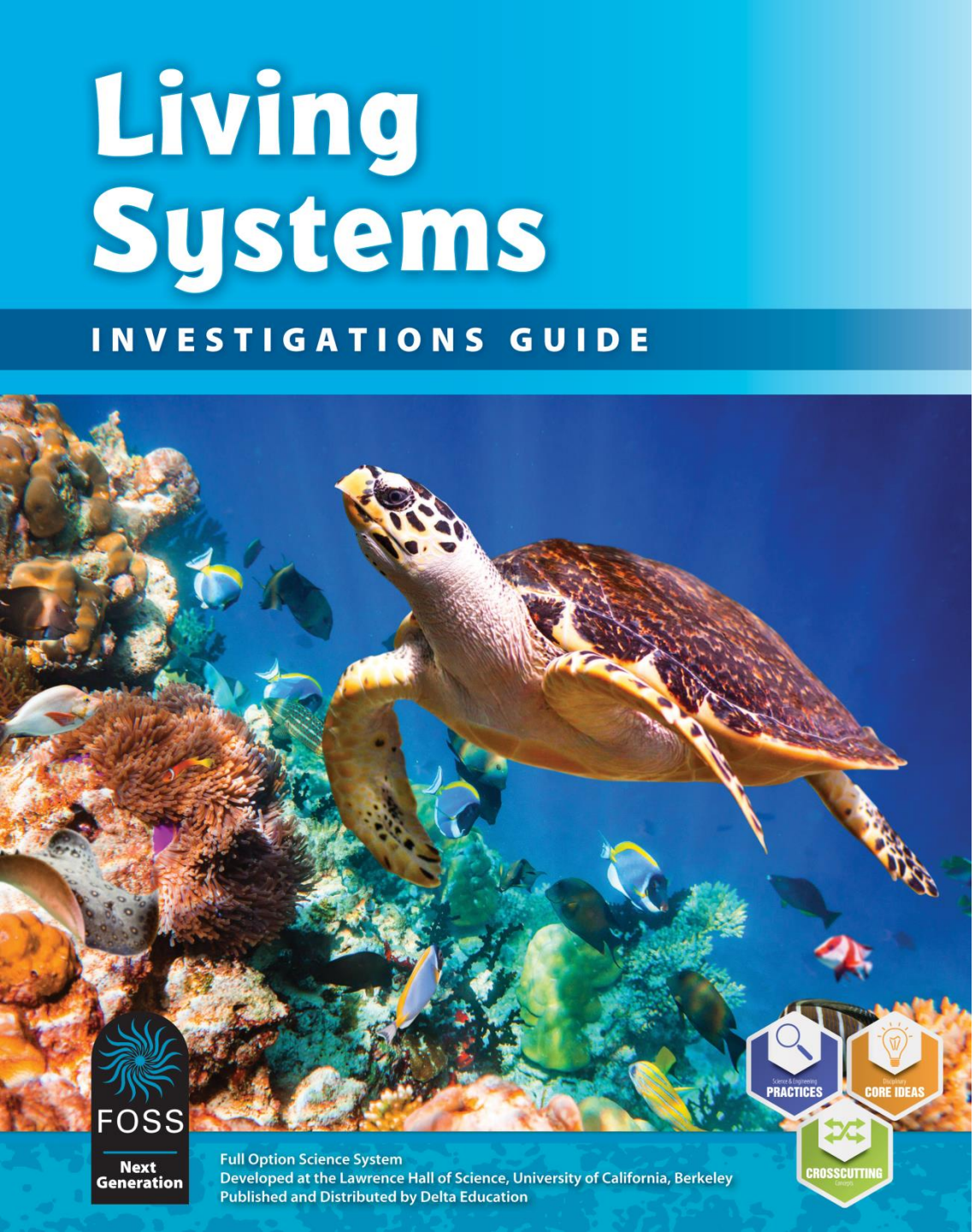


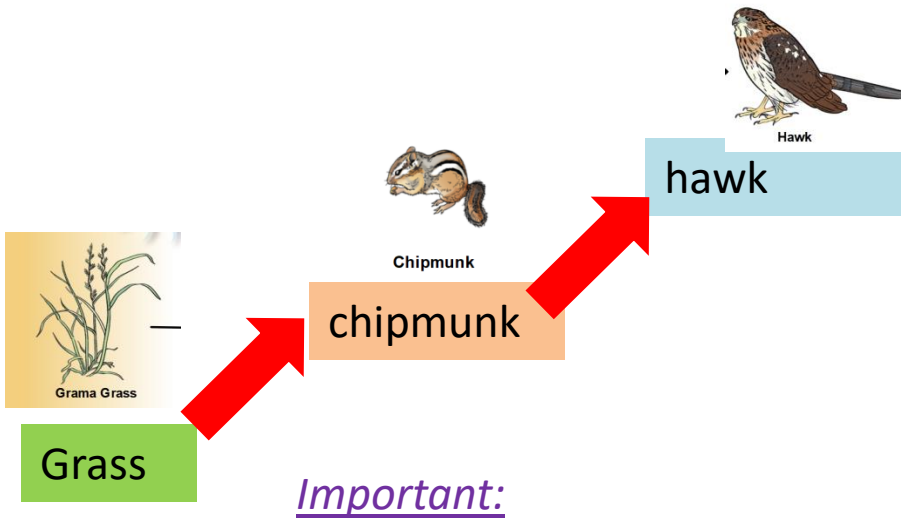
Investigation 1 - Systems

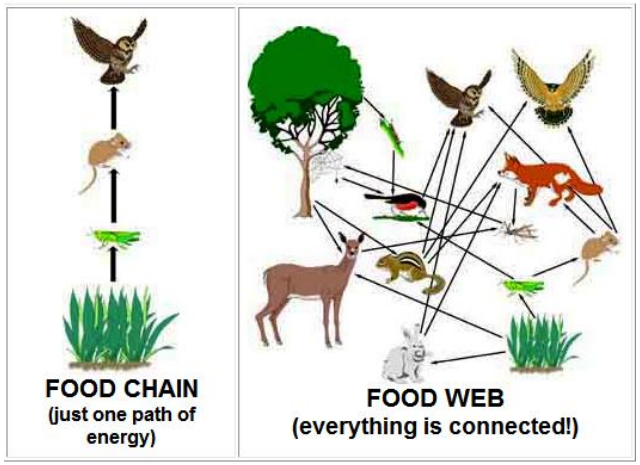
PART 3:
The Kelp Forest Food Web

NGSS Standards:
5-PS3-1
5-LS2-1
5-ESS2-1

2 sessions

food chain VS food web





Important:

The direction the arrow points shows the direction food (energy moves through a food chain.

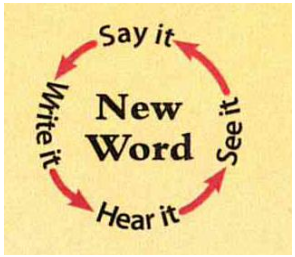
Producers	**Organisms, such as plants or algae, that makes its own food.**	**grass, algae, trees, wild berries**
Consumers	**Organisms that eat other organisms.** **Herbivores: animals that eat plants.** **Carnivores: animals that eat other animals .** **Omnivores: animals that eat both plants and animals.**	**bears, chipmunks, hawks, fish, coyote** **Predators - an animal that hunts and catches other animals for food.**
Decomposers	Organisms that break down plant and animal matter into simple chemicals.	Bacteria – microorganisms that decompose things.

Part 1: Four Spheres

https://www.youtube.com/watch?v=VMxjzWHbyFM

Part 2: Four Spheres

https://www.youtube.com/watch?v=UXh_7wbnS3A



kelp forest – *a subsystem of the biosphere.*

*A **kelp forest** occurs in the ocean.*

Kelp is a kind of seaweed.

There is a kelp forest off the California coast.

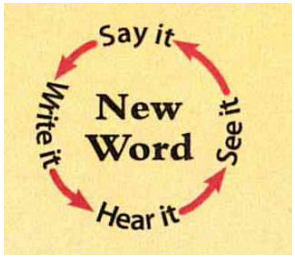
*It is called the **Monterey Bay National Marine Sanctuary.** It is like a national park in the ocean. It is the largest of 13 national marine sanctuaries. It goes from San Francisco to Santa Barbara. The sanctuary extends from the shoreline out into the ocean an average of 50 kilometers.*

*A **marine ecosystem** is an ocean ecosystem.*

Marine Organisms:

What organisms are <u>both</u> predators and prey in the kelp forest ecosystem?

- *Spread out the Monterey Bay Food Web cards.*
- *Take three cards and review the information on them.*
- *Work with your group to create **food chains** with your cards.*
- *In a few minutes, each group will report out one **food chain** they discovered.*

