

Shorebird Food Webs

Adapted from “Salt Marsh Food Web.” San Francisco Bay National Wildlife Refuge. “Salt Marsh Manual.”

Grade Level: lower elementary, upper elementary/middle school

Duration: one 30-minute class period

Skills: critical thinking, problem solving, predicting, discussion, and vocabulary

Subject: science

Concepts

- Habitat is the place where an organism lives because it is adapted to find food, water, shelter, and space there. Numerous habitats are located within an ecosystem.
- Shorebirds are one part of a healthy functioning ecosystem.
- Both shorebirds and humans depend on clean, healthy ecosystems.
- Wetland and grassland ecosystems provide extremely important habitats for shorebirds.

Vocabulary

- ecosystem
- endangered
- extinct
- food web
- producers
- consumers
- predators
- prey
- habitat

Overview

In this activity, students take on the roles of abiotic or biotic components of a wetland or grassland habitat. Using a ball of yarn, students create a web to demonstrate how shorebirds are connected to all parts of their habitat. They discover how changes in the food web can affect a shorebird’s survival.

Objectives

After this activity, students will be able to:

- Identify at least five different plants and animals from one of the seven habitats.
- Name at least two relationships between plants and animals.
- Name at least two shorebirds that live within the habitat studied.
- Explain what it means to be an endangered species.
- Define the word extinct.

Materials

- Ball of yarn to create a web
- Shorebird Food Web Cards for either: tundra, salt marsh, freshwater marsh, mudflat and sandy beaches, rocky-intertidal habitat, or grasslands.

Introduction

Habitat is the place where species find food, water, shelter, and space to survive. Habitat is found within an *ecosystem*. An ecosystem consists of all living parts (plants and animals) and the nonliving parts (air, water, soil, minerals) in an area of any size, interacting and linked together by nutrient flow and energy from the sun. There are many relationships and interactions between the *producers*, the green plants that use sunlight to produce their food, and the *consumers*, those animals that feed on plants and each other. These relationships and interactions in an ecosystem can be demonstrated as a “web,” with each plant, animal, or nonliving part connected to each other either directly or indirectly. When one part of the web is touched, every part is affected.

Plants and animals are considered *endangered* when there are so few of a particular species left that it runs the risk of becoming *extinct*. Many shorebird populations today are in trouble because the habitats they depend on for nesting, migration, stopover, and

nonbreeding have been lost to development.

For more information on shorebird habitats, read *Shorebirds Depend on a Chain of Healthy Habitats* in the *Shorebird Primer*.

Activity Preparation

1. Select the habitat food web that you want to explore with your students from the Shorebird Food Web Cards.
2. Photocopy the Food Web Cards onto cardstock and cut them out.
3. If you have more students in your class than you have cards, photocopy and cut extra producer cards. It is okay for more than one student to represent the producers in the food web. In reality, a healthy food web requires a greater number of producers to support the other organisms.

Procedure

1. Ask the students to form a circle. Hand out a food web card to each student. Save the sun card for yourself. Let the students know that it is okay for several people to have the same cards.
2. Ask the students if they know why several students are representing *producers* in the web? These are the producers at the base of the food web which usually do outnumber the *consumers* in nature. They have to support the animals at the top.
3. Have the students read their cards silently, then aloud to the rest of the class. Ask them to listen to each other carefully for clues to the order of the web. Explain that they will have to connect their organisms to other organisms they depend on.

4. You, the “sun,” start the web activity. Read your card, then wrap one end of the yarn around your hand and pass the ball of yarn to the student representing the organism you are connected to. For example, the “sun” would connect to a “plant” and say “ I am the sun and I provide energy for the plant to grow.” NOTE: Connections can be indirect—that is animals also require air, water, and sunlight.
5. Now the student with the ball of yarn reads his or her card and passes the ball to the organism he or she is connected to. For example, a student with a plant card would then pass the ball of yarn to an animal that eats it and say “I am a plant and provide food for _____.”
6. Continue this until all the students are connected by the web of yarn.
7. Discuss with students what might happen if one species were lost from the web. Simulate removing one of the organisms from the web by tugging on one line in the web or have one “organism” drop its line. Instruct everyone who feels the tug to *gently* tug the line(s) she or he is holding. This ripple effect should pass through everyone in the web.
8. Have a class discussion of the following questions:
 - How does the loss of one species in the food web affect the other species?
 - What would happen to the food web if one of these species were to be permanently removed from the habitat?
 - What does it mean when a species is listed as *endangered*?
 - Are any animals in this food web endangered?
 - What do you think we can do to keep shorebirds from becoming endangered?

Additional Activities

Food Webs in Other Habitats

Make another set of food web cards for a habitat not found in your area. After creating this food web as a class, ask students to research this food web further. What other plants and animals live there? What are the environmental conditions in this habitat? Refer older students to the *Habitats Student Readings* in the *Types of Habitat* activity in this section for more information about important shorebird habitats.

Shorebirds of Your Habitat

Read the *Shorebird Profiles* found in the *Appendix* to find the shorebirds mentioned in your food web. Find and color the matching shorebird illustrations in the *Shorebird Coloring Pages* of the *Appendix*.

