



Food Web Dynamics

What do plants and animals have in common and what do they need to survive? What is food chain and food web?

◆ **Grade Levels**

2nd-5th grade

◆ **Subject Areas**

Life Science, Biology, Ecology and Environmental Science

◆ **Key Topics**

Animal and plant characteristics, food chains, food webs, producers, consumers

◆ **Duration**

Preparation Time: 30 min
Activity Time: 4 x 50 min

◆ **Setting**

Classroom (Groups of 2)

◆ **Skills**

Organizing, Interpreting, Applying Information

◆ **Standards**

NGSS & MT Science Std.:

5-LS2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

CORE IDEA(S):

LS2.B: Cycle of Matter and Energy Transfer in Ecosystems

CROSSCUTTING CONCEPT(S):

Systems and System Models

SCIENCE & ENGINEERING

PRACTICE(S):

Developing and Using Models

Overview

Students are introduced to what all plants and animals have in common and what they both need to survive. During this activity they will build a lake food web and learn how all organisms in the lake ecosystem are interconnected.

Objectives

Students will be able to:

- identify three characteristics that animals and plants share.
- identify what plants and animals need to survive.
- build a lake food chain and food web.

Materials

Warm Up/Activity/Wrap Up

- Computer, projector, and student worksheets #1-3
- Student Resources #1-4
- 2' x 3' Poster paper (1/pair)
- Scissors (1/student)
- Color pencils or markers (1 set/student)
- Glue/glue stick (1/student)

Advanced Preparation

- Print the students worksheets #1-2 double-sided (1/student)
- Print the student worksheet #3 single-sided (1/student)
- Print the student resources #1-4 single-sided (1 set/student)
- Gather colored pencils, markers, glue, scissors, and poster paper.
- If needed, made a demo food chain and web poster for the students to use as an example.
- To speed up the food chain and food web activities, pre-cut the animals and descriptions ahead of time.
- Prior to class, pre-load the Food Web Dynamics_Kto5 presentation found on our website:
<https://flbs.umt.edu/newflbs/k12teachingmaterial>



Food Web Dynamics

Background

An **ecosystem** is a community of organisms that all share a particular habitat and interact with each other as they work to survive. These organisms are often organized into different trophic levels based upon how they acquire their food energy. **Producers** are organisms that can create their own food from inorganic (non-living) chemicals in the environment. Phytoplankton are microscopic algae found in lakes, rivers, streams, wetlands, and oceans. Plankton is derived from planktos, which means “to wander or drift.” Therefore, phytoplankton are producers often found drifting where there is abundant light for photosynthesis. Phytoplankton use sunlight to convert water and carbon dioxide into sugar and oxygen through photosynthesis. This oxygen and sugar is then used to make chemical energy needed for survival. In contrast, **consumers** are organisms that cannot make their own food. These organisms must find and consume their food from their surrounding environment. Zooplankton are examples of primary consumers that eat phytoplankton as they drift through the water.

A **food chain diagram** is a visual representation of the flow of food energy through an ecosystem. Typical food chains start with a producer and are composed of at least three types of organisms. For example, when zooplankton eat phytoplankton, the energy from the phytoplankton goes into the zooplankton. Likewise, when young trout eat zooplankton the energy from the zooplankton and the phytoplankton collectively goes into the juvenile trout population. This food energy is further passed on when larger organisms such as adult trout, osprey, or bald eagles eat the juvenile trout. It is important to remember that even though we simplify a food chain diagram by depicting one individual organism, in reality this organism represents a population of that organism in a specific ecosystem.

A **food web** is simply a collection of interwoven food chains that represent the flow of energy throughout the system. It is important to explain that the food chains and web in this lesson are a small representation of the larger web that exists in the natural environment.

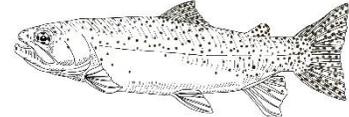
Since producers are the base or foundation to every food chain within an ecosystem, there are typically more producers than consumers in any given habitat. Freshwater lakes in Northwestern Montana are often filled with a variety of phytoplankton, periphyton (slimy algae on rocks or other surfaces), submerged vegetation, emergent aquatic plants (i.e. water lilies), and wetland plants that border the lake. These producers support a wide variety of animal life in and around the lake. The animals in the lake ecosystem can either be found in the lake or around the lake. For example, there are many different types of waterfowl (e.g., ducks, geese) and raptors (e.g., osprey, eagles, hawks) that find their food in, on top of, or near the lake.

