San Elijo Lagoon CONSERVANCY

Preserving, Protecting, and Enhancing San Elijo Lagoon Ecological Reserve and its Watershed

What's for Lunch?
Food Chains and Food Webs

Teacher's Guide • Grade 4 • Supplemental Curriculum & Field Experience

TEACHER OVERVIEW

Objectives

From the information and activities in this packet, students will gain:

- An understanding of what food chains and food webs are and how they work.
- An awareness of the food webs of several San Elijo Lagoon habitats and how they're linked.
- Familiarity with some of the plants and animals that rely on the lagoon for their survival.

California State Standards

This packet will assist you in meeting these Science Content Standards for California Public Schools, which focus on organisms' need for energy and matter to live and grow and their dependence on one another and their environment for survival.

4.2a.	Students know plants are the primary source of matter and energy entering most food chains.
4.2b.	Students know producers and consumers (herbivores, carnivores, omnivores, and decomposers) are related in food chains and food webs and may compete with each other for resources in an ecosystem.
4.2c.	Students know decomposers, including many fungi, insects, and microorganisms, recycle matter from dead plants and animals.
4.3a.	Students know that ecosystems can be characterized by their living and nonliving components.

Vocabulary

abiotic	non-living components of an ecosystem; something that was never alive
algae	photosynthetic organisms, ranging in size from giant kelp to microscopic phytoplankton, that serve as food for many animals, including those in the lagoon (plural, algae; singular, alga)
bacteria	microscopic, single-celled organisms that serve many ecological roles, some harmful and some helpful, including breaking down organic matter (e.g., dead leaves) and releasing nutrients into the environment (plural, bacteria; singular, bacterium)
biotic	living components of an ecosystem, such as the plants and animals
carnivore	an animal that eats only other animals (e.g., hawk or lizard)