Make a Food Web Mobile

Divide your class into seven teams and assign each team one of the habitat types included in this activity. Instruct each team to color its food web cards and assemble them into a mobile. Ask them to highlight, in any way they choose, any species in the web that are endangered. Have each team present its food web mobile to the entire class before hanging it in the classroom.



List of Food Web Cards

Food Web Habitats

Tundra	166
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Tundra Food Web Cards

Sun

I am the sun. *Everything* on earth depends on me. And in my hands I hold the web of life.

Water

I am water. *All living things* need me to survive. Most plants and animals find me pooled in small depressions on top of the soil. I cannot seep into the hard frozen permafrost of the tundra.

Air

I am air. I am made up of oxygen and nitrogen. I am very important to *all living things*. *Fish*, which do not breathe air directly, get oxygen from the water. It is important to keep me clean because pollution in the air is harmful to all creatures.

Soil

I am soil. I am very important to *all living things*. *Plants* use the nutrients in me to grow. Only the top six inches of me thaws in the summer. *Animals* get their nutrients from plants. When living things die, they decompose and form a spongy layer on top of me called peat.

Zooplankton

I am *zooplankton*. I like to eat *detritus*, *phytoplankton*, and other *zooplankton*. I am eaten by lots of different animals, including *small fish*, *crabs*, *worms* and *snails*. I can be found in the small pools of water scattered across the tundra.

Phytoplankton

I am phytoplankton. I use *sunlight* to produce my own food. Many different organisms like to eat me, including *aquatic worms*, *zooplankton*, and *insect larvae*. You can find me floating in the small pools of water scattered across the tundra.

Lichen

I am lichen—part algae, part fungus. I use *sunlight* and nutrients in the *soil* to grow. I am one of the main diets of the *caribou* that nibble on me year round!

Detritus

I am detritus—dead plant material. When I was a live plant, I used *sunlight* to produce my own food. When I died, I decomposed into a material that feeds lots of other animals. *Zooplankton*, *insect larvae*, *grasshoppers*, and *beetles* eat me.

Tundra Food Web Cards

Cloudberry

I am cloudberry. I use *sunlight* and the *nutrients* in the soil to grow. *Ptarmigan*, *Arctic foxes*, *Arctic hares*, and *lemmings* eat my ripe berries in the fall.

Cotton Grass

I am a cotton grass. I use *sunlight* and the nutrients in the *soil* to grow in clumps across the tundra. I provide shelter and nesting material to many small animals. *Lemmings*, *Arctic hares*, and *musk ox* nibble my delicate shoots and eat my seeds.

Mosquito/Insect Larva

I am an insect larva. I hatch from an egg my parent laid on the *cotton grass*, *cloudberry*, or in the *water* of the small wetlands pools scattered across the tundra. I eat *zooplankton*, *phytoplankton*, and *detritus*. Tundra shorebirds like the *Pacific-Golden Plover*, the *Buff-breasted Sandpiper*, and the *Dunlin* time their arrival at the yundra just when I am hatching because I give them lots of energy to raise their chicks.

Ptarmigan

I am a ptarmigan. I eat *cloudberry*, *cotton grass seed*, and *insect larva*. *Arctic fox*, *gray wolf*, and *snowy owl* all try to make a meal of me. Thank goodness for camouflage! There aren't many places to hide from predators on the flat, barren tundra landscape.

Lemming

I am a lemming. I eat tundra plants like *cloudberry* and *cotton grass* and *insect larvae*, *beetles*, and *grasshoppers*. I have to watch out for *Arctic foxes*, *gray wolves*, and *snowy owls*—tundra predators that eat me.

Arctic Fox

I am an Arctic fox. I eat almost anything smaller than myself. I chase tundra shorebirds like *Pacific Golden-Plover*, *Buff-breasted Sandpiper*, and *Dunlin*. I will also eat *lemming*, *ptarmigan*, *Arctic hare*, and even *beetles*, *grasshoppers*, and the berries of the *cloudberry* plant!

Caribou

I am a caribou, the wild relative of the reindeer. Even though I am one of the largest animals on the tundra, I survive by nibbling the *lichen* growing on the rocks scattered across the landscape. While I graze, I keep a careful watch for *gray wolf* which tries to catch the young and weak members of my herd.

Pacific Golden-Plover

I am a Pacific Golden-Plover. Like other tundra shorebirds, I feast on *insect larvae*, *beetles* and *grasshoppers*. *Arctic fox*, *gray wolf*, and *snowy owl* prey on my chicks and me.

Tundra Food Web Cards

Buff-breasted Sandpiper

I am a Buff-breasted Sandpiper. I use *lichen* and *dead willow leaves* to line my nest. I eat *beetles*, *grasshoppers*, and *insect larvae*. Sometimes *caribou* trample my nest and eggs as they slowly graze across the tundra.

Dunlin

I am a Dunlin. I feed on the abundant supply of tundra insects—*beetles*, *grasshoppers*, and *insect larvae*. My camouflage helps hide me from the *Arctic fox*, *gray wolf*, and *snowy owl* which like to eat my chicks and me.