Common Lake Food Chain in N.W. Montana



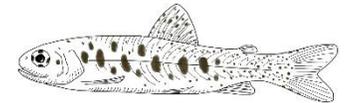
OSPREY

Quaternary Consumer



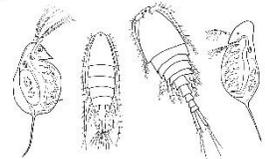
ADULT TROUT

Tertiary Consumer



JUVENILE TROUT

Secondary Consumer



ZOOPLANKTON

Primary Consumer



PHYTOPLANKTON

Primary Producer

Food Web Dynamics

Vocabulary

Animal – A multicellular organism that can move, feed itself, digest its food, remove its waste, respond to its environment, and reproduce.

Carnivore – A consumer that only eats other animals.

Cell – The basic unit of life.

Consumer – An organism that eats or consumes other organisms to survive.

Ecosystem – A community of organisms and the non-living environment they inhabit.

Food Chain – A series of organisms linked together by the transfer of food energy from one population of organisms to another population of organisms.

Food Web – A series of interlocking and independent food chains found in an ecosystem.

Herbivore – A consumer that only eats photosynthetic plants and/or algae.

Omnivore – A consumer that eats both plants/algae and animals.

Organism – A living creature.

Plant – An organism that produces its own food to survive.

Producer – An organism that can use light or chemical energy to produce its own food from inorganic (non-living) substances (ex. plant, algae, or cyanobacteria) typically via photosynthesis.

Procedure

◆ Warm Up (25 min.)

- Turn on the projector, display the Food Web Dynamics_Kto5 slide show, and pass out the student worksheets #1-2.
- Slide #2: Conduct a 1-minute brainstorm and have the students write down the characteristics or traits that all plants have in common.
- Slide #3: Ask 4-5 students to share their responses. Discuss what they have in common (ex. they are made of plants cells, can make their own food using photosynthesis, can respond to their environment, and can reproduce).
- Draw the following chart on the board:

Plants	Animals

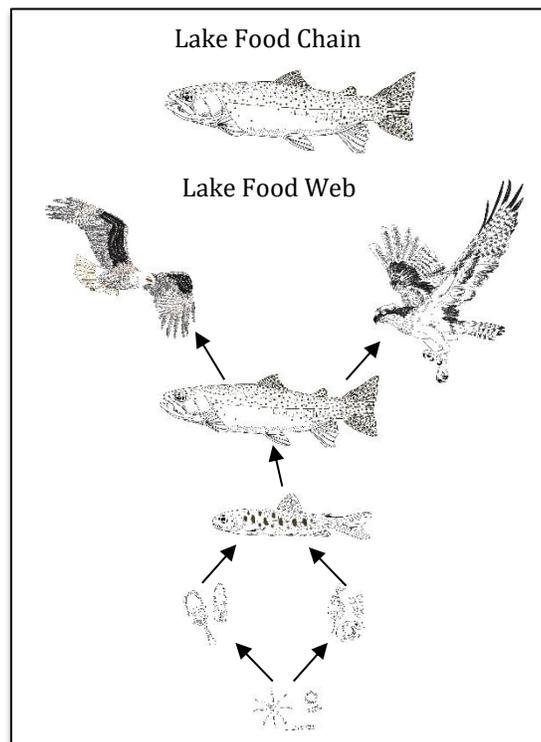
- Slide #4: Students write down what all plants need to survive on their worksheet. Ask 4-5 students to share and write their responses in the chart on the board.
 - *Review that all plants need water, energy/food, oxygen, a space to live, and the ability to respond to their environment.*
- Slide #5: Conduct a 1-minute brainstorm and have the students write down the characteristics or traits that all animals have in common.
- Slide #6: Ask 4-5 students to share their responses. Discuss what they have in common (ex. they are made of animal cells, eat other organisms for food, can remove wastes, can respond to their environment, and can reproduce).
- Slide #7. Students write down what all animals need to survive on their worksheet. Ask 4-5 students to share their answers and write their responses in the chart on the board.
 - *Review that all animals need water, energy/food, oxygen, a space to live, and the ability to respond to their environment.*
- Circle the items in the chart on the board that both the plants and animals need in order to survive.



Food Web Dynamics

◆ Part I – Build a Food Chain (25 min.)