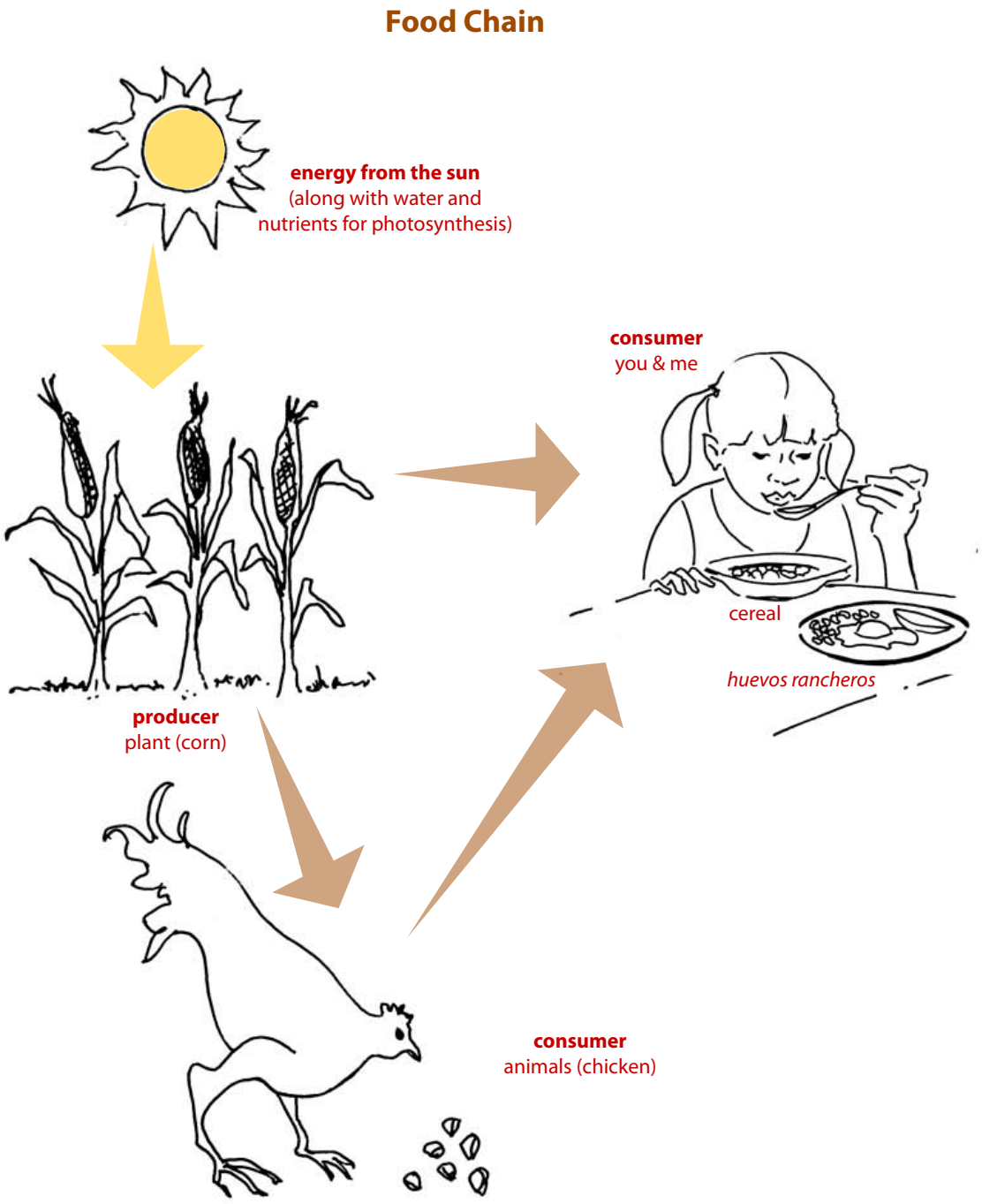
coastal sage scrub	a habitat growing on drier coastal slopes that consists of drought-resistant shrubs and other plants
component	a part of something; a smaller part of a larger entity or system
consumer	an animal that gets its energy by eating other plants or animals
decomposer	a living thing (organism) that breaks down the remains of dead organisms (e.g., some insects, crabs, fungi, or bacteria)
ecosystem	all the living and nonliving things that interact in an area
energy	the capacity to be active, or, as defined in physics, to do work
food chain	the path of food energy in an ecosystem from sunlight to plants to animals
food web	a system of interconnected food chains
fungi	a group of organisms, including mushrooms, yeast, and mold, which feeds on living and dead organic matter or material (plural, fungi; singular, fungus)
habitat	a specific type of environment inhabited by particular animal and plant species
herbivore	an animal that eats only plants (e.g., rabbit or deer)
lagoon	a body of water cut off from another larger body of water by sand, coral or reef
nutrient	a substance that living things need to live and grow
omnivore	an animal that can eat both plants and animals (e.g., skunk, raccoon, chicken, or human)
photosynthesis	the process by which a plant makes its food from sunlight
phytoplankton	plankton that are plants or are photosynthetic
producer	an organism that makes its own food using energy usually from sunlight
riparian	a type of wetland near or along the banks of a river, stream or lake
salt marsh	a type of wetland habitat growing in or near salt water
species	a group of the same type of living things that can mate and produce other living things of the same kind
wetland	an area that is covered by water during all or some part of the year

Introduction

Where Do You Get Your Energy?

What did you (or your students) have for breakfast today? Was it cereal and milk, or bacon and eggs, or eggs with tortillas and salsa (*huevos rancheros*)? Why is eating breakfast, or any meal, important? We eat food for the **energy** it provides to get us through the day.

Breakfast, or any meal or snack, is part of an energy transfer chain called a **food chain**. A good way to understand a food chain and how energy gets transferred is to show one. This is an illustration of a human breakfast food chain.



Starting this food chain with you, the diagram links you to the eggs you may have eaten and the animal they came from — eggs from chickens. The arrow points from the chicken to you because the energy is transferred from the chicken to you. What did the chicken eat? In this food chain, the chicken ate corn and so the diagram shows the link from the chicken to the plant with the transfer of energy (arrow) flowing from plant to chicken. And the plant is linked to the sun. Starting with sunlight, energy flows to plants through the process called **photosynthesis**. This food chain shows how energy is transferred from the sun to plants to animals to you.

