



## INTRODUCTION

1. Introduce the upcoming trip to Ballona Wetlands - Saltwater Marsh.
  - a. *Answer questions if any arise, especially if there are fears*
2. At Ballona Wetlands we'll be able to explore different types of ecosystems including a salt marsh, coastal dune, and estuarine ecosystem. In these ecosystems, there are many complex interactions between the living and non-living things that call it home. We will explore them in person on the field trip but we'll see if we can discover a few of them today in the classroom.

## BODY

1. One way to look at the interactions between living things is through the transfer of energy seen in a **food chain (Example Food Chain Diagram)**.
  - a. A food chain shows the order of feeding among organisms and how the energy of one organism, energy stored in its tissues, is transferred to the next organism when it gets eaten and digested.
  - b. It usually starts with a plant because plants are **producers**. They are able to make their own "food" from water, air, soil and sunlight in a process called photosynthesis. In this example, we are looking at salt grass, a type of plant found in Ballona Wetlands Saltwater Marsh.
  - c. The plant is eaten by **consumers**. Consumers are organisms which eat other organisms, like plants and animals, to get the energy they need to survive and grow. In our example, a ground squirrel eats the grass seeds for the energy stored there.
  - d. Often there are more than one level of consumers as not all animals eat only plants (**herbivores**). Sometimes it is **omnivores**, animals that eat plants and animals, which are the next level or sometimes it is **carnivores**, animals that only eat meat. In our example, it is a gopher snake which is a carnivore but still not the top of the food chain.
  - e. At the top of this food chain is a red-tailed hawk. It gets its energy from eating the gopher snake which got its energy from the ground squirrel which got its energy from salt grass which got its energy from the sun and non-living things. The red-tailed hawk is the top of the food chain because it doesn't have anyone eating it...unless you consider the things eating it after it dies.
  - f. **Scavengers and decomposers** eat dead stuff and help to return the nutrients back into the soil so the cycle can start again. *Scavengers* like horn snails and fiddler crabs break down the dead stuff (organic matter) into smaller pieces that decomposers like fungus and bacteria are then able to break down fully into inorganic matter.
2. But are these the only 5 organisms living at Ballona Wetlands? No! There are many more plants, animals and bacteria and more that call Ballona Wetlands home. To represent the flow of energy more accurately in an ecosystem we have to look at a lot of food chains and how they interact with each other in a model called a **food web**.
  - a. A food web is a group of connected food chains in an ecosystem.
  - b. Producers (plants, algae) that can make their own food from non-living things are the base of the food web.
  - c. Consumers like herbivores and omnivores which eat the producers are either primary or secondary consumers. Species which eat other consumers are secondary, tertiary or higher consumers.
  - d. At the top are apex predators which eat other consumers and have few or no predators themselves.
3. With all of these new terms in mind, you are going to create a sample food web for one of the ecosystems at Ballona Wetlands, either Salt Marsh, Coastal Dune, or Subtidal Estuary.

### COMPLEX CONNECTIONS

Classroom  
60 minutes

#### Goal(s):

Review ecosystem interactions with wetland food webs then examine human impacts.

#### Measurable Objective(s):

By end of lesson, 90% of students will recognize producers, consumers and decomposers within their food web.

By end of the lesson, 80% of students will develop a model of the flow of energy in a food web.

By the end of the lesson, 50% of students recognize the complex effects of a human impact scenario.

#### Interpretive Thought(s):

Change can have complex effects.

