Unit 4
# How Can a Dam Affect a River?

Activity A

# Can you identify members of the food pyramid?

## Introduction

This lesson examines both a river ecosystem and a river ecosystem with a dam and reservoir. Most students have preconceptions about the kinds of animals these ecosystems contain. They will first construct their own food pyramid based on these preconceptions. Based on the food pyramid they create, they will then determine how a scientist would evaluate its accuracy.

Although this activity includes a reservoir component, it is important to note that many dams are called "run of the river" because they operate without a reservoir.

## Scientific Learning Goals and Objectives in this Activity:

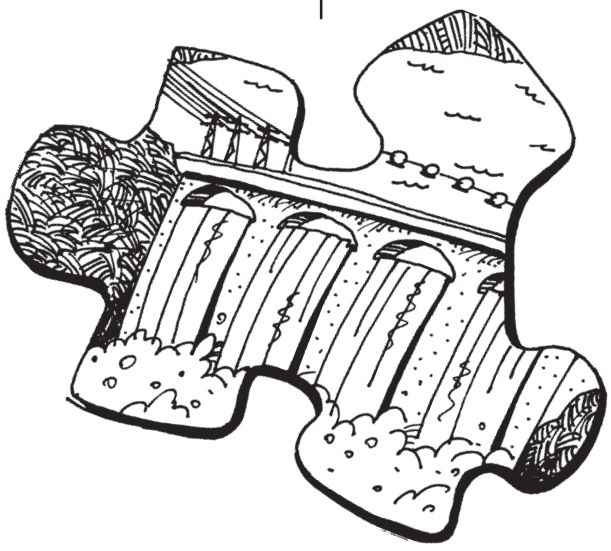
(Goals from Washington State Commission on Student Learning —Essential Learning Requirements for Science)

### Goals

- Students will understand and apply scientific concepts and principles.
- Students will conduct scientific inquiry.
- Students will communicate scientific understanding.

### Objectives

- Students will be able to view and sketch living aquatic organisms, and predict where aquatic organisms would choose to live.
- Students will be able to demonstrate their knowledge of the food pyramid through the individual construction of their own.
- Students will gain knowledge of species that are common to many Northwest river and reservoir ecosystems.
- Students will learn that scientific tests occur within parameters.
- Other objectives:



## Teacher Preparation

### Preparation Time:
*20 minutes*

### Materials
Prepare water samples in advance (see Teacher Notes.)

*Prepare for the Entire Class:*

- water samples
- transparency of river/ reservoir ecosystem

*Prepare for Each Team:*

- microscope or hand lens
- microscope slide
- eye dropper
- clear plastic cup or jar
- river/reservoir ecosystem

*Prepare for Each Student:*

- copy of journal page

## Student Involvement

### Activity Time:
*50 minutes*

### Activity Processes:

*? Do different organisms prefer different depths of water?*

1. Provide each team with a sample of water containing aquatic organisms in a jar or clear plastic cup, an eyedropper, and a hand lens. (Use microscope slide and microscope if available). Ask students to collect several drops of sample water from different depths by squeezing the eye dropper bulb, then placing the end of the dropper in the water sample at the desired depth and releasing the bulb. This allows water to enter the dropper at various depths. Place water on slide and view it using a hand lens or microscope. Ask students to carefully observe their samples and sketch any plants or animals in journal, noting where the organisms occur in the sample (e.g., floating, near bottom, swimming, etc.).

*? In the sample, do different organisms prefer different depths?*

Allow time for students to share answers and discuss. Discuss why plants and animals prefer different habitats, e.g., the amount of light, difference in temperature, food source, etc. If no changes are found in the sample, clarify with students why. Ask how much depth and what conditions would be needed to demonstrate changes. Collect water sample and materials.

*? What plants and animals do you think live in and around a river?*

2. Give each team a river/ reservoir ecosystem handout.

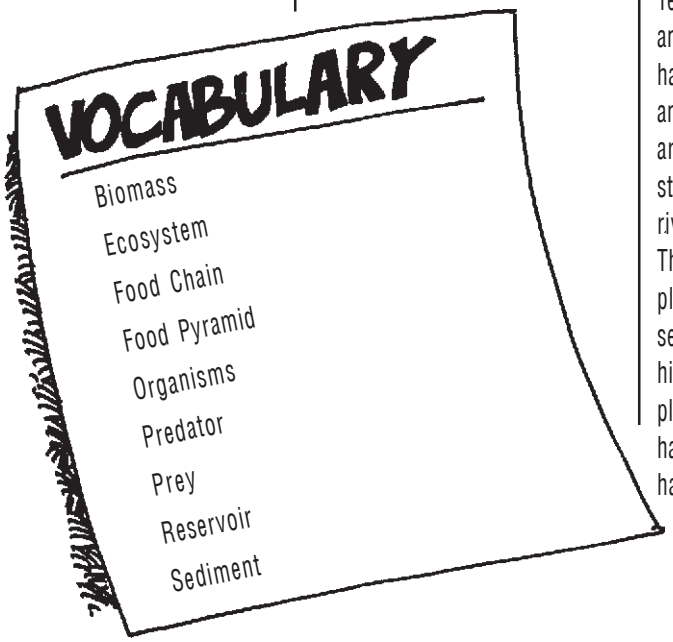
Teams brainstorm for 5 minutes and list on the river/reservoir handout all the plants and animals they think live in and around the river. Encourage students to think about local rivers and reservoirs/lakes. They can share the different plants and animals they have seen while swimming, fishing, hiking, etc. Place names of plants and animals on the handout in their approximate habitat location. For example, eagles in the air, fish in the river, raccoon on the bank, duckweed in the river/reservoir. If students know several different species, encourage them to write down as many as possible. For example, bull, cutthroat, and brown trout instead of just "trout" or "fish".