What if you just had cereal or pancakes or tortillas? As you see in the illustration, the food chain is shorter and shows the energy transfer from the sun to plants to you.

(Note: Some of your students may not know where their food comes from. You may need to use pictures or videos to show how we get eggs from chickens or milk from cows, and how plants, such as corn or wheat, are made into flour and the flour used to make cereals, breads, pancakes, and tortillas. This may be important before continuing to teach about food chains and webs.)

Because every living thing on Earth needs energy to live, grow and reproduce, every living thing is part of a **food chain**. Within every **ecosystem** there are many food chains that overlap. Overlapping and linked food chains create a complex **food web** in which every plant and animal plays a role (see illustration on page 6).

Our role in a food web is as a **consumer**. A chicken is a consumer as well. We both consume or eat things to get our energy. All consumers rely on **producers**. Producers are the starting point for all food chains and food webs because they make their own food from sunlight, along with water and **nutrients**. That food-making process is called photosynthesis. On land, plants are the foundation of the food web. In the **lagoon**, **algae** and tiny drifting plants called **phytoplankton** are the foundation of the aquatic food web. Consumers couldn't live without producers.

Within a food web, there are different kinds of consumers. Rabbits and deer can eat only plants and so are a type of consumer called an **herbivore** (based on the Latin word roots *herb* for grass or plants and *vor* for eat). Some animals, such as hawks, egrets, and lizards, eat other animals. Animals that eat only other animals are called **carnivores** (*carn* for flesh or meat and *vor* for eat). Some animals eat a variety of foods. Chickens eat corn, seeds, and insects. Humans can eat plants and animals for energy (although some people choose not to eat animals). Animals that eat a variety of foods are called **omnivores** (*omni* for all and *vor* for eat). Omnivores, carnivores, and herbivores are all consumers.

There is one other group of organisms that play a very important role in a food web. They are the **decomposers**—nature's recyclers. Decomposers feed on decaying plants and animals or on animal wastes. These recyclers can be large, such as a turkey vulture, or small, such as ants or crabs. And some can be very small, sometimes too small to see easily, such as **bacteria** or **fungi**. You can see tiny decomposers at work when you see mold on bread or find fruit rotting. All decomposers have a role in breaking down animal and plant remains, thereby enriching the soil with nutrients. The recycling of nutrients enables more plants, the producers, to grow. It also helps clean up an ecosystem, which keeps it healthy. If there weren't any decomposers, imagine the pile up of wastes that would occur.

This is one of the problems with some wastes that humans make, such as plastic bottles, candy wrappers or other trash. There are no natural decomposers that can break down and recycle most of our trash. That's why it's important that each of us recycles the things we can recycle, such as paper, glass, and aluminum, and even more important that we limit the use of things we can't recycle and that never break down, such as plastics. We want to keep our ecosystem clean and healthy for ourselves and the other organisms that share this planet with us.

In addition to the living (or **biotic**) **components** of an ecosystem, there are also non-living (**abiotic**) components. The main energy source for almost all food webs is the sun. The sun is one of the abiotic components of an ecosystem. Other non-living components are the air, soil, and water. Every ecosystem is made up of abiotic and biotic components that interact and it is that interaction that makes an area unique and productive.

When you visit San Elijo Lagoon, you will learn details about some of the biotic and abiotic components of at least three different **habitats**: **salt marsh**, **riparian** forest, and **coastal sage scrub**. The salt marsh is washed by salty ocean water when the mouth of the lagoon is open, creating a succulent, salt-tolerant, low-growing, **wetland** plant community. Where there is fresh water flowing in streams and drainages, you'll find a thicket of trees and shrubs of the riparian forest near the wetland. Coastal sage scrub is composed of drought-resistant shrubs and other plants that grow on drier coastal slopes.

Why are these habitats so different? It's because their abiotic components, especially water and soils, are different. Abiotic components play a major role in determining what plant communities survive, which in turn determine which animals will live there. These interactions result in different food webs as well. Where there are different habitats close together, as there are at San Elijo Lagoon, the food webs of each overlap creating a very complex system (see illustration on page 6).

