

FOSS WATERWAY SEAPORT

Food Web *Jenga* Lesson Plan (with Instructor Tips)

Designed and Tested by the Education Department at Foss Waterway Seaport

Learning objectives:

- Understand what ecosystems, food chains and food webs are
- Understand the difference between a food chain and a food web
- Understand that humans are part of ecosystems and food webs
- Understand why primary producers are important to food webs
- Connect their actions in the game (destabilizing the tower by removing pieces) with changes in ecosystems – some due to human actions

Vocabulary:

Ecosystem- a biological community of interacting organism AND their physical environment.

Food Chain - a hierarchical series of organisms each dependent on the next as a source of food

Food Web- a system of interlocking and interdependent food chains.

1. Ecosystems

- a. Start the students off by asking them what an ecosystem is. Write the word “ecosystem” on the whiteboard. After they’ve given some answers, give them the definition, either in your own words or from the written definition above.
- b. Ask them to give examples of what makes up the Puget Sound ecosystem. If they don’t list humans, ask them if they think humans are part of the ecosystem.
- c. Remind them that it includes *non-living* things (physical environment). Ask them to think about non-living parts of an ecosystem such as rocks, sand, etc.
- d. What are other ecosystems? (deserts, forests, rivers, etc.)

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- e. OPTIONAL EXTENSION- What type of ecosystem is Puget Sound?
 - i. Estuary- where fresh and salt water meet

Instructor tip: A great way to talk about ecosystems and integrate art is to have students draw their own ecosystems on a whiteboard or piece of paper. Alternatively, have students “ad-lib” by passing around a board or piece of paper, with each student adding a new component to the ecosystem. For example, one student adds an animal, one adds a plant, one adds a non-living object, etc.

2. Food Chain

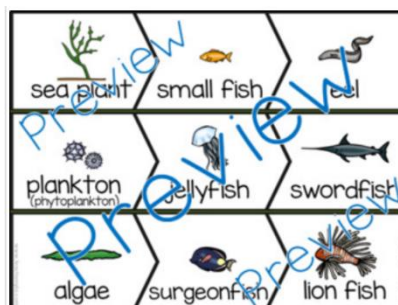
- a. Ask if animals eat the same thing all the time. Do we eat the same thing every day? Do all humans eat exactly the same thing? Ask each student what they last had to eat.
- b. Show a graphic of a food chain (linear trophic/feeding interactions). Ask them if they think that is “real” – is this how animals REALLY eat? Does every animal ONLY eat one thing?
- c. Either go back to the list of things that live in Puget Sound, or generate a new list. Select each organism one-by-one and ask “What do you think THIS eats?” and then “WHO do you think EATS this?”
 - i. This will make for a VERY messy diagram!! That is the point to introduce Food Webs.

Instructor tip: Depending on the ages of the students, it is fun to have cards or papers with different animals on them and have the students MAKE their food chain and then their food web. Involves visual and kinesthetic learners.

Example:

from Teachers Pay Teachers website

(<https://www.teacherspayteachers.com/>)



3. Food Webs

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- a. Introduce the food web graphic (note: you can use any graphic that works best for you). Explain the trophic levels (primary producers, primary consumers, etc.) and describe example species briefly.
- b. Food webs allow for more complex interactions between animals and the things they eat. It's more useful than using a food chain, which is generally simpler.

4. *Jenga* Game

- a. Introduce the *Jenga* blocks and explain that the colors relate to each of the trophic levels that they just learned about:
 - i. GREEN – producers
 - ii. GOLD – primary consumers
 - iii. BLUE – secondary consumers
 - iv. RED – tertiary consumers
 - v. BLACK (or plain) – quaternary consumers or Apex Predators
- b. Ask the students to sort the blocks by color and either stack them up (2 blocks wide, as high as they go) or line them up by color
 - i. They will create a visual “graph” of the relative amounts of organisms in each trophic level
 - ii. This is a great discussion of why there are so many of the producers and primary consumers and so few of the higher levels – this can lead to a discussion of if you are going to CHOOSE to eat from a particular level, what is/are the most sustainable level(s)
- c. Introduce the game and explain that you are going to pretend your *Jenga* tower is a food web in the ocean. Explain the rules if needed (most kids know how to play *Jenga*). They will go one at a time and remove a block.
 - i. In this version of *Jenga*, the blocks are NOT stacked on top, they are removed completely and set aside. This can be explained as depletion of various stocks of organisms.