Beetle

I am a beetle. I eat whatever I can find including the bodies of dead animals! Mostly I feed on *insect eggs and larva*, *detritus*, *cotton grass*, *cloudberry*, and other tundra plants. In turn, I am food for *Arctic fox*, *Pacific Golden-Plover*, *Buff-breasted Sandpiper*, and *Dunlin*.

Grasshopper

I am a grasshopper. I feed on tundra plants like *cloudberry*, *cotton grass*, and *dwarf willow*. *Arctic fox*, *Pacific Golden-Plover*, *Buff-breasted Sandpiper*, and *Dunlin* eat me.

Dwarf Willow

I am a dwarf willow. I offer shelter and protection to many tundra birds and small animals. *Ptarmigan*, *grasshopper*, *caribou*, *lemming*, and *Arctic hare* eat my tender buds.

Snowy Owl

I am a snowy owl. I hunt from above, soaring in search of *lemming*, *arctic hare*, *Arctic fox kits*, *Pacific Golden-Plover*, *Buff-breasted Sandpiper*, *Dunlin* adults and chicks, and *ptarmigan*. Few tundra predators can catch me, but *gray wolf* will eat me if he can.

Freshwater Marsh Food Web Cards

Sun

I am the sun. *Everything* on earth depends on me. And in my hands I hold the web of life.

Water

I am water. *All living things* need me to survive. Rain and snowmelt bring me into the marsh.

Air

I am air. I am made up of oxygen and nitrogen. I am very important to *all living things*. *Fish*, which do not breathe air directly, get oxygen from the water. It is important to keep me clean because pollution in the air is harmful to all creatures.

Soil

I am soil. I am very important to *all living things*. *Plants* use the nutrients in me to grow. *Animals* get their nutrients from plants. When living things die, they decompose and return their nutrients to me.

Zooplankton

I am *zooplankton*. I like to eat *detritus*, *phytoplankton* and other *zooplankton*. I am eaten by lots of different animals, including *small fish*, *aquatic worms*, *snails*, *tadpoles*, and *mosquito larvae* as I swim through the water.

Phytoplankton

I am phytoplankton. I use *sunlight* to produce my own food. Many different organisms like to eat me, including *aquatic worms*, *zooplankton*, *insect larvae*, and *tadpoles* as I float in the water.

Detritus

I am detritus—dead plant material. When I was a live plant, I used *sunlight* to produce my own food. When I died, I decomposed into a material that feeds lots of other animals. *Zooplankton*, *insect larvae*, *tadpoles*, and *fish fry* eat me.

Cattail

I am a cattail. I use the *sun*, *water*, and *soil* to grow in the shallows of the freshwater marsh. *Muskrat* eat my tender shoots and collect my stalks to make their huts. *Red-winged Blackbirds* nest within my tall growth.



Freshwater Marsh Food Web Cards

Rush

I am a rush. I use the *sun, water, and soil* to grow along the edges of the freshwater marsh. Many wetland creatures including *Mallard ducks* eat the seeds I drop.

Snail

I am a snail. I eat *phytoplankton* and *zooplankton*. Lots of different birds prey on me, such as *Spotted Sandpiper, Hudsonian Godwit, and Great Blue Heron*. I live in the mudflats of the wetland.

Duckweed

I am duckweed. I float on top of the *water* like little green dots, using the sun to make food for myself. *Mallard ducks* use their strainer-like bills to collect me off the water's surface.

Dragonfly

I am a dragonfly. As a winged adult I am a fierce *mosquito* predator. I have to watch out for birds that like to eat me, like the *Red-winged Blackbird* and *sunfish* that grab me as I drink from the surface of the water. *Humans* who sometimes like to collect me are a danger too!

Insect Larva

I am a dragonfly larva. I begin life in the water eating *detritus, small fish, tadpoles,* and other *insect larvae*. However, *fish, frogs,* and *turtles* like to eat me when they can.

Mosquito

I am a female mosquito. When I am hungry I look for any warm-blooded animal to feed on. At the wetland, I feed on *muskrat, Mallard duck, Red-winged Blackbird, Spotted Sandpiper,* and *Hudsonian Godwit,* but I like *humans* the best!

Mallard Duck

I am a Mallard duck. I spend my time straining *duckweed* from the water's surface. I often get an *invertebrate* along with my plant meal. Unleashed *dogs* and *humans* are my biggest threats.

Great Blue Heron

I am a Great Blue Heron. I use my sharp, pointed bill to spear *fish* and *frogs*. Like Mallard duck, unleashed *dogs* are a threat to my chicks and me.

Freshwater Marsh Food Web Cards

Sunfish

I am a sunfish. I take shelter as a young fry among the *cattails* and *rushes*, eating *detritus*, *zooplankton*, *phytoplankton*, and small *insect larva*. As I grow, I venture out into the open water area of the pond in search of a bigger meal—dragonflies as they try to take a drink, *tadpoles*, and small *frogs*.

Muskrat

I am a muskrat. I eat *cattails* and use them to build my home. If I am not careful I may be trapped by a *human being* or caught by an unleashed *dog*. *Red fox* likes to eat my young—and me too!