To summarize, why is it important to understand how the biotic and abiotic components of a community interact? It's because both components are important within any ecosystem. A break in any part of a single food chain can negatively impact the entire food web and harm the entire ecosystem.

References and Suggested Readings

For more information, look for these references at a local library or online.

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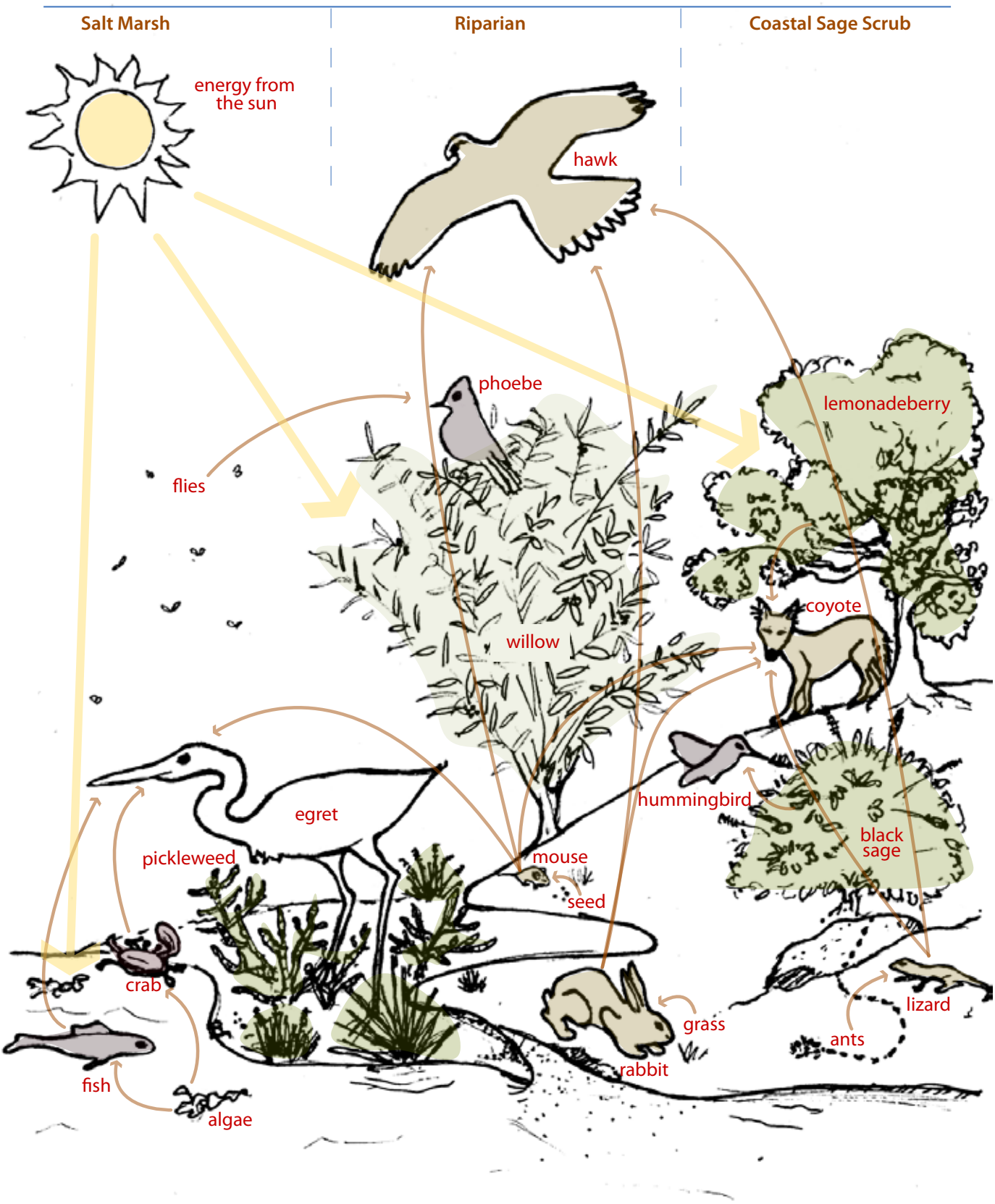
Silverstein, A., Silverstein, V. & Nunn, L.S. 2008. *Food Chains*. Minneapolis, MN: Twenty-first Century Books.