- Explain that they will be learning about food chains. Ask if anyone knows what a food chain is. Discuss that food chains are a visual picture that represents the food energy that moves from one population of organisms to another in a habitat. It is essentially a picture that show who eats who in a habitat.
- Slide #8: Introduce and explain what producers are. Be sure to explain how plants use the sun's energy and carbon dioxide to build sugar and to make oxygen (to demonstrate carbon dioxide have them blow into their hand). So they are called producers because they produce sugar and oxygen for all of the other organisms on the planet. Ask them to share a producer that they like to eat. Take 2-3 responses.
- Slide #9: Introduce and explain what consumers are. Ask the students what herbivores eat and then ask them what kind of herbivores live in this area (ex. snowshoe hares, deer, elk, etc).
- Slide #10: Ask the students what carnivores eat and then ask what kind of carnivores live in this area (ex. mountain lions, bobcats, coyotes, foxes, owls, hawks, eagles, osprey, etc.)
- Slide #11: Ask the students what omnivores eat and then ask them what kind of omnivores live in this area (ex. bears, raccoons, birds, etc.)
- Slides #12-13: Introduce and explain what food chains are.
- Read the top of the "Understanding a Food Chain" worksheet. Review the provided aquatic food chain and discuss how food chains represent a transfer of FOOD energy from one level to another. The producers at the bottom of the food chains support all life above them, which is why there are typically more producers than consumers in any environment.
 - Students then create one food chains (from any habitat) on their paper. Ask students to share.
- Slide #14: Pass out the Student Resources #1, poster, scissors, and glue to each student. Explain that they will be creating a food chain on the top of their poster. Ask them to neatly write "Lake Food Chain" at the top of their poster. Either display a demo poster or draw an example on the board so that they see how big to write the words and how they need to write them at the top and also leave more space at the bottom for the food web.
- Ask the students to carefully cut out the food chain organisms.
- Slide #15: Before they begin, review the food chain displayed on the slide as an example and then demonstrate how they will arrange/stack the organisms and glue them on their poster so that they can each be folded back to see what is "inside." The phytoplankton is glued down first, the top tab of the zooplankton is then glued down to the top tab of the phytoplankton. Next, the top edge of the juvenile fish is glued to the top tab of the zooplankton. Lastly, the top edge of the adult trout is glued to the top edge of the juvenile trout. Posting the demo poster in the classroom is helpful at this stage.

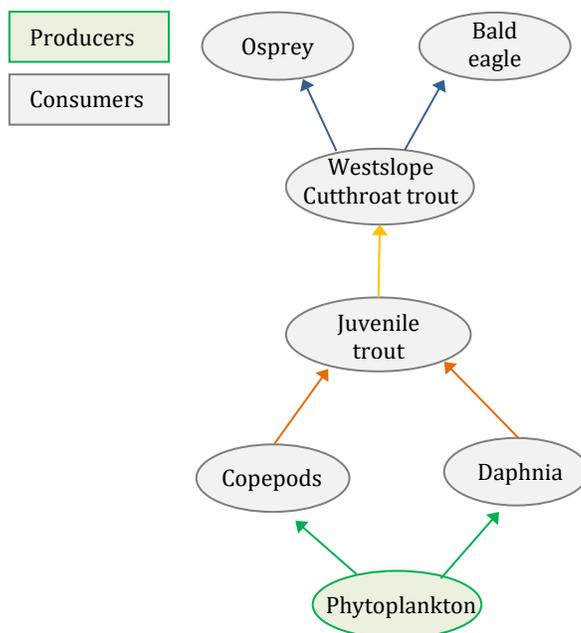


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◆ Part II: Build a Lake Food Web (35 minutes)

- Slides #16-18: Use the provided food web examples to introduce and explain what food webs are.
- Pass out the colored pencils and student worksheet #3. Walk the students through the completion of the “Understanding a Food Web” worksheet.
- Pass out the Student Resources #2-4, the students’ food chain/web poster from the previous session, scissors, and glue. Explain that they will now be creating a simple lake food web.
- Ask the students to neatly write “Lake Food Web” below the food chain already on the poster and then to carefully cut out the food web organisms and descriptions.
- Next, they match the descriptions to the correct organisms, arrange the organisms into a web, and then ask the instructor to check the web.
- They glue the organisms and descriptions down on the poster and then draw the arrows moving up through the web.

Simple Lake Food Web:



◆ Wrap Up (15 min.)

- After they build the web, they must summarize their understanding by verbally explaining what the food web represents to the teacher.

Teacher Resources

Assessment Options

Have students:

- **complete the Food Web Dynamics worksheets** as described
- **build the Lake Food Chain and Web** to show how the organisms are connected.
- **summarize their understanding** by verbally explaining what the food web represents.

Modifications

- Students may build the web individually or in pairs as appropriate.
- Simplify the food web by removing food chains from the web.
- Enlarge the food chain images and worksheets as needed.