Leopard Frog/Tadpoles

I am a leopard frog. As a tadpole I feast on the *detritus* near the edges and on the bottom of the wetland. I am food to *fish* and *dragonfly larvae* when I am young. Once I am a frog, even more wetland creatures consider me food, including *Great Blue Heron*.

Red-winged Blackbird

I am a Red-winged Blackbird. I make my nest among the tall *cattails* at the edge of the wetland pond. I eat wetland insects like *dragonflies* and *mosquitoes*. A stray *dog* or a *red fox* will make a meal of me when they catch me.

Spotted Sandpiper

I am a Spotted Sandpiper. I probe the wetland mud for *tiny snails* and *insect larvae*. I move quickly and am well camouflaged to help me hide from *red fox* and *dog*.

Hudsonian Godwit

I am a Hudsonian Godwit. My long, slightly upcurved bill is perfect for finding *snails* and *insect larvae* in the mud. If I am not careful, I can become food for *red fox* or *dog*.

Red Fox

I am a red fox. I am the great hunter of the wetland. I eat *Mallard ducks*, *muskrats*, *Red-winged Blackbirds*, *Spotted Sandpipers*, and *Hudsonian Godwits* when I can catch them. I am happy, however, to eat *leopard frogs* too. I watch out for *dogs*, a relative of mine that is often quite bigger than I am. I also stay clear of *human beings* who sometimes trap me for my beautiful red fur coat.

Dog

I am a dog. I love to chase anything that runs. I can catch *Mallard ducks*, *muskrats*, *Red-winged Blackbirds*, *Spotted Sandpipers*, *Hudsonian Godwits*, *Great Blue Herons*, and even *leopard frogs* when I am loose in the wetland!



Freshwater Marsh Food Web Cards

Human Being

I am a human being. As you know, I eat a huge variety of foods including *ducks* and *fish*. I am at the top of the food chain, so no animals prey on me except that pesky *mosquito*! Sometimes I drain wetlands to build homes and businesses or to make way for roads and shopping centers. *Dog* often accompanies me on my walks, and I let him run off-leash for exercise.



Rocky-Intertidal Habitat Food Web Cards

Sun

I am the sun. *Everything* on earth depends on me. And in my hands I hold the web of life.

Water

I am water. *All living things* need me to survive. Saltwater from ocean tides and freshwater from the rain collect in small pools among the rocks.

Air

I am air. I am made up of oxygen and nitrogen. I am very important to *all living things*. *Fish*, which do not breathe air directly, get oxygen from the water. It is important to keep me clean because pollution in the air is harmful to all creatures.

Rocky Substrate

I am rock. I take the place of soil in the rocky intertidal habitat. *Seaweed* anchors its roots to me. *Mussels*, *limpets*, *barnacles*, *starfish*, and *sea urchins* cling to my surface as waves crash to shore.

Zooplankton

I am *zooplankton*. I like to eat *detritus*, *phytoplankton* and other *zooplankton*. I am eaten by lots of different animals, including *small fish*, *aquatic worms*, *shrimp*, *clams*, and *barnacles* as I swim through the water.

Phytoplankton

I am phytoplankton. I use *sunlight* to produce my own food. Many different organisms like to eat me, including *small fish*, *aquatic worms*, *zooplankton*, *shrimp*, *clams*, and *barnacles* as I float in the water.

Detritus

I am detritus—dead plant material. When I was a live plant, I used *sunlight* to produce my own food. When I died, I decomposed into a material that feeds lots of other animals. *Zooplankton*, *phytoplankton*, *tidepool shrimp*, *aquatic worms*, *clams*, and *barnacles* eat me.

Seaweed

I am seaweed. I use *sunshine* to make food for myself. *Sea urchins* and *small fish* nibble at me as I cling to the rocks. I also provide places for fish and other wildlife to hide. When I die and become *detritus*, I am eaten by many other organisms.

Rocky-Intertidal Habitat Food Web Cards

Tidepool Shrimp

I am a tidepool shrimp. I feed on *seaweed* and *detritus* floating through the water. *Ruddy Turnstones*, *starfish*, and *gulls* make a meal of me.

Limpet

I am a mussel called a limpet. I cling to the rocks like a suction cup. I eat *phytoplankton* and *zooplankton* that floats in with the tide. *American Oystercatchers* use their strong, flattened beak to pry me off the rocks to eat my soft body that is hidden under my shell.

Razor Clam

I am a razor clam. I burrow deep into the sand and wait for the tide to bring me a fresh supply of *phytoplankton* and *zooplankton* with each pulse of the surf. Birds like *gulls*, *Ruddy Turnstones*, and *oystercatchers* are always looking to make a meal of me. *Starfish* and *Gulls* eat me too when rough surf brings me to the surface.

Starfish

I am a starfish. I cling to the *rocks* as the surf rolls in out of the tidepool. I eat anything that I can get my strong arms around, mostly *clams*, *limpets*, *barnacles*, *oysters*, and *sea urchins*. *Gulls* like to eat me if they can tear me loose from the rocks.

Sea Urchin

I am a sea urchin. I cling to the *rocks* as the surf rolls in and out of the tidepool. I eat *seaweed* that grows on the rocks or is brought in with the surf. *Gulls*, *sea otters*, and *starfish* like to eat me.