Stienstra, T. 2000. *California Wildlife: A practical guide*. Emeryville, CA: Avalon Travel Publishing, Inc.

Food Web


Salt Marsh
Riparian
Coastal Sage Scrub
energy from the sun
hawk
phoebe
lemonadeberry
flies
willow
coyote
egret
hummingbird
pickleweed
mouse
black sage
seed
crab
grass
lizard
ants
rabbit
fish
algae

ACTIVITIES

We developed the activities in this packet to support your field trip.

Pre-Visit

Activities 1 and 2 are designed as pre-visit activities. We recommend you use these to familiarize your students with the concepts of living (biotic) and non-living (abiotic) things in an ecosystem and food chains that they're a part of. This will help them connect to the food chains and food webs you will learn about from your onsite leader (docent) during your visit to San Elijo Lagoon.

Post-Visit

Activity 3 is designed as a post-visit activity that will help your students review what they learned about the food chains and food webs in their lives and at San Elijo Lagoon.

Teacher's Aid

Activity Introduction

Every habitat or ecosystem is composed of living and non-living things that interact. Some of the living, or biotic, components are plants, birds, insects, fungi, and bacteria. Some of the non-living, or abiotic, components are air, soil, water, and sunlight. During this activity, your students will survey the living (biotic) and non-living (abiotic) components of their schoolyard or school campus. This will help prepare them for their visit to San Elijo Lagoon.

Time & Materials

- This activity should take about 45 to 60 minutes to complete.
- Students can work in teams or individually.
- You will need one copy of the Student Worksheet for each student or student team.

Instructions to Teacher

Make copies of the Student Worksheet on page 9. Give each student or group of students a copy of a worksheet.

You're going to have your students survey the schoolyard or school campus for living (biotic) and non-living (abiotic) items. After they complete the worksheet, you will discuss their observations and their answers to the questions on how the biotic and abiotic factors interact in this environment.

Instructions to Students *(to be given verbally)*

Every habitat or ecosystem is composed of living (biotic) and non-living (abiotic) things. We are going to survey our schoolyard (or playground or school campus) to find the major biotic and abiotic components. I am going to give each of you (or each team) a worksheet so that you can record your survey data.

Note: Review the worksheet with students so they understand what they're supposed to do.

We will spend about 15 to 20 minutes outside conducting our survey and completing the table on your worksheets. When we come back to our classroom, I want you to answer the questions below the survey table. Then we will discuss your observations and answers to the questions.

Student Worksheet

Instructions

You are looking for living (biotic) things, such as birds, insects, or plants, and for non-living (abiotic) things such as water, dirt, or sunshine. When you find something, write the name of the item in the table. Next, add your observations, such as where you saw it and what it was doing (if alive). For each item you observe, check a box to identify if it is biotic and alive, biotic but now dead, or abiotic. When you return to the classroom, answer the questions at the bottom of the page.

Name of Item	Your Observations (Where was it and, if alive, what was it doing?)	Biotic (alive)	Biotic (dead)	Abiotic
EXAMPLE: sunlight	everywhere outside because it was a sunny day			✔

Questions:

Did you find more biotic or abiotic items? _____

Which places had the most biotic items? _____

What do biotic things need to survive? _____

How do the abiotic things help or harm the biotic things? _____

_____

Teacher's Aid

Activity Introduction

Every living thing needs energy to survive. We get energy from the foods we eat, which makes us part of a food chain. A food chain is the transfer of energy from the sun to plants, from plants to animals, and from animals to other animals. Parts 1 and 2 of this activity engage individual students in identifying a personal food chain. Part 3 of this activity involves the entire class in building a food web from their individual food chains. This will help prepare your students for the food chains and food webs they will learn about during their visit to San Elijo Lagoon.

Time & Materials

- This activity should take about 30 to 60 minutes to complete. You may want to conduct it over two class periods.
- Students will work initially individually on their worksheets. Then they'll work together as a class.
- You will need one copy of the Student Worksheet (both sides) for each student.