Extensions

Students can:

- **observe phytoplankton and/or zooplankton** collected from a local water source using plankton nets. *Supplies needed: zooplankton net (~64 mm), phytoplankton net (~20mm), sampling jars, microscopes, microscope slides for phytoplankton, microscope depression slides for zooplankton, cover slips, and disposable plastic pipettes.*
- **design a cause and effect poster** about a specific ecological disturbance that could disrupt the lake food web.

Acknowledgements

All food web images were illustrated by Holly Church. Many thanks to Sherry Bradstreet at Swan River School for her contributions to this lesson.



Food Web Dynamics

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Warm Up

Look at the provided photographs of the plants.

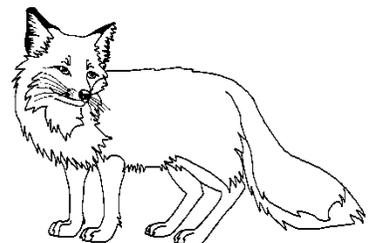
1. Brainstorm for ONE MINUTE...**WHAT DO ALL PLANTS HAVE IN COMMON?**

2. What do plants need to survive?

Look at the provided photographs of the animals.

3. Brainstorm for ONE MINUTE...**WHAT DO ALL ANIMALS HAVE IN COMMON?**

4. What do animals need to survive?



Food Web Dynamics

Understanding a Food Chain

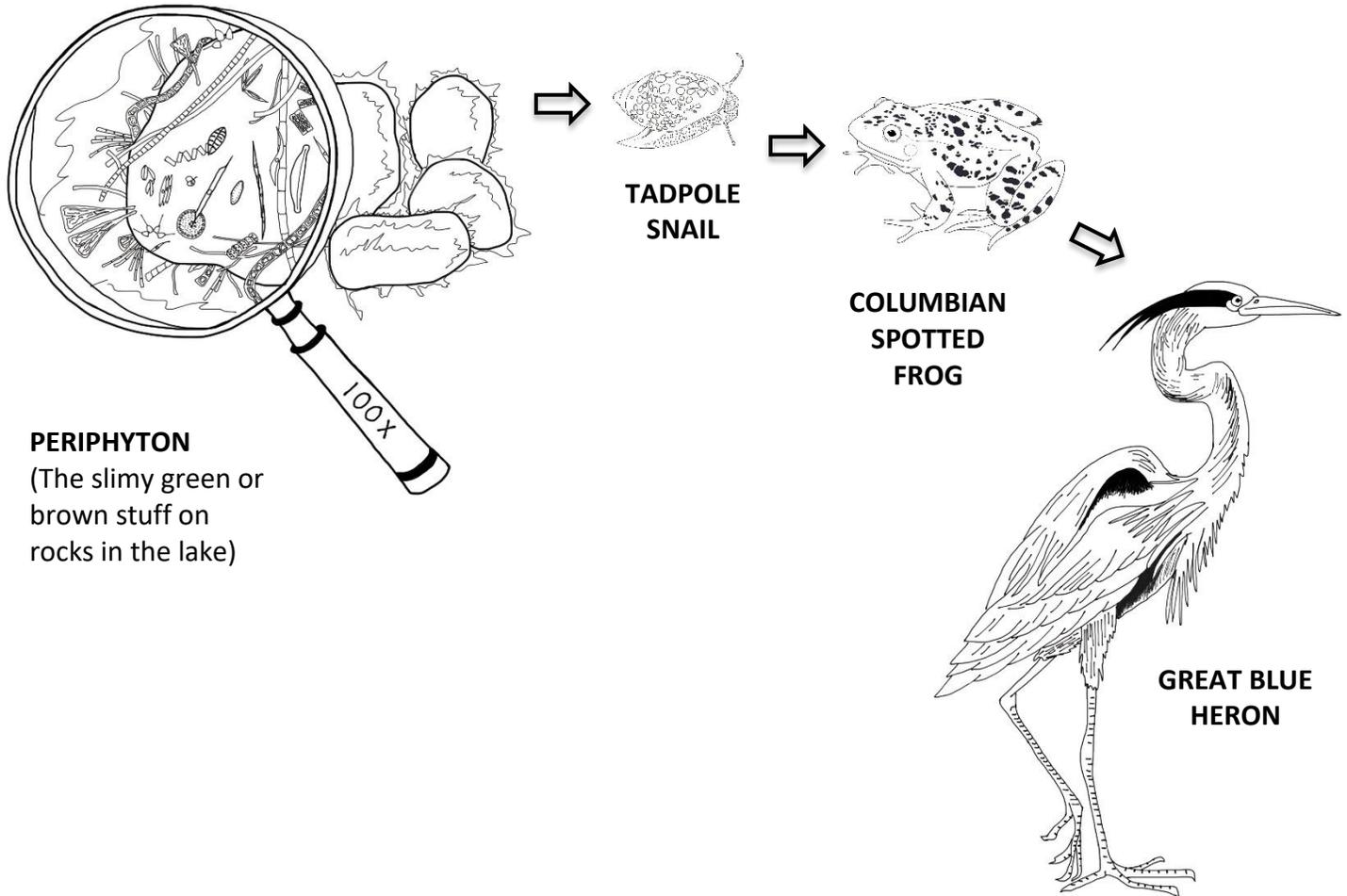
Student Worksheet (2 of 3)