Gull

I am a gull. I eat almost anything I can find on the beach—*starfish*, *sea urchins*, *clams*, and even the chicks and eggs of shorebirds like *oystercatcher* and *Ruddy Turnstone*!

Oystercatcher

I am an oystercatcher. I use my chisel-like beak to pry open the shells of *razor clams* and *oysters* and to pull *limpets* from the rocks. *Gulls* prey on my eggs and chicks.

Ruddy Turnstone

I am a Ruddy Turnstone. I get my name from the way I flick over *seaweed* or turn over small stones in search of small marine invertebrates like *snails*, *aquatic worms*, *razor clams*, and *tidepool shrimp* to eat. *Gulls* prey on my eggs and chicks.

Rocky-Intertidal Habitat Food Web Cards

Small Fish

I am a small marine fish. The tide brings me into the rocky tidepool where I spend my time nibbling on the *seaweed* I find there. If I am not careful, a *starfish* or a *Gull* may make a meal of me.

Barnacle

I am a barnacle. I filter *zooplankton*, *phytoplankton*, and *detritus* from the water for food. *Starfish* eat me.

Oyster

I am an oyster. I filter *zooplankton* and *phytoplankton* by sucking ocean water into my shell through my siphon. *Crabs*, *starfish*, *oystercatchers* and *human beings* eat me.

Aquatic Worm

I am an aquatic worm. I eat mostly *detritus*, *phytoplankton*, and *zooplankton*. Lots of animals eat me, including *gulls* and *Ruddy Turnstones*. I live in the wet sand along the shoreline.

Human Being

I am a human being. I harvest *oysters* from the sea for food. I sometimes bring my pets to the ocean for a swim and accidentally disturb *Ruddy Turnstones* and *oystercatchers* when they are feeding.



Mud Flats and Sandy Beaches Food Web Cards

Sun

I am the sun. *Everything* on earth depends on me. And in my hands I hold the web of life.

Water

I am water. *All living things* need me to survive. Saltwater from ocean tides and freshwater from the rain bring me to mudflats and sandy beaches.

Air

I am air. I am made up of oxygen and nitrogen. I am very important to *all living things*. It is important to keep me clean because pollution in the air is harmful to all creatures.

Soil

I am soil. I am very important to *all living things*. *Grasses* use the nutrients in me to grow. When living things die, they decompose and return their nutrients to me.

Zooplankton

I am *zooplankton*. I like to eat *detritus*, *phytoplankton* and other *zooplankton*. I am eaten by lots of different animals, including *small fish*, *aquatic worms*, *snails*, *invertebrate larvae*, and *sand fleas* as lake tides and river floods carry me in.

Phytoplankton

I am phytoplankton. I use *sunlight* to produce my own food. Many different organisms like to eat me, including *aquatic worms*, *zooplankton*, *invertebrate larvae*, and *sand fleas* as lake tides and river floods carry me in.

Detritus

I am detritus--dead plant material. When I was a live plant, I used *sunlight* to produce my own food. When I died, I decomposed into a material that feeds lots of other animals. *Zooplankton*, *phytoplankton*, *shrimp*, *sand fleas*, *aquatic worms*, *fiddler crabs*, and *clams* depend on me for food.

Invertebrate Eggs and Larvae

I am an invertebrate egg that will hatch into a larva. Snails, worms, sand fleas, clams, shrimps, and crabs all lay eggs. Sooner or later many of me end up becoming food for Sanderlings, Dowitchers, Black-bellied Plovers, and fiddler crabs.



Mud Flats and Sandy Beaches Food Web Cards

Snail

I am a snail. I eat *phytoplankton* and *zooplankton*. Lots of different birds prey on me—such as *Dowitchers*, *Laughing Gulls*, *Sanderlings*, and *Black-bellied Plovers*. I live in the grasses of the mudflats and the *seaweed* that washes up along the sandy beach.

Aquatic Worm

I am an aquatic worm. I eat mostly *detritus*, *phytoplankton*, and *zooplankton*. Lots of animals eat me, including *Laughing Gulls*, *Sanderlings*, *Dowitchers*, and *Black-bellied Plovers*. I live in the wet sand and mud along the shoreline.

Sand Flea

I am a sand flea, but you may know me as a “sand hopper.” I am not really a flea at all but a marine crustacean. I feed mostly on decaying seaweed called *detritus*. Shorebirds like *Sanderlings*, *Dowitchers*, and *Black-bellied Plovers* pick through washed up *seaweed* and *grasses* along the edges of the mudflat in search of me.

Fiddler Crab

I am a fiddler crab. I get my name from my one oversized claw that looks like a violin (fiddle) and the smaller one that looks like a bow. I eat any small plants or animals I can pick up with my claws—*sand fleas*, *aquatic worms*, *snails*, *invertebrate eggs* and *larvae*, *clams*, and *shrimp*. *Laughing Gulls* and *raccoons* catch and eat me when I venture too far away from the safety of my underground burrow.

Clam

I am a clam. I burrow deep into the sand and wait for the tide to bring me a fresh supply of *phytoplankton* and *zooplankton* with each pulse of the surf. Birds like *Laughing Gulls*, *Dowitchers*, and *Black-bellied Plovers* probe the sand for me.