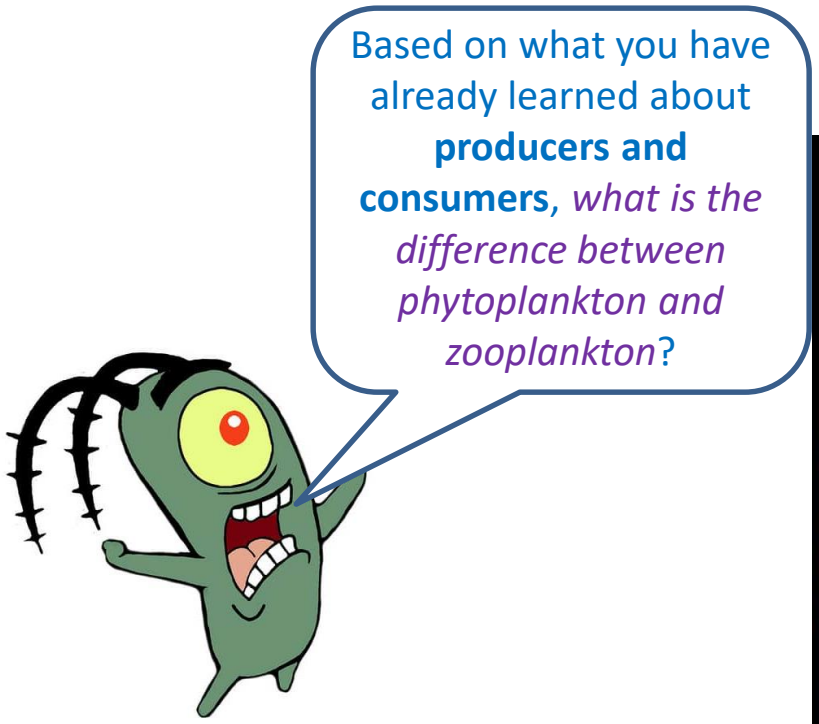


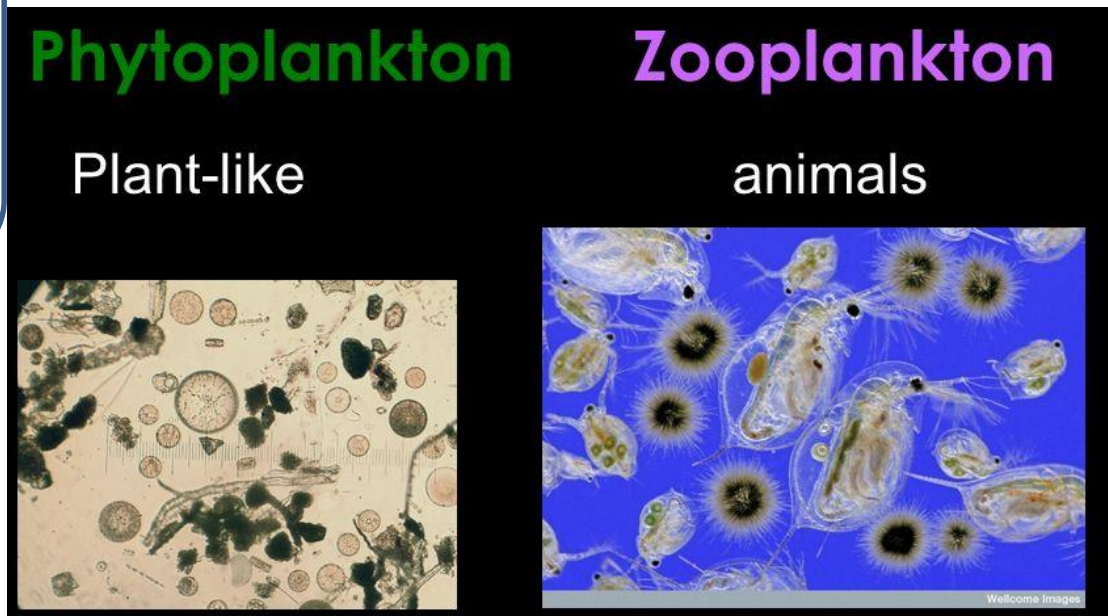
plankton – "drifting" *microorganisms that drift in the water with current.*

Find the cards that include the name "plankton". You should find two….

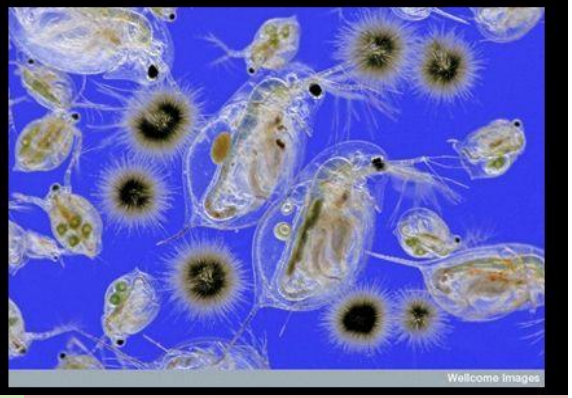
Phytoplankton *- "phyto" – means plant-like.*

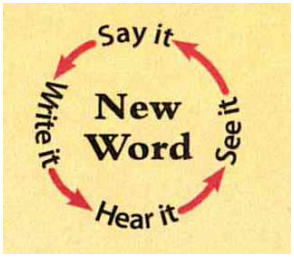
Zooplankton *– "zoo" means animal-like.*





Plankton – "drifting" *microorganisms that drift in the water with current.*

Phytoplankton	Zooplankton
Plant-like	animals
	
Phytoplankton make their own food using sunlight, water and carbon dioxide, therefore they are **PRODUCERS**	Zooplankton eat phytoplankton, therefore they are **CONSUMERS**