Place transparency of river/ reservoir ecosystem on overhead. Have team members write on the overhead organisms listed by their team. The overhead is complete when it shows a complete list of their understanding. Make sure a team member saves the team's river/reservoir handout for next activity.

*? What organisms either eat or are eaten by other organisms?*

Using the overhead, teams answer the questions and the teacher records the answer by drawing an arrow from each organism that is eaten (prey) to the organism that eats it (predator). Continue to ask team members until most of the predator/prey relationships are identified.

3. Explain the concept of the food pyramid (see Teacher Notes). Ask students to fill out the pyramid in their journal using plants and animals from the classroom overhead list, and based on "what organisms depend on which other organisms for food or survival?"



## Student Involvement Continued

Students should list several food chains on the pyramid, and use arrows to show relationship (*zooplankton* p *fish* p *eagle*). Encourage students to use organisms that are involved in several relationships (*mayfly* p *fish* p *eagle*; *mayfly* p *frog* p snake p *eagle*).

4. Students can conduct additional research and add to their pyramid at home.

## Notes

This first step can take an entire period depending on how the teacher engages the students. If time is a constraint, this activity can be completed without this hands-on step.

Step 1: When collecting samples, plunge the collection bottle (a wide mouth jar with lid) as deeply as possible, and allow some sediment from the river or lake bottom to enter the bottle. Many aquatic organisms are found in shallow water, within about 6" from the bottom. Ventilate the collection bottle and store away from sunny windows in the classroom until ready to use. Here are three ways to collect or create water samples:

1. Take students to a nearby water source, preferably a river. Students can observe larger organisms by catching them using nets made from nylons and coat hangers, and collecting water samples to view with a hand lens or take back to the classroom to view through the microscope. If a field trip is not an option, students can view organisms in marshes, small streams, runoff ponds, etc. that are often within a short walk from the classroom. This activity provides an excellent opportunity for students to observe aquatic organisms and predator/prey relationships in their natural environment .

2. The teacher or students can collect water samples if outside travel is not possible. Try to collect one sample from standing water such as a lake, pond, or marsh. The second sample should be collected from running water such as a river or stream for comparison.

3. If collection of organisms in their natural water source is not feasible, an aquatic culture can be grown in the classroom several weeks prior to the lesson. Place tap water in several clear 2-liter pop bottles and add 1/2 cup of soil (do not use sterilized potting mix). Allow the soil and water to sit in a well lit place in the classroom for at least 2 weeks. Algae growth should be visible on the sides of the bottle after two weeks. Another excellent source for water collection for the culture is a fish tank. Ask students to bring in tank water several weeks in advance of this lesson.

Step 3: There are a variety of terms for this process such as energy pyramid, food chain, food cycle, and food web. For clarity, you may wish to explain that food chains are less complex representations than food webs and cycles, which are comprised of all interconnecting food chains in a community.

You may also want to note that food chains represent cycles as well. For example, in the mayfly p frog p snake p eagle chain, when the eagle dies it can feed bacteria and insects. Thus the chain is replenished. The pyramid, in addition to demonstrating the dependence of a series of organisms on each other for food, also depicts relative **biomass.**

To demonstrate biomass, students estimate the number of organisms in the pyramid and their approximate weight. This will illustrate the large amount of mass at the pyramid base and the small amount at the apex. For example, students may estimate 10,000 mayflies at 1 gram each (10 Kg total), 12 fish at .5 kilogram each (6 Kg total), and 1 eagle at 2 kilogram each (2 Kg total).

