form-- it has no beginning or end, just a specific order: evaporation --> condensation --> precipitation --> collection

   c) Where does water spend most of its time? Water spends most of its time in the oceans.

2. How do weather and climate affect the quality and quantity of our water? Weather and climate affect the quality and quantity of our water in many ways, including:
   - The amount of water entering the area as precipitation (rain, snow, sleet, hail)
   - The amount of heat causing water to leave an area by evaporation (don't forget, it doesn't need to be hot for evaporation to happen. Even in freezing temperatures there can be some evaporation.)
   - The amount of water being removed from an area by plants during a growing season. (Hot weather, plants need more water).
     - drought= not enough precipitation or fast evaporation
     - flood= too much precipitation
   - Even small changes in the global cycle can cause droughts or floods at the local level.

3. What kind of climate does Missouri have? Missouri tends to have hot, humid summers and cold, damp winters. Some parts of Missouri receive abundant rain in late spring and may experience flooding. Other places may receive sparse rain in mid-summer and experience drought. Throughout Missouri, plants have plenty of time to grow each year. Every part of Missouri can expect to experience below-freezing temperatures each winter.

4. Where does water go when it runs off a street? Rain that runs off of parking lots, driveways, and streets goes down storm drains and through ditches, then directly into streams, lakes and wetlands without being cleaned or processed.

5. a) Where does our water come from? Our water comes from the water company, which gets the water from local
bodies of water.

b) How does it get to our faucets? The water company takes the water from a nearby river, cleans it, treats it with chemicals to keep it clean, then sends it through pipes to businesses and homes.

6. What happens to water after we’ve used it? Where does it go when it goes down the drain? After we’ve used water, it goes down the drain inside of buildings, through pipes we call the sewer system, to a waste water treatment facility where it is cleaned and then returned into a local body of water.

This answer could be different for any students whose home utilizes a septic tank system.

**Be able to:**
- Define weather and climate and differentiate between them. How are they related? Describe Missouri’s climate.

**Definitions:**
- Weather is the movement of water through the water cycle, or the observed atmospheric conditions in a given time and place.
- Climate is the average weather conditions over longer times.

**Difference:**
- Weather is the actual observed atmospheric condition at a given time and place.
- Climate is the atmospheric conditions one would tend or expect to observe at a given time and place.

**Relationship:**
- Climate is determined and understood by observing and recording weather over many years. It includes seasonal variations in weather.

**Missouri’s climate:**
- Missouri tends to have hot, humid summers and cold, damp winters.
- Some parts of Missouri receive abundant rain in late spring and may experience flooding. Other places may receive sparse rain in mid-summer and experience drought.
- Throughout Missouri plants have plenty of time to grow each year, but every part of Missouri can expect to experience below-freezing temperatures each winter.

- Justify the following statement: The availability of fresh water for humans and other living organisms is dependent upon the water cycle.
How much water there will be in a certain region in a given part of the water cycle depends on the amount of rainfall, the effect of temperature on evaporation and the uptake of water by plants during the growing season. Even small changes in the global cycle can cause droughts or floods at the local level.

- Assess how human activities affect the quality of water. Using a specific example, show how a technological solution (such as groundwater wells, paved roads and parking lots, sewer systems, use of fertilizers and herbicides, etc.) to a problem can have both benefits and drawbacks (such as risks or unintended consequences) to aquatic resources in Missouri.

<table>
<thead>
<tr>
<th>Activity/technological solution</th>
<th>Potential benefit</th>
<th>potential drawback</th>
</tr>
</thead>
<tbody>
<tr>
<td>groundwater wells</td>
<td>provides water for drinking, cleaning, watering plants</td>
<td>can take thousands of years to recharge; pumping out water can cause the ground to cave in or sink</td>
</tr>
<tr>
<td>paved surfaces</td>
<td>makes land travel easier</td>
<td>water running off the surfaces carries heat and pollutants</td>
</tr>
<tr>
<td>sewer systems</td>
<td>carries away wastes</td>
<td>can contaminate water bodies</td>
</tr>
<tr>
<td>fertilizer</td>
<td>increases plant growth</td>
<td>results in overgrowth of algae</td>
</tr>
<tr>
<td>herbicide</td>
<td>kills unwanted plants</td>
<td>can kill native plants and animals</td>
</tr>
</tbody>
</table>

- Diagram and describe the path of water through the biosphere, geosphere and atmosphere (the water cycle). Show at least five processes that are part of the cycle. Be sure to label the parts of your diagram correctly. Refer to FIG. 2.1 in the book. Answers should include at least five of the following:
  · evaporation
  · condensation
  · precipitation
  · interception (plants catch and slow precipitation)
  · infiltration or recharge (water soaking into the ground)
  · transpiration (plants releasing water through photosynthesis)
  · surface runoff or stream flow
Vocab clarification:

- **water cycle** - The water cycle is the process by which water is continually purified and redistributed over the earth. The energy for the water cycle comes from the sun's heat which triggers water to evaporate. The water vapor in the cooler atmosphere begins to condense and water droplets start to form. When water drops are big enough, gravity causes them to fall back down as precipitation.

- **weather** - Weather is the movement of water through the water cycle, or the observed atmospheric conditions in a given time and place.

- **climate** - Climate is the average atmospheric conditions in an area over many years.

- **surface water** - Surface water is precipitation that flows over the land.

- **groundwater** - Groundwater is water that soaks into the ground in saturated soil or aquifers.