Instructions to Teacher

Make copies of the Student Worksheet (2 sides) on pages 13 & 14. Give each student a copy.

For Part 1, choose a meal (e.g., lunch) and have your students record everything they ate during that meal. (You could also assign this as homework and have students record breakfast or dinner. You'll need to modify the wording of the instructions if you choose another meal.)

For Part 2, after they have completed Worksheet 1, have them draw their personal food chain linking the sun to plants to animals to themselves on Worksheet 2. Make sure their links have arrows showing the flow of energy from sun to plants to animals (see the illustration in this packet's Introduction).

Finally, for Part 3, have the entire class work on building a class food web by combining all of the food chains on Worksheet 2 into one large food web diagram on a classroom board. On this food web, identify the producers, the different kinds of consumers (omnivores, carnivores, herbivores) and the decomposers. Don't forget the sun, soil, and water (all important abiotic components). Discuss the differences between the individual food chains and the class food web.

For visual examples, see the illustrations in this packet's Introduction.

Instructions to Students *(to be given verbally)*

Every living thing needs energy to survive and energy comes from the foods we eat, which makes us part of a food chain. A food chain shows the transfer of energy from the sun to plants, from plants to animals, and from animals to other animals. For this activity, you're going to identify and draw your personal food chain, then as a class we're going to draw a food web.

Part 1 Instructions

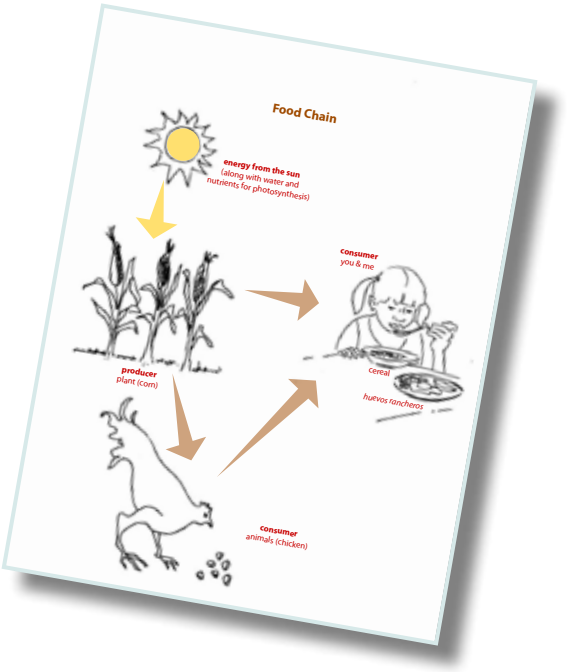
When you go to lunch today, I want you to "record in your brain" everything that you eat. When you come back into class, you will be completing a chart listing the foods in your lunch. [*Hand out the Student Worksheet after lunch.*] On the front page—Student Worksheet 1—I want you to write down everything you ate during your lunch. Next to each food on your list, explain where that food comes from, that is, what organism it is from. For example, if you had a tuna sandwich, what kind of organism is a tuna? (*Answer: a fish, which is an animal.*) How about the bread? What kind of organism is bread made from? (*Answer: from wheat, which is a plant.*)

Now complete your lunch worksheet.

Part 2 Instructions

For Part 2 (back page of worksheet), I want you to draw your personal food chain based on your food list. Here's my example.

Draw for students an example food chain based on your lunch or other meal — see the illustration in this packet's Introduction for a visual example. Include yourself and the sun and explain why.



Go ahead and make your food chain drawing like the one I just showed you, but use your food list. Make sure you include yourself and the sun in your drawing, and all the foods you ate.

Draw lines showing how the energy from the sun transfers through your foods to you.

Part 3 Instructions

Now as a class we're going to combine our food chains to build a food web. We'll start with the sun and the producers — those are organisms that make their own food from the sun. What uses sunlight, water, and nutrients to make food? (*Answer: plants.*) So who has plants on his or her food chain.

Take students' answers and draw the various plants at the bottom of the food web. Remind students of the importance of plants—they're the foundation of a food chain.

If any students mention mushrooms, place those slightly to the side so you can explain that mushrooms aren't a plant, they're fungi. That would also give you an opportunity to talk about decomposers when the food web is complete.