A **food chain** represents the food energy that flows through an **ecosystem**.

The sun provides energy for the **producers** (plants) to make their own food through photosynthesis. The producers are the base of the food chain and are eaten by many organisms.

A **consumer** is an organism that cannot make its own food. **Herbivores** are consumers that eat plants. **Omnivores** are consumers that eat plants and animals. **Carnivores** are consumers that eat other animals.

Below is a diagram of a food chain often found in N.W. Montana. Notice the arrows are pointed to the animal that is receiving the food.



Write another food chain below. Remember, all food chains start with a producer and are made of at least FOUR organisms.

1. _____

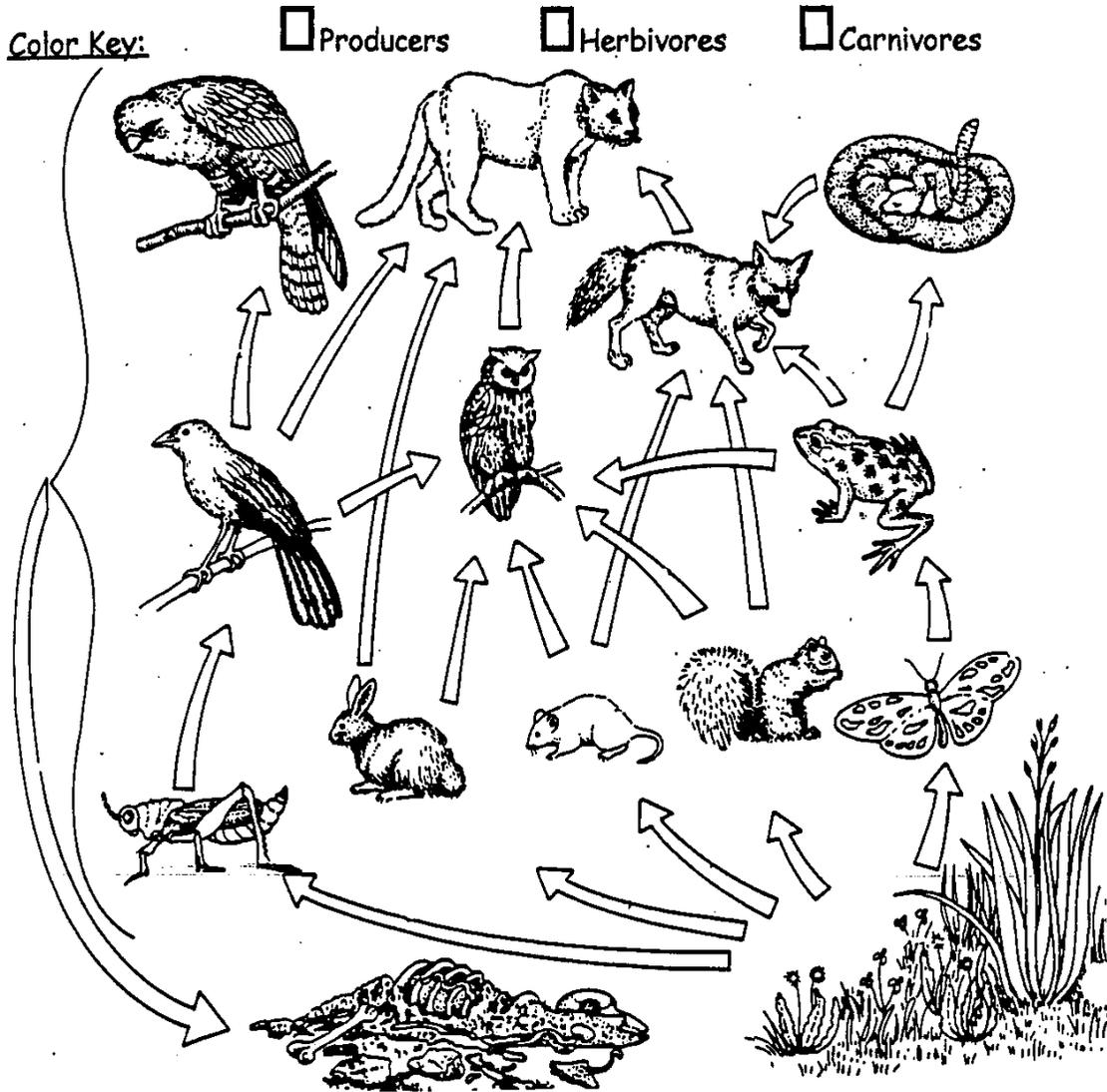


