Lesson Name: Aquatic Environments

Expedition Link: Biology – The goal of this investigation is to characterize the population of organisms living in the lake and understand the ecosystem organization (e.g. food chain, energy supply). This investigation includes collection of biological samples with plankton nets dragged from a boat, collection of other biological material during diving and sampling of bottom sediment. It also includes the search for living organisms in the crater and lakeshore, including shallow subsurface ground. One interesting question is: since the lake seems to be completely isolated from the outside world, are there new species up there?

National Science Standards:

K-4.3 students should develop understanding of life cycles of organisms

K-4.3 students should develop understanding of organisms and environments

5-8.3 students should develop understanding about populations and ecosystems

5-8.3 students should develop understanding about diversity and adaptations of organisms

5-8.6 students should develop understanding about populations, resources, and environments

9-12.4 students should develop understanding of energy in the earth system

California State Science Standards:

California State Science Standards 4th

Life Science

3. Living organisms depend on one another and on their environment for survival.

Investigation and Experimentation

6. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations.

California Science Standards 5th

Scientific Investigation

6. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations.

California State Science Standards 6th

Scientific Investigation

7. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations.

California State Science Standards 7th

Scientific Investigation

7. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations.

California State Science Standards 8th Grade

Scientific Investigation

9. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations.

9th-12th California State Science Standards

Ecology

6. Stability in an ecosystem is a balance between competing effects.

Biogeochemical Cycles

7. Each element on Earth moves among reservoirs, which exist in the solid earth, in oceans, in the atmosphere, and within and among organisms as part of biogeochemical cycles.

Investigation and Experimentation

1. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop their own questions and perform investigations.

Aquatic Environments Investigation

Materials:

Each team (3-5 students) needs;

- •one thermometer
- •pH test strips & color chart
- •collection tray
- •dip net (strainer)
- •one or more hand lens
- •insect identification guide
- •plant identification guide

Procedure:

The students will investigate an aquatic – riparian environment to identify the various living organisms found at the site.

1 Select an aquatic site that is safe. Secure permission from the owner and arrange a field trip to the site.

2 Tell the students you are going to collect evidence and actual specimens that will help them determine the type of living organisms found at an aquatic site to determine possible food chains found at the site. Pass out and review the information provided on the handout "Aquatic Environments Food Chains." Lead a class discussion on the concept of a food chain.

3 Divide your class into teams of 3-5 students. Provide each team with pH test strips, a pH color chart, one thermometer, a dip net (A kitchen strainer with a handle, collection tray, one or more plant & insect identification books (Aquatic plant and insect guides are recommended.), and one or more type of hand lens. Students can find sites on the internet to help them identify insects they collect if you do not have insect guides.

4 Assign each team a section of aquatic area..

a) Each team needs to collect the air temperature and the temperature of the water. To collect the air temperature the students need to find an area that isn't shaded and an area that isn't in direct sunlight. To collect the temperature of the water the students need to find an area away from the bank and into the flow of the aquatic area if possible.

b) To collect insects the team needs to use the strainer. Have one student hold the strainer and another student disturb the floor of the aquatic area for one minute. The strainer should be a maximum of 12 inches from the strainer.

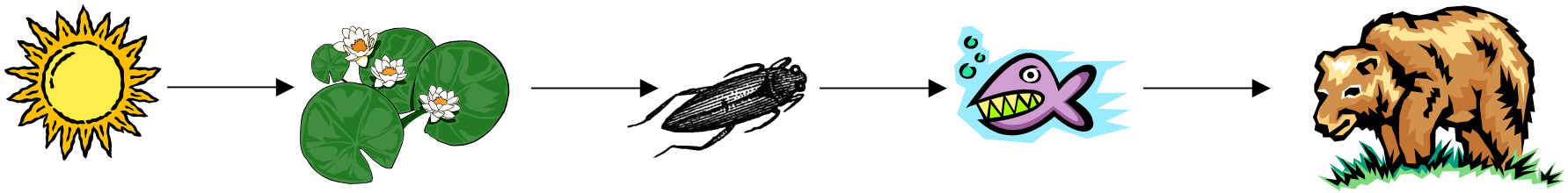
c) Dump the contents of the strainer into the collecting tray. (This works best if the collection tray has a white bottom.) Have the students sketch the living organisms they find on their record sheet. Assist them in using the insect and plant sorting guides to identify the plants insects they find.

5 Have the students use the pH paper and chart to find the pH level of the water. The students need to record this on their record sheet.

6 Have the students use aquatic insect guides and plant guides to help them identify plants and organisms they find.

7 Have the students use the "Food Chain" student worksheet and have them set up possible food chains for the selected aquatic environment.