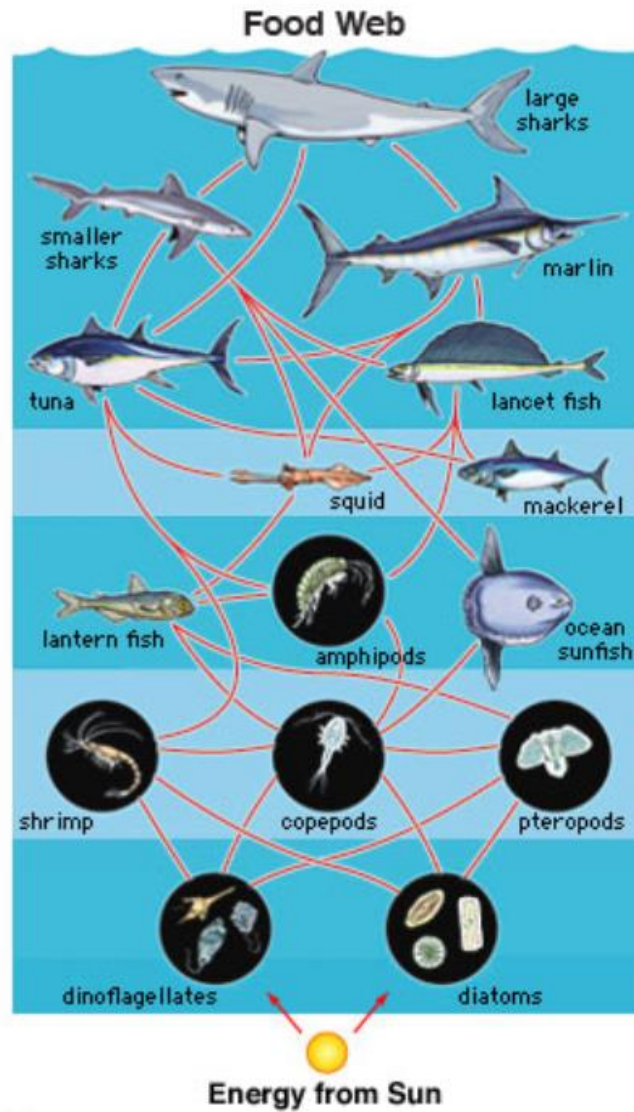
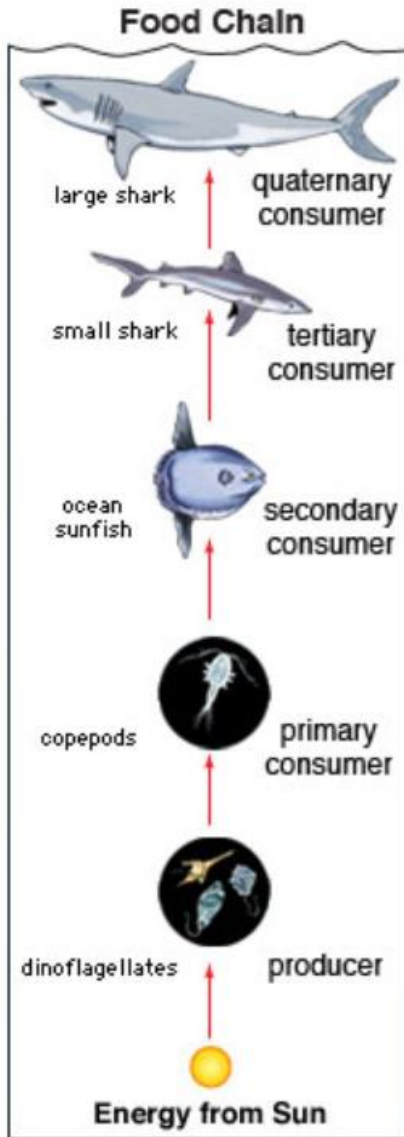
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Instructor tip: *You can also ask the kids to think of reasons that might cause an organism of that type to disappear from the ecosystem – natural disaster, over fishing, oil spill etc. This can bring up a conversation around human impacts.*

- d. After the tower falls, discuss why and how it relates to actual food webs in the ocean, i.e. what would happen if all the plant plankton disappeared?

Note: *Feel free to add more information you find relevant or interesting, or to use different examples. This works for any ecosystem with a few modifications! Also feel free to expand on the critters that make up the Puget Sound food web if students aren't familiar with them.*

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Food Web *Jenga* DIY Instructions

To make a Food Web *Jenga* set for YOUR classroom you will need:

1. A *Jenga* set – 54 wood blocks
 - a. This may be a store bought set (\$10 - \$15) – THIS IS THE EASIEST
 - b. You can make the set yourself with scrap wood – anything from 1" x ½" x 3" pieces to sections of 2x4 for a GIANT set
2. AT LEAST ONE glass or plastic bin – approximately 7"x5"x2"
 - a. Any "Tupperware" container will work – smaller just means that you can't dye as many blocks at a time
3. Several boxes of Food Coloring/Food Dye (\$2 - \$3.50)
4. Paper towels (LOTS)

PROCEDURE:

- Place the appropriate number of blank blocks into the bin
 - GREEN blocks = 26 (primary producers – plants, phytoplankton)
 - GOLD blocks = 15 (primary consumers – herbivores, deer, rabbits, zooplankton)
 - BLUE blocks = 8 (secondary consumers – anything that eats herbivores, small bait fish, anchovy, smelt)
 - RED blocks = 4 (tertiary consumers – larger animals that do not directly rely on herbivores – raptors like eagles, salmon, tuna)
 - BLACK or blank = 1 (quaternary consumer or apex predator – top of the food chain having few or no predators – humans, bears, orcas)
- Squirt AT LEAST one WHOLE bottle of the appropriate color into the bin, onto the blocks. It doesn't matter if it spreads equally.
 - NOTE: the GOLD blocks are made using the YELLOW food coloring
 - the BLACK block is a combination of blue and red to make a dark purple/near black color

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- Add enough water to just come to the top edge of the blocks. More water will just allow the blocks to float – not useful – and it will dilute the food coloring making the colors more washed out.
- Use a chopstick, plastic utensil, or a finger (if you don't mind getting your skin dyed different colors) to flip the blocks so that all sides get wet with the water/dye solution
- Cover the container with a lid or plastic wrap to prevent evaporation
- Leave the blocks in the dye overnight – flipping them once or twice during the dying time.
- Remove the blocks and put them on the narrow side on a stack of 2-3 paper towels to dry. It will take about 8-10 hours for them to fully dry.
 - Once fully dry, the blocks are color fast and non-toxic.
 - Dry blocks may be stacked back inside the *Jenga* box, stored in a gallon size Ziplock bag, or kept in any type of container that works for you.