Next, who had meat or other animal products for lunch?

Take students' answers and place the various animals/animal products on the next layer of the food web.

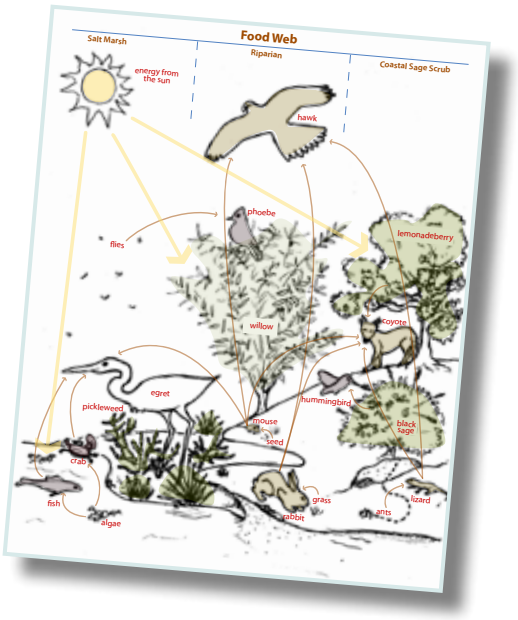
As you draw, if possible, organize animals together by those that are herbivores (cows, some fish), those that are carnivores (tuna, salmon, and some other fish), and those that are omnivores (chickens).

Finally, let's add ourselves to the food web.

Explain that we are omnivores — can eat a variety of foods.

Draw lines from sun to plants to animals to people to show how energy transfers from layer to layer.

Note: If some students are vegetarians, you can have two or more people at the top of your food web and show energy transfer through plants and animals for omnivores and through plants only for vegetarians.



Extension

You can use the food web illustration of San Elijo Lagoon habitats from the Introduction of this packet and have students compare and contrast what they see in it with what they see in the class food web.

Student Worksheet 1

Part 1 Instructions

Record everything you ate during your meal. Next to each food you list, explain where that food comes from, that is, what type of organism it is from — a plant or an animal.

Name of Food	Source of Food What kind of organism did your food items come from?
LUNCH EXAMPLE: tuna fish sandwich	tuna is a fish, which is an animal bread is made from wheat, which is a plant
apple	apple is a fruit, which comes from a plant

Student Worksheet 2

Part 2 Instructions

Use your food list on the front of this sheet to draw your personal food chain. Make sure you include yourself and the sun in your drawing, along with the foods you ate. Draw lines showing how the energy from the sun transfers through your foods to you.

Picture of My Food Chain

Teacher's Aid

Activity Introduction

It's important that your students reflect on and process what they learned during their field trip. This activity will help them synthesize what they learned about the lagoon's food webs.

Time & Materials

- This is an individual student activity that could take your students 30 to 45 minutes to complete.
- Your students will need paper and writing tools.
- You may also want to make available the vocabulary list, San Elijo Lagoon Animal Cards (available online) and/or library books showing the species they saw at the lagoon.

Instructions to Teacher

Have your students talk for a few minutes about their experiences at the lagoon. Which animal and/or plant species did they see? What was new to them? What new words did they learn? Did they see any food web activity (animals hunting, birds or butterflies feeding, ants or crabs eating, fungi growing and decomposing plant materials, etc.)? Did they see any human waste or trash that could be harmful to lagoon organisms? What could they do to make sure the lagoon stays clean and healthy?

Now ask students to write a story about an animal or plant that they saw during their field trip to the lagoon. Include in the story where that organism would be found, what it eats (or how it gets its energy), and if it's a consumer (herbivore, carnivore, or omnivore), producer, or decomposer. Have students include all the biotic and abiotic components they can think of that would be linked to their organism. Have them conclude their story by describing what they could do to help keep the lagoon clean and healthy for their organism. Finally, you can have students finish with a lagoon food web drawing that includes their organism and complements their story.

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Bring your class on a field trip to the lagoon. To learn about the different programs offered or to schedule a walk...

- visit www.sanelijo.org/education
- email education@sanelijo.org
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