

Fish SD: Aquatic Web of Life

Background: Review Chapter 5: *Fish Identification and Life History in Going Fishing*

Duration: Part I: 30-45 minutes, Part 2: 60 minutes

Materials: 3x5 index cards for each student with holes punched in two adjacent corners, ball of yarn.

Objectives: Students will identify components of an aquatic ecosystem, describe connections between components of the ecosystem, discuss hypothetical changes and the effect of the change, and explain how energy flows through the ecosystem.

Background: A lake or river, including its riparian zone, is a living community. The organisms within this ecosystem are connected in what is often called “the web of life.” How can so many different organisms occupy the same ecosystem without wearing out all of the resources? The answer is that each organism has evolved to have its own niche, or role in the community. W.B. Saunders made the analogy that “the habitat is the organism’s ‘address’, and the niche is its ‘profession’, biologically speaking.” With all of these different ‘professions,’ each species contributes to the health of this interwoven community.

One way the animals living in and around a river are connected is through eating relationships. All life depends on the sun and the ability of green plants to use sunlight to synthesize simple sugars from carbon dioxide and water. Through this process, known as photosynthesis, plants take energy from sunlight and make it available to animals. Plant eaters, or herbivores, eat the plants directly; animal or flesh

eaters, carnivores, eat both herbivores and other carnivores, thus forming a food chain.

A food chain is a simplified way of showing energy relationships between plants and animals in an ecosystem. For example, a food chain of **sun → algae → mayfly → rainbow trout → bald eagle** shows that the sun provides energy to the algae (producer), which in turn is eaten by a mayfly (primary consumer and herbivore). The mayfly then becomes energy for a rainbow trout (secondary consumer and omnivore). Finally, a bald eagle (tertiary consumer and carnivore) eats the trout. However, this is a very simplified version of what actually happens in nature. Rarely does an animal eat only one type of food; most animals consume many types of food and are in turn consumed by many types of predators. A food web, as opposed to a food chain, is a more accurate way of demonstrating the interconnections of various organisms in an ecosystem. A food web extends the food chain concept from a simple linear pathway to a complex network of interactions.

Organisms in an ecosystem are connected in additional ways beyond the food web. They can also provide habitat for other species. For example, trees provide habitat for nesting birds and a beaver's dam creates a pool in the river, providing habitat for certain aquatic insects. Furthermore, species may rely on others to aid in some way with reproduction. Certain flowering plants need honey bees and other insects to carry pollen from one flower to another. Additionally, species of birds help spread a cottonwood's soft seeds while using it to build a nest each spring.

The web of life created in this activity suggests that all living things are connected. No matter how unrelated organisms may seem, they are, in fact, connected.

Warm up: Write out John Muir's quote, "When you try to change a single thing, you find it hitched to everything else in the universe," on the board. Ask students to share their ideas about what Muir meant. Do the students agree? Prompt them to list examples of connections.

Activity:

Part I:

Discuss the terms ecosystem, producer, consumer, herbivore, carnivore, omnivore, scavenger, and niche. Ask the class to brainstorm all the living components they think they would need to make a healthy river ecosystem. Write down the list on the board. Refer to the example list at the end of the activity for further ideas.

Explain to your students that they will get to become an expert on one species in an aquatic ecosystem. Assign each student to one of your listed species and give each an index card. The students must research their species.

If they are assigned an animal, have them research (1) what the animal eats, (2) what eats the animal, (3) if it is an herbivore, carnivore, omnivore, and/or scavenger, (4) what niche the species fills in the ecosystem, and (5) any fun/ weird trivia about the organism.

If they are assigned a plant, bacteria or fungi have them research (1) what the species gives others, (2) what eats the species, (3) if it is a producer or decomposer, (4) what niche the species fills in the ecosystem, and (5) any fun/ weird trivia about the organism.

Students should record this information either on one side of their card or in paragraph form on a separate piece of paper. On the other side of the card, the student should display a picture of the organism.

Part 2:

Display the list of aquatic food web members the class came up with. Go through the list with each student giving a mini-presentation to the class describing their animal or plant and its role in the ecosystem. Create an index card that represents the sun.

Each student gets a piece of yarn to attach to their card, making a name tag to wear around their neck. Have each student wear the card so that the photo of their organism is visible. The class then gets up and stands in a circle, preferably outdoors. Ask the class what all life needs to grow – the ultimate source of energy, the sun. Assign a student to be the sun. The ball of yarn starts here.

What would be next in the chain? It would be some sort of producer since the sun is what provides energy to the producer, allowing it to make food. While holding on to the end of the ball of yarn, the sun passes the ball to someone with a plant/producer card.

Continue through the web. The ball of yarn must then be passed to a species that depends on that plant – either for food or for habitat (to lay eggs, find cover, etc.). Continue until everyone becomes ‘woven’ into the web. It is okay to go to a member of the web more than once.

When all the cards have been used, ask the “sun” to tug gently on the yarn. As each member of the web feels the tug, they should also start tugging. Soon everyone is tugging, showing the connectivity between all the organisms in the ecosystem.

Have the class stop tugging and pull the yarn taut. Now have one member drop the yarn. As each person feels the tightness go away, they also drop the yarn. Soon no one is holding the yarn.

Wrap up: Regroup and discuss the following questions:

What happens when we remove a link in the aquatic ecosystem? (Organisms that depend on it are affected)

Would the effect of losing a ‘link’ be more or less dramatic if there were fewer members in the system? (Should be more dramatic)

What can we say about the relationship between how many parts the system has (its complexity or diversity) and how stable it is? (In general, complexity makes it more stable.)

How do humans play a role in the web?

What can we do to help ecosystems stay healthy?

OPTION: Recreate your web of life on a bulletin board. Post the class's species and yarn to link them.

Examples of Aquatic Web of Life Members:

Bacteria
Algae
Sedges
Cottonwood tree
Ponderosa pine
Dogwood
Willow
Chokecherry bush
Scud
Mayfly
Dragonfly larva
Aquatic worm
Aquatic snail
Water strider
Dace
Rainbow trout
Largemouth bass
Creek chub
Leopard frog
Tiger salamander
Garter snake
Bullfrog
Great blue heron
Wood duck
Bald eagle
Pelican
Osprey
Killdeer
Beaver
River otter
Muskrat