Shrimp

I am a shrimp. I feed on *seaweed* and *detritus* floating through the water. *Laughing Gulls*, *Dowitchers*, and *Black-bellied Plovers* make a meal of me.

Dowitcher

I am a Dowitcher. I use my bill like a sewing machine needle, probing the sand and mud for *invertebrate eggs and larva*, *snails*, *aquatic worms*, *sand fleas*, and *clams*. I am afraid of *raccoons*, *Laughing Gulls*, and *human beings*.

Black-bellied Plover

I am a Black-bellied Plover. You will find me running back and forth from the water's edge, picking food off the surface of the sand or mud. I eat *snails*, *aquatic worms*, *sand fleas*, *clams*, and *invertebrate eggs and larvae* like the other shorebirds here.

Mud Flats and Sandy Beaches Food Web Cards

Sanderling

I am a Sanderling, sometimes called a “wave chaser.” What I am really doing is trying not to get wet while I peck for small bits of food like *invertebrate eggs and larvae, aquatic worms, sand fleas, clams, and snails*.

Laughing Gull

I am a Laughing Gull. I am a bold and persistent predator. I will attack unsuspecting *Sanderlings, Black-bellied Plovers, and Dowitchers*. I also eat *shrimp, snails, crabs, and even mice* when I can catch them!

Grass

I am grass. I grow in the *soil* along the edges of the mudflats and on areas of the sand dunes. I use *sunlight, water, and air* to grow and produce my own food. *Mice* nibble on me; *shorebirds* use my dead stalks to line their nests; some *invertebrate eggs and larva* cling to me where I am wet and grow near the water’s edge. *Crabs* and *snails* hide within me.

Mouse

I am a mouse. I eat grasses growing along the edges of the mudflat. *Laughing Gulls* and *raccoons* sometimes eat my young and me.

Raccoon

I am a raccoon. I eat just about anything I can find. *Human beings* help me by leaving their food scraps and trash behind. When they get too close to a shorebird nest, they unknowingly leave a scent trail that I can follow right to my prey!

Human Being

I am a human being. I accidentally disturb *Sanderlings, Black-bellied Plovers, and Dowitchers* when I walk too close to where they are feeding. I unknowingly trample nests and lead predators like the *raccoon* right to the nests of shorebirds when I get close enough to see the eggs and chicks.

Mud Flats and Sandy Beaches Food Web Cards

Flyway-Specific Additional Cards

Horseshoe Crab

(Atlantic Flyway)

I am a horseshoe crab, a coastal scavenger. I will eat just about any small animal the surf brings me, including clams and aquatic worms. I am a favorite food of coastal birds including gulls. When I am just an egg, Ruddy Turnstones feast on me too. In fact, thousands of shorebirds time their spring migration along the Atlantic flyway to arrive when I am laying eggs. My eggs provide important energy that shorebirds need to continue their journey to the Canadian tundra. It is okay that they eat my eggs because the eggs are on top of the sand and would not hatch anyway.

Red Knot

(Atlantic Flyway)

I am a Red Knot. I migrate from Tierra Del Fuego, Argentina to the Delaware Bay to feast on horseshoe crab eggs. This gives me the energy to continue my flight to the Canadian tundra to nest.

Snowy Plover

(Pacific Flyway)

I am a Snowy Plover. I nest in the flat, open sandy beach habitat. Laughing Gulls and raccoons eat my eggs and even sometimes my chicks. Human beings get too close to me and scare me off my nest or disturb me while I am feeding on snails, aquatic worms, sand fleas, and clams. They also unknowingly walk or drive on my nests.

Piping Plover

(Atlantic Flyway)

I am a Piping Plover. I nest in the flat, open sandy beach habitat. Laughing Gulls and raccoons eat my eggs and even sometimes my chicks. Human beings get too close to me and scare me off my nest or disturb me while I am feeding on snails, aquatic worms, sand fleas, and clams. They also unknowingly walk or drive on my nests.



Grassland Food Web Cards

Sun

I am the sun. *Everything* on earth depends on me. And in my hands I hold the web of life.

Water

I am water. *All living things* need me to survive. Rainwater brings me to the potholes hidden within the grassy landscape.

Air

I am air. I am made up of oxygen and nitrogen. I am very important to *all living things*. It is important to keep me clean because pollution in the air is harmful to all creatures.

Soil

I am soil. I am very important to *all living things*. *Plants* use the nutrients in me to grow and provide food to many other kinds of animals. When living things die, they decompose and return their nutrients to me.

Big Bluestem

I am big bluestem. I use the *soil* and the *sun* to grow. I am eaten by lots of different animals, including *grasshoppers*, *beetles*, *prairie dogs*, *ground squirrels*, *cottontail rabbits*, and even the noble *bison*.

Purple Coneflower

I am purple coneflower. I use the *soil* and the *sun* to grow. *Bees* and butterflies drink nectar and take pollen from my flowers.

Bumblebee

I am a bumblebee. I visit *purple coneflower* and collect nectar and pollen from the flower of this prairie plant. Birds like the *Bobolink* and the *Upland Sandpiper* eat me.