Aquatic Environments Food Chain

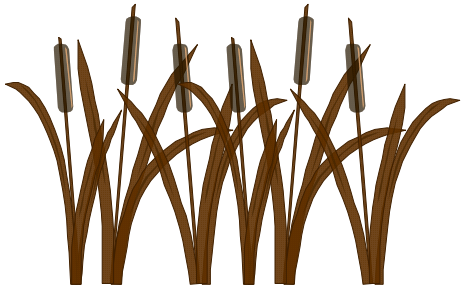


Background: A healthy riparian environment is an ecosystem where plants, animals, and non-living things interact. A stream – pond study provides an opportunity to observe and evaluate the various components of this ecosystem. In an ecosystem many relationships occur between the plants, the animals, and the environment. These relationships are so intertwined that any element of the system cannot exist interdependent of the others. Because of this interdependence anything affecting one part of the system will ultimately affect the whole system. A food chain links animals and plants together by "What they eat or who eats them." The sun begins the food chain and gives energy to the plants. The plants are able to produce their own food using the energy from the sun. Plants are called **producers** because they produce their own food. Animals cannot make their own food so they are dependent upon other living things as their food sources and are known as **consumers**. Animals derive energy from food therefore food chains involve the transfer of energy. Only a portion of the energy acquired by a link is transferred to the next link. Some of the energy is lost as heat energy. Each plant and animal for growth and movement uses the remainder of energy.

In streams and ponds the presence or abundance of certain organisms, called **indicator species**, reveals much about water quality. These creatures make up a biotic index, or number of living organisms found in a **riparian ecosystem**. The absence or presence of these organisms is an indicator of water quality.

Directions: Collect evidence that will help you determine possible species living in a selected aquatic environment . Use the data below to help determine the type of living organisms you might find at the selected site.





Temperature Ranges of Common Organisms

Less than 55° F (12.8° C) cold water

Trout, caddisfly, stonefly, mayfly, various minnows, darters, sculpins

55 - 68° F (12.8 - 20° C) cool water

Salmon, trout, stonefly, mayfly, caddis fly, water beetles, small mouth bass, diverse minnows, darters, mussels

More than 68° F (20° C) warm water

Abundant plant life, numerous fish diseases
Mostly bass, crappie, bluegill, caddis fly, dragonfly, mayfly, mussels

pH Ranges of Common Species

- **Bacteria** 1.0 to 13.0
- **Plants** 6.5 to 13.0
- **Carps, suckers, catfish, some insects** 6.0 to 8.5
- **Bass, crappie** 6.0 to 8.5
- **Snails, clams, mussels** 6.5 to 9.0
- **Largest variety of animals (trout, mayfly, stonefly, caddis fly)** 6.0 to 8.5

_____

Type of Riparian Ecosystem

Water Temperature _____°C _____°F

Lower the thermometer a few inches below the water surface. Keep the thermometer in the water for the (3) minutes until a steady reading is obtained.

Air Temperature _____°C _____°F

Use a dry thermometer and hold it in the air until reading is constant. Sunny and shady areas may have different temperatures.

pH Level _____

Dip 1/2 of the test strip into the water. Take the sample at least one foot from the shoreline. Compare the color of the wet portion with the pH color chart.

AQUATIC PLANTS AND INSECTS I FOUND

Insect Name_____

Location of Insect _____

Sketch of Insect

Insect Name_____

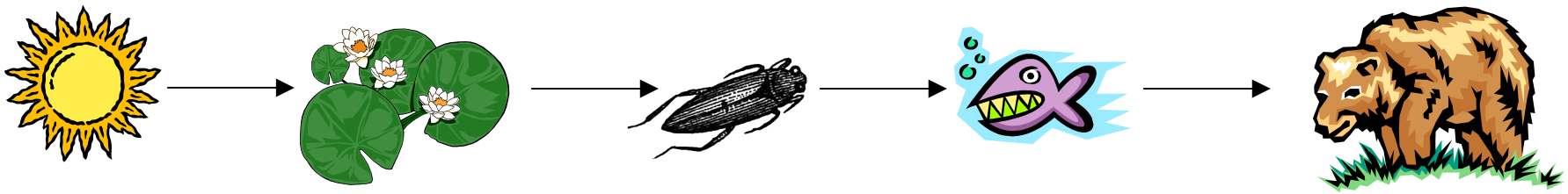
Location of Insect _____

Sketch of Insect

Sketch of Plant

Sketch of Plant

Aquatic Food Chains



Directions: Use the information you collected from the site and create possible food chains.

_____ → _____ → _____ → _____ → _____

Producer → Primary Consumer → Consumer → Consumer → Consumer

_____ → _____ → _____ → _____ → _____

Producer → Primary Consumer → Consumer → Consumer → Consumer

_____ → _____ → _____ → _____ → _____

Producer → Primary Consumer → Consumer → Consumer → Consumer