# Journal 4A
# Can you identify members of the food pyramid?

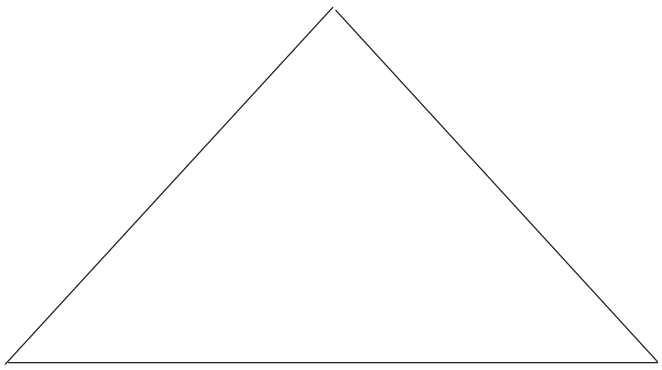
Name _____

Team Name _____

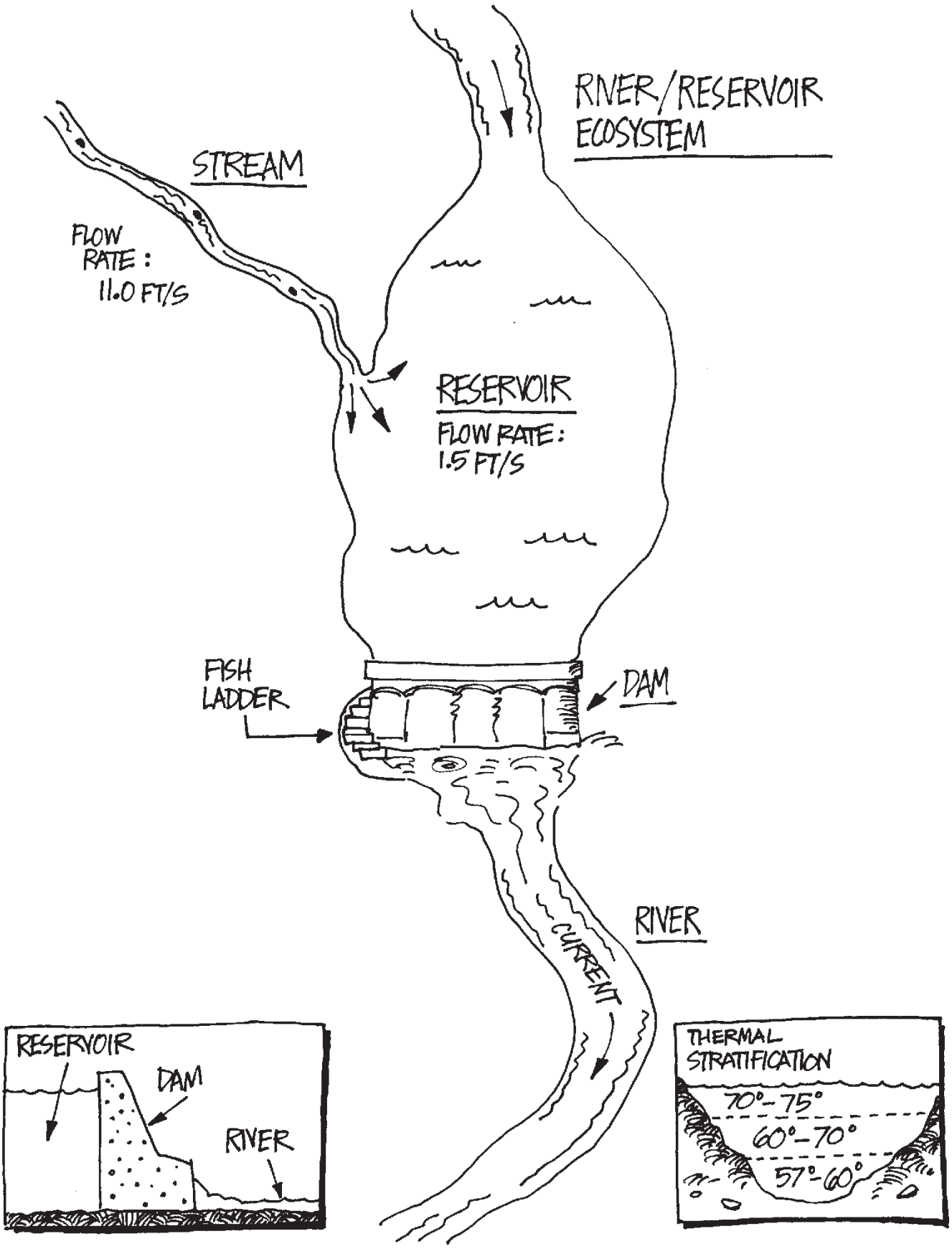
Date _____

Sketch the organisms you saw in your water sample.

From the class list, write down 1 to 3 plants or wildlife that can be found at each level of the pyramid.



From your food pyramid, draw 2 or 3 food chains.
Example: mayfly p frog p snake p eagle.


RIVER/RESERVOIR ECOSYSTEM
STREAM
FLOW RATE: 11.0 FT/S
RESERVOIR
FLOW RATE: 1.5 FT/S
FISH LADDER
DAM
RIVER
CURRENT
RESERVOIR
DAM
RIVER
THERMAL STRATIFICATION
70°-75°
60°-70°
57°-60°