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Understanding a Food Web

Student Worksheet (3 of 3)

Below is a diagram of a food web or a group of interlocking food chains that show the flow of energy through an ecosystem. First, select three colored pencil colors and color in the key below. Next, color the arrows flowing out of the producers, herbivores, and carnivores.



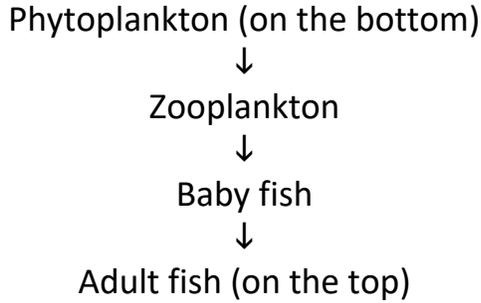
Second, find five food chains in this web. Food chains usually have at least four links and always start with a producer. Write your five food chains below:

1. _____
2. _____
3. _____
4. _____
5. _____

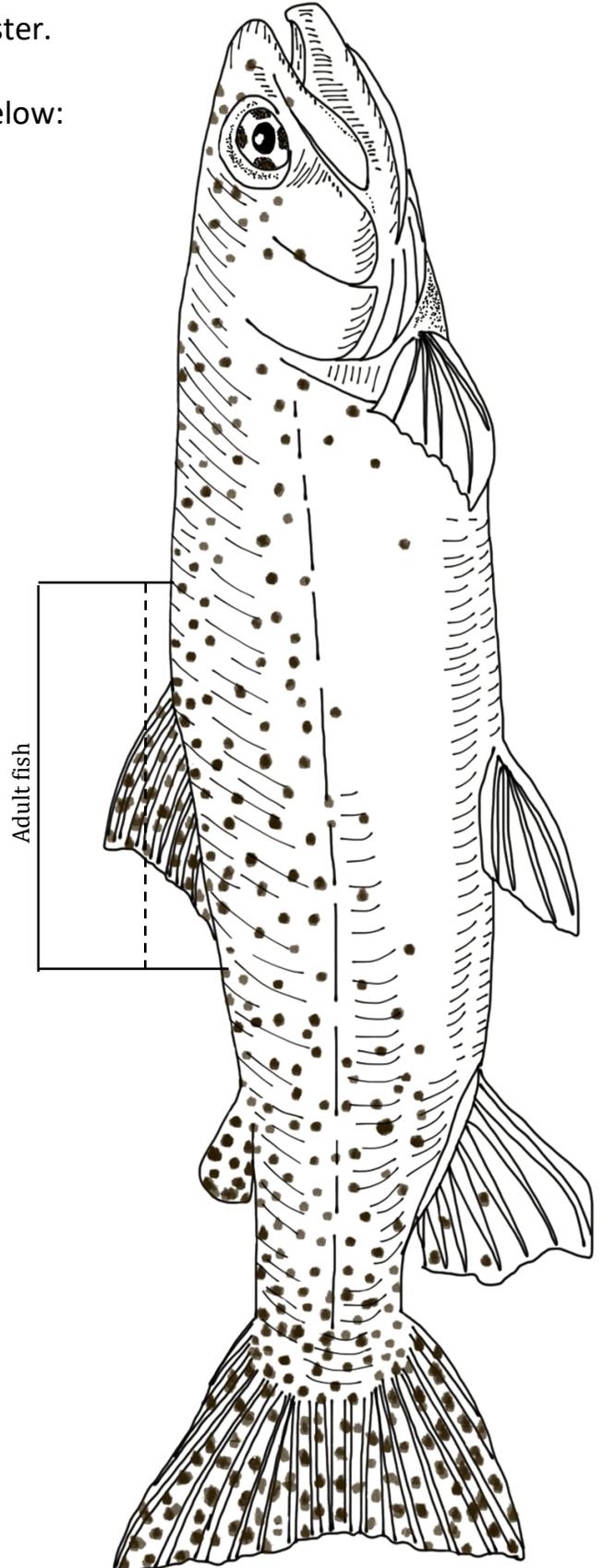
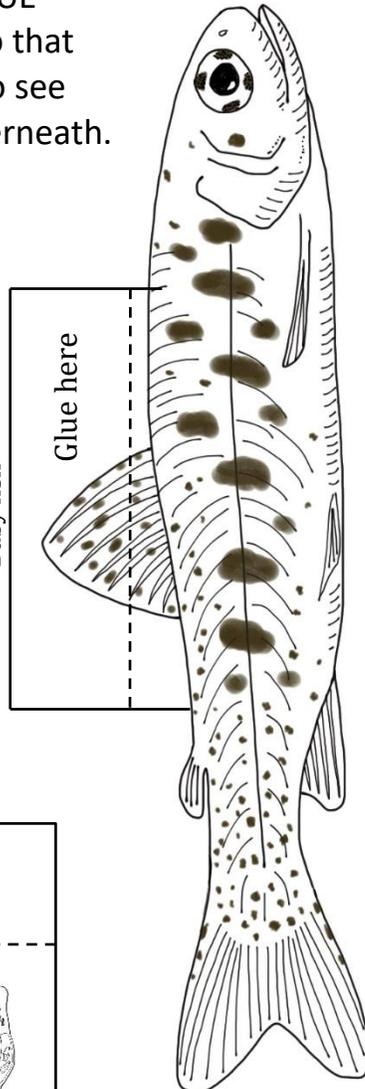
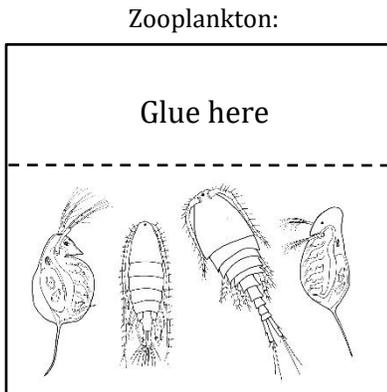
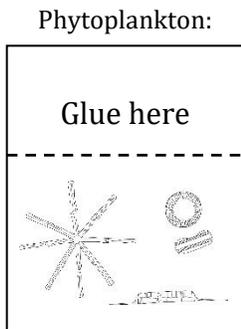