Beetle

I am a beetle. I feed on prairie grasses, including *purple coneflower* and *big bluestem*. *Killdeers*, *Upland Sandpipers*, and *Long-billed Curlews* eat my larvae and me.

Grassland Food Web Cards

Grasshopper

I am a grasshopper. You can find me eating prairie plants like *purple coneflower* and *big bluestem*. I also hide in the prairie grasses to keep from being eaten by *Bobolink*, *Upland Sandpiper*, *Marbled Godwit*, *Long-billed Curlew*, and *Killdeer*.

Earthworm

I am an earthworm. I live deep in the prairie soil, chewing on plant material like *big bluestem*, helping to decompose it into nutrients for other plants. *Long-billed Curlew* and *Marbled Godwit* both have bills designed to probe for me under the soil.

Bison

I am a bison. I roam across the grassland grazing on the plants growing there, including *purple coneflower* and *big bluestem*. *Human beings* hunt me in some parts of the grasslands for meat and for my coat. Sometimes *coyote* catches one of my sick or injured calves.

Coyote

I am a coyote. I like to eat *prairie dog*, *ground squirrel*, *cottontail rabbit* and *red fox*. *Human beings* do not like me around and will shoot or trap me if I venture into their territory.

Prairie Dog

I am a prairie dog. I live together with many other prairie dogs. We take turns watching out for *coyotes*, *red foxes*, and *Red-tailed Hawks* that would eat us if they caught us. *Human beings* trap or poison us if we try to start a “town” on their property. I guess they do not like our system of underground tunnels.

Bobolink

I am a Bobolink. I eat insects like *bumblebees* and *grasshoppers*. *Coyotes*, *red foxes*, and *Red-tailed Hawks* try to eat me.

Ground Squirrel

I am a ground squirrel. I eat plants like *big bluestem* and *purple coneflower*. *Coyote* and *red fox* eat me. If I am not careful and venture into the territory of a *human being*, I might get trapped or poisoned.

Red Fox

I am a red fox. I eat *ground squirrels*, *cottontail rabbits*, *Bobolinks*, and *prairie dogs* when I can catch them. *Grasshoppers* are often an easier meal for me. I have to watch out for *coyote* because he would like to eat my kits and me. *Human beings* love my fur coat and try to shoot or trap me in some areas.

Grassland Food Web Cards

Cottontail Rabbit

I am a cottontail rabbit. I eat grassland plants like *purple coneflower* and *big bluestem*. I hide from the animals that want to eat me—*red fox*, *coyote*, and *Red-tailed Hawk*.

Long-billed Curlew

I am a Long-billed Curlew. I eat *grasshoppers*, *beetles*, and *earthworms*. *Red-tailed Hawk*, *red fox*, and *coyote* will eat my chicks and me. *Human beings* have drained the prairie potholes where I breed.

Upland Sandpiper

I am an Upland Sandpiper. I eat *grasshoppers*, *beetles*, and *earthworms* just like the Long-billed Curlew. *Red-tailed Hawks*, *red foxes*, and *coyotes* are the predators that hunt me. When *human beings* graze their cattle in areas where I nest, my eggs and chicks are often trampled.

Killdeer

I am a Killdeer. I eat *grasshoppers*, *beetles*, and *earthworms* like other grassland shorebirds. *Red-tailed Hawks*, *red foxes*, and *coyotes* eat me. I have adapted to living around *human beings* but am sometimes killed by their loose dogs and cats.

Red-tailed Hawk

I am a Red-tailed Hawk. I soar over the grasslands in search of shorebirds and their chicks like the *Killdeer*, *Upland Sandpiper*, and the *Long-billed Curlew*. I also eat *ground squirrel*, *cottontail rabbit*, *prairie dog*, and *Bobolink*.

Human Being

I am a human being. I hunt the *buffalo* for meat and fur and because they compete with my cattle for tender prairie grasses. I graze my cattle, farm crops, and build homes on the grasslands. I do not like *prairie dogs* and *ground squirrels* because their underground tunnels make a mess of my pastures, yard and gardens. Birds like the *Killdeer* that have adapted to living in my territory sometimes fall victim to my free-roaming cats and dogs.

Salt Marsh Food Web Cards

Sun

I am the sun. *Everything* on earth depends on me. And in my hands I hold the web of life.

Water

I am water. *All living things* need me to survive. Most plants and animals in the salt marsh are adapted to salt water. Twice a day, the high tide fills the slough and marsh with salty bay water. This area is sometimes called an estuary because salt and fresh water mix here.

Air

I am air. I am made up of oxygen and nitrogen. I am very important to *all living things*. Fish like the *goby*, which do not breathe air directly, get oxygen from the water. It is important to keep me clean because pollution in the air is harmful to all creatures.

Soil

I am soil. I am very important to *all living things*. *Plants* use the nutrients in me to grow. *Animals* get their nutrients from plants. When living things die, they decompose and return their nutrients to me.

Zooplankton

I am *zooplankton*. I like to eat *detritus*, *phytoplankton* and other *zooplankton*. I am eaten by lots of different animals, including small *fish*, *crabs*, *worms*, and *snails*. I can be found in the slough.

