Missouri Grade Level Expectations (Content Standards):

Strand 1: Changes and Interactions of Living Organisms

#1 Organisms are interdependent with one another and with their environment.

D. The diversity of species within an ecosystem is affected by changes in the environment, which can be caused by other organisms or outside processes.

a. Describe beneficial and harmful activities of organisms, including humans (ex. deforestation, overpopulation, water and air pollution, global warming, restoration of natural environments, river bank/ coastal stabilization, recycling, channelization, reintroduction of species, depletion of resources) and explain how these activities affect organisms within an ecosystem.

Strand 5: Process and Interactions of the Earth's Surface

#3. Human activity is dependent upon and affects Earth's resources and systems.

A. Earth's materials are limited natural resources affected by human activity.

Scope and Sequence- Earth's Resources

a. Relate the comparative amounts of fresh water and salt water on the Earth to the availability of water as a resource for living organisms and human activity

b. Describe the affect of human activities (ex. landfills, use of fertilizers and herbicides, farming, septic systems) on the quality of water

c. Analyze the ways humans affect the erosion and deposition of soil and rock materials (ex. clearing of land, planting vegetation, paving land, construction of new buildings, building or removal of dams)

Essential Question: *Is fresh water valuable?*

Understandings:

1. Students will understand that fresh water is a valuable resource that is limited on Earth.

2. Students will understand that humans affect the quality of water as a resource.

3. Students will understand that changes in an ecosystem affect the organisms that live in them.

Knowledge

1. Students will know that only a small amount of water on Earth is fresh water and that only a fraction of that water is free flowing and not frozen as ice.

2. Students will know that water is a valuable resource and that humans use water for many purposes. These uses include farming, industry, transportation and recreation, fisheries and agriculture, energy and drinking water.

3. Students will know that water pollution is the result of human activities. They will know that humans affect the levels of oxygen, nitrogen, phosphate and sediments in water. They will know that humans also affect the pH and temperature gradients in water. They will know that water pollution affects many populations of organisms including humans.

4. Students will know that changes in ecosystems (ex: pollution) affect the populations present. Students will know that some organisms can

be used to determine the "health" of an ecosystem and that these organisms are called bio-indicators. They will know that macroinvertebrates can be used as a tool to determine the water quality of a stream.

Skills

1. MO GLE Strand 7/1/B/a: Students will be able to make qualitative observations using the 5 senses.

2. MO GLE Strand 7/1/B/c: Students will be able to use a variety of tools and equipment to gather data.

3. MO GLE Strand 7/1/C/a: Students will be able to use quantitative and qualitative data a support for reasonable explanations.

Assessment Evidence:

1. *Distribution of Earth's Water* graph made on *Appleworks.*
2. "Water Use" page from ABC book/ 4 Note cards with uses on back.
3. Comprehension responses from *Rachel Carson* film.
4. Student responses on *Map Exercise: Glaize Creek and Surrounding Watersheds.*
5. Student responses on *Sources of Pollution WS.*
6. Student responses on *Identifying Macroinvertebrates WS*
7. Visual survey, evaluation of water chemistry and macroinvertebrate population at 6th grade camp (Water Unit data sheet).

Learning Activities:

**Students will understand that fresh water is a valuable resource that is limited on Earth.*

Activity 1

1. Begin lesson with *Big Drop* bellringer, discuss answers.
2. Read chapter 1 section 3 on recycling water.
3. Direct students' attention to the table on page 22. Discuss the availability of fresh water to the percentage of total water on Earth.
4. Ask kids what type of graph would help us to see the relationship of usable fresh water compared to unusable water.
5. Introduce Atomic Learning tutorial on making graphs using *Appleworks*. Have students use tutorial.
6. Have students create a bar or pie graph that illustrates the amount of each type of water on Earth. Have them highlight the types that are available for human use.
7. Perform demo for kids on page 36 of book.

Activity 2

1. Begin the lesson with *Artificial Oasis* bellringer.
2. The night before beginning activity introduce the idea of an ABC book for water use. For a homework assignment have the kids read 1-2 and find 3 words on how water is used(ex. **F** for **F**arming, **A** for **A**griculture). Assign reward or extra credit for any kids that can come up with uses for hard letters like X or Q.
3. In class make a page, which includes and illustration, that depicts how water is used for that letter and by whom (does not have to be human use).
4. Have a gallery walk where students move around the room to look at each use of water. The students will then classify each type of water use into the four categories listed in the book on the back of a note card. (industry, agriculture, transportation, recreation).

**Students will understand that humans affect the quality of water as a resource.*

Activity 1

1. Watch *Rachel Carson's Silent Spring* and complete comprehension questions that accompany the film.

Activity 2

1. Begin with *No Seriously- the River Caught Fire* bellringer.
2. Read section 2-1 on streams, introduce the terms **runoff** and **drainage basin**. Read section 2-4 on freshwater pollution and introduce the terms **point source** and **non point source pollution**. Have students make a note card for each of the terms.
3. Introduce Glaize Creek (show pictures) and Stream Team. Introduce that we are going to monitor Glaize Creek for pollution.
4. Introduce quadrangle topographical map for Glaize Creek and have students complete worksheet (use the topographical map symbols on page 198). Discuss our drainage basin and point and non point sources of pollution in it.
5. Have students complete: *Map Exercise: Glaize Creek and Surrounding Watersheds*.

Activities 3-6

1. Introduce the different sources of pollution using the information on pages 76-81 of the text book.
2. Read about each type of pollution and identify on the cartoon map where we might find it. Practice the water quality test used to monitor this type of pollution with water from Glaize creek.
3. Fill in the information for each source of pollution in the *Sources of Pollution WS.*

**Students will understand that changes in an ecosystem affect the organisms that live in them.*

Activity 1

1. Introduce macroinvertebrates as an indicator species. Show other examples of indicator species (migratory birds, lichens).
2. Explain that we will be monitoring for macroinvertebrates as a way to help us understand if a creek is healthy.
3. Introduce macroinvertebrate keys and demonstrate how to use it with the overhead of a mayfly.
4. Have students identify macroinvertebrates from pictures using the key and have them record the steps they took on the *Identifying Macroinvertebrates WS.*

Activity 2

1. Take students to Glaize creek to demonstrate how to look for macroinvertebrates and how to collect them.
2. Identify the macroinveretebrates from Glaize creek. Identify whether they come from the tolerant, somewhat sensitive or sensitive category.
3. Determine the water quality based on the types of macroinvertebrates collected in each of the 3 categories.

Resources and Materials

The Water Planet by Glencoe Science
Low Cost Water Monitoring Kit by Green
Rachel Carson's Silent Spring film
U.S.G.S Topographical map for Glaize Creek
Sources of Water Pollution map
Volunteer Water Quality Monitoring handbook published by MO Department of Conservation