Part I: Build a Lake Food Chain

1. Write **Lake Food Chain** on the top of the poster.
2. Cut out the organisms below with the tabs.
3. Stack and glue the organisms in the order below:



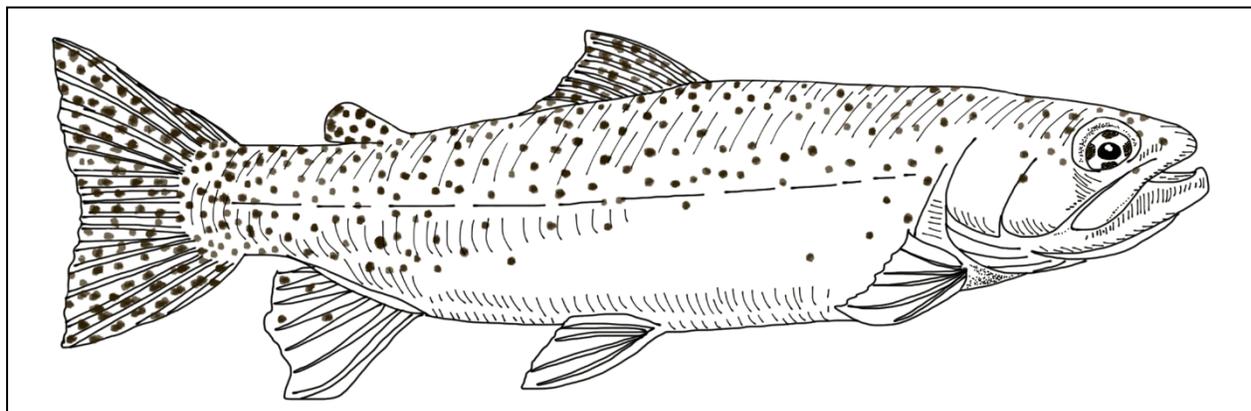
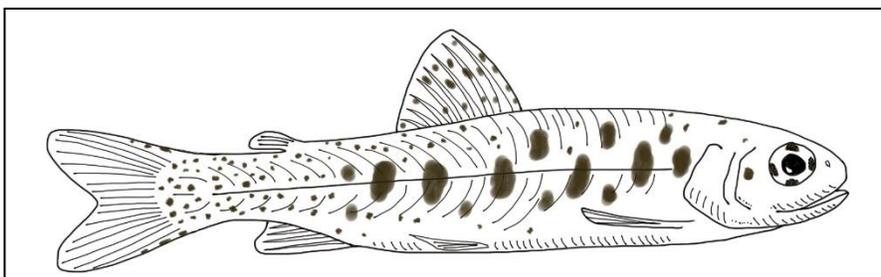
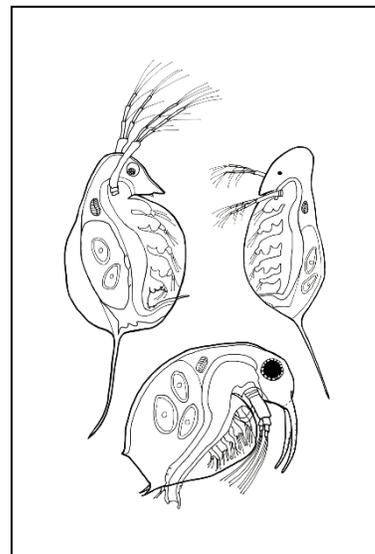
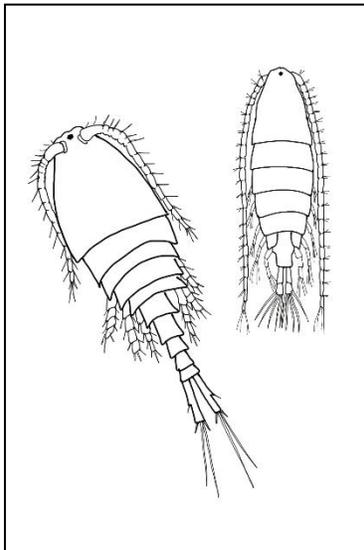
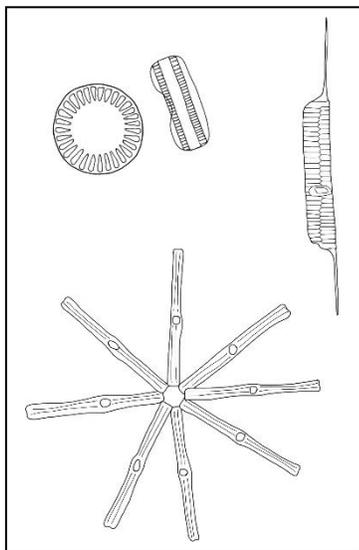
4. Be sure to ONLY GLUE THE TABS DOWN so that you can flip them to see the organisms underneath.



Part II: Build a Lake Food Web

Student Resources (2 of 4)

1. Cut out the organisms and descriptions.
2. Match each organism with the description that fits.
3. Arrange the organisms on the poster to build a food web. Remember each food chain in the web should start with a producer. So place your producer at the bottom.
4. Ask your teacher to check your web BEFORE YOU GLUE it to the poster.
5. Glue the organisms and descriptions to the poster and use a marker to draw arrows between the organisms (the arrows should flow UP through the web).



Food Web Dynamics

Part II: Build a Lake Food Web

Student Resources (3 of 4)



Food Web Dynamics

Part II: Build a Lake Food Web

Student Resources (4 of 4)

Phytoplankton

I am a diatom (microscopic algae) that floats and drifts with the water currents.

I use sunlight, water, and carbon dioxide to build sugar for myself through photosynthesis.

Cladocerans - Zooplankton

I live in lakes, ponds, streams, rivers, and wetland areas. You need to use a microscope to see me.

I mostly eat phytoplankton and bacteria.

Copepods - Zooplankton

I live in lakes, ponds streams, rivers, and wetland areas. You need to use a microscope to see me.

I mostly eat phytoplankton and bacteria.

Juvenile Trout

I live in lakes, stream and rivers. I like to hide in the pools and side channels of rivers and streams.

I eat aquatic insect larvae, baby fish, and zooplankton.

Adult Westslope Cutthroat Trout

I live in the cold, clear water of lakes, streams, and rivers.

I eat aquatic insects and smaller fish

Osprey

I hunt in fish-filled lakes, ponds, streams, rivers, and wetlands. I like to build my nest on high man-made structures.

I dive into the water to catch fish.

Bald Eagle

I nest in forested areas near large lakes and rivers. I often soar in the sky to search for my food.

I eat fish, mammals, birds, frogs, snakes, lizards, and dead animals.