Phytoplankton

I am phytoplankton. I use *sunlight* to produce my own food. Many different organisms like to eat me, including *aquatic worms*, *zooplankton*, *snails*, *crabs*, and fish such as the *goby*. You can find me in the slough.

Northern Harrier

I am a northern harrier. I eat different animals, including the *salt marsh harvest mouse*, *rail*, *Mallard duck*, and *stilts*, *avocets*, and *phalaropes*. I am at the top of the food chain so other animals do not prey upon me.

Rail

I am a rail. I eat lots of different things such as *crabs*, *small fish*, *snails*, and even *salt marsh harvest mice*. I am sometimes eaten by *northern harriers*. I live in the salt marsh, hiding and nesting in the *pickleweed* and *cordgrass*.

Salt Marsh Food Web Cards

Mallard Duck

I am a Mallard duck. Some of the foods I like to eat are *detritus*, *worms*, *phytoplankton*, and *zooplankton*. Sometimes *people* eat me. I live in the *waters* of lakes, ponds, sloughs, and rivers.

Snail

I am a snail. I eat *phytoplankton* and *zooplankton*. Lots of different birds such as *egrets*, *rails*, *Killdeer*, *American Avocets*, *Black-necked Stilts*, and *Wilson's Phalaropes* prey on me. I live in the mudflats of the slough.

Salt Marsh Harvest Mouse

I am a salt marsh harvest mouse, an endangered species. I eat *pickleweed*. *Northern harriers*, *rails*, and *egrets* like to eat me. You can only find me living in the salt marshes of San Francisco Bay, but you will not see me during the day because I am nocturnal.

Snowy Egret

I am a snowy egret. I eat lots of different things, including *small fish*, *mice*, *snails*, and *crabs*. *Northern harriers* try to eat my young. In the past, *human beings* killed me to decorate their hats with my feathers. I live in the salt marshes and tidal sloughs.

Pickleweed

I am pickleweed. I use the *sun* to produce my own food. The *salt marsh harvest mouse* eats me. The *rails* build their nests on me. I live in the salt marsh and get wet when tidal *water* comes in from the bay.

Cordgrass (Detritus)

I am cordgrass. I use *sunlight* to produce my own food. When I die, I decompose into a material called *detritus*. Lots of animals feed on *detritus*, such as *zooplankton*, *ducks*, *fish*, *worms*, and *crabs*. I grow close to the slough and the *rail* hides under me.

Black-necked Stilt

I am a Black-necked Stilt. I use my long, needle-like bill to pick *aquatic snails*, *worms*, *insects*, *small fish*, and *crabs* from the shallow water. Sometimes *northern harriers* will eat my chicks and me. *Human beings* sometimes scare me away from my feeding grounds. You can find me in the salt pond, salt marsh, and mudflats.

American Avocet

I am an American Avocet. I sweep my slim, upcurved bill from side to side, straining *aquatic snails*, *worms*, *insects*, *small fish*, and *crabs* from the water. Sometimes *northern harriers* will eat me and my chicks. *Human beings* sometimes scare me away from my feeding grounds. You can find me in the salt pond, salt marsh, and mudflats.

Salt Marsh Food Web Cards

Wilson's Phalarope

I am a Wilson's Phalarope. I am known for spinning like a top to create a temporary whirlpool in the water in order to stun the *aquatic snails, worms, insects, small fish,* and *crabs* I eat. Sometimes *northern harriers* will eat my chicks and me. *Human beings* sometimes scare me away from my feeding grounds. You can find me in the salt pond, salt marsh, and mudflats.

Aquatic Worm

I am an aquatic worm. I eat mostly detritus, phytoplankton, and zooplankton. Lots of birds, including Killdeer, Black-necked Stilts, American Avocets and Wilson's Phalaropes, like to eat me. Goby like to eat me as well. I live in the mudflats of the slough.

Crab

I am a crab. I eat different foods, including detritus, phytoplankton, zooplankton, and dead gobys. Lots of animals feed on me, including birds such as egrets, rails, Killdeer, avocets, phalaropes, and stilts. I burrow in the mudflats of the slough.

Aquatic Insect

I am an aquatic insect. Salt marsh birds like *avocets, stilts, phalaropes, Killdeer, egrets,* and *rails* are constantly probing and stirring the water looking for me. Small *fish* and *crabs* eat me too.

Bay Goby

I am a bay goby. I feed on the bottom of the slough, eating *phytoplankton, zooplankton, detritus,* and tiny mud creatures such as *aquatic worms*. Many different birds, including egrets, rails, stilts, avocets, and phalaropes, eat me. I live in the slough *water*.

Killdeer

I am a Killdeer. You will often find me probing the mud for food such as *aquatic worms, snails,* and small *crabs*. Many animals try to eat me, including the *northern harrier*. I can usually be found on the mudflats during low tide.

Human Being

I am a human being. As you know, I eat a huge variety of different foods, including *Mallard ducks* and fish. I am at the top of the food chain so no animals prey on me. Sometimes I build my home on top of salt marshes. I may get too close to feeding shorebirds like *Black-necked Stilts, American Avocets,* or *Wilson's Phalaropes* and scare them away from their feeding grounds.