#### Materials:

Food Chain Diagram,  
Worksheet, Advanced Food  
Web Field Guide

#### Supports NGSS:

MS-LS2-B, MS-ESS3-C

#### 4. Activity: Food Web Worksheet

- a. *Hand out the Worksheet with students getting a different ecosystem than their neighbor. You can either use the Worksheet which has the species of each ecosystem already included or you can use the Advanced worksheet and have students figure out which species belong in their ecosystem and then draw or write it in.*
5. To create your sample food web you will use the **Advanced Food Web Field Guide** to figure out who eats whom and its place in the food web.
  - a. *To reduce printing costs, the field guide can be printed one per small group of students or displayed with a projector for all students to see.*
6. As you figure out who eats who, connect the organisms with arrows which depict the flow of energy through the food web. For example, an arrow would go from a prey to its predator since the predator is eating the prey and through digestion is gaining energy from its meal.
7. Identify the producers, decomposers and consumers with a color-coded system (ex: highlighting producers with green, decomposers with brown and consumers with red). Be sure to include a key to identify the colors.
8. There are likely to be lots of overlapping arrows so don't worry if your page gets a bit messy, nature is messy! Take your time to make sure you have all of the connections made between the organisms of your food web then we'll take the next step in this activity.
  - a. *Walk around the class assisting students with any questions or reminding them to label each organism. Once students have completed their sample food web, move to the next step.*
9. As you can see, in an ecosystem, just looking at how energy flows through it via a food web model, there are complex connections between all of the living things. But there are connections that extend beyond just one ecosystem and beyond just the living components.
  - a. If we were to add in some non-living things, how do you think it would affect the connections of the food web? There would be a lot more lines connecting everything.
  - b. Thinking back to the field guide, are there some organisms that live and feed in multiple ecosystems? Red-tailed Hawk, Great Blue Heron, etc.
    - i. These species help to connect ecosystems, especially in an area like Ballona Wetlands where there is limited space in each ecosystem.
    - ii. Let's use an example of one food web of each ecosystem type and take a larger look how things are connected. Place the Example Food Webs (Marsh, Dune, Estuary) on a white board next to each other or project them together on a screen.
    - iii. Use a dry erase marker to highlight the species common to multiple ecosystems.
  - c. Seeing that ecosystems are also connected to each other through species which use multiple ecosystems to live or feed, let's explore what can happen when there are changes to just one part of an ecosystem.
10. What if it was decided a new big building, like a school, hospital or mall, was needed and it was decided to build it on part of the coast dune ecosystem. It ended up being built over all of the dune buckwheat. Let's use the food web models to see how the loss of this one species might affect others.
  - a. *Work with the students to discuss how the loss of dune buckwheat might affect other species, either positively or negatively. Discussion will mostly revolve around the increase or decrease of another species population in response to the loss of the species.*
  - b. *Common discussions will be:*
    - i. *The complete loss of the El Segundo Blue Butterfly because it relies solely on the dune buckwheat. With the loss of the butterfly, the fence lizard will lose one of the insects it eats and it will rely more on other insects. In our simple food chain, the lizard population would drop.*
    - ii. *The cottontail rabbit and ground squirrel population might decrease with fewer food sources or they will switch to eating more willow and salt grass which might decrease the populations of those plants.*
    - iii. *If the populations of willow and salt grass decreased it would ultimately decrease the populations of the rabbit and squirrel which in turn might decrease the populations of the species which eat it, like the coyote, gopher snake, hawk and great blue heron.*
    - iv. *If the population of great blue heron decreased, there would be fewer eating the arrow goby so the arrow goby population might increase putting more pressure on marine invertebrates and decreasing their population. With fewer marine invertebrates, the population of marine algae might increase.*
  - c. As you can see, a change effecting one organism can have a domino effect effecting every species in an ecosystem and even into neighboring ecosystems. The effects might be large, like the complete loss of a species like the El Segundo Blue Butterfly, or small, like an increase in the arrow goby population, but the changes are real and often unpredictable.

- d. Flip over your Food Web Worksheet and answer the questions there based on the human impact described. Make predictions like we did with the buckwheat and be sure to also include how the change listed might impact another ecosystem using the example food webs shown on the board.

## CONCLUSION

It is amazing to see how connected all of the species are in our food webs and it is important to remember we too are connected to them through our actions. We might not eat buckwheat or arrow goby, but actions humans take can have an impact on species, both positive and negative. When we visit Ballona Wetlands in the coming few weeks, we'll be able to observe in person some of the species we've seen in our food webs and see in person some of the human impacts Ballona Wetlands has experienced over time.

## VOCABULARY

**Consumer:** an organism, often animals, that feeds on plants or animals

**Decomposer:** an organism, such as a bacterium or fungus, that breaks down organic matter into its chemical and mineral components

**Ecosystem:** a place where living and non-living things come together and interact

**Food chain:** the order of feeding among organisms

**Food web:** a group of connected food chains in an ecosystem

**Producer:** an organism, like a plant, that is able to produce its own food from inorganic (non-living) substances

**Scavenger:** an organism that feeds on dead organic (once living) matter

## References and Resources

"Scavenger" National Geographic Society <https://www.nationalgeographic.org/encyclopedia/scavenger/> (accessed 12/4/2018)

Content for this lesson was developed independent of this lesson plan but elements were adapted once this resource was found. Modeling Marine Food Webs and Human Impacts. PBS Learning Media <https://www.pbslearningmedia.org/resource/marinesci-sci-foodwebs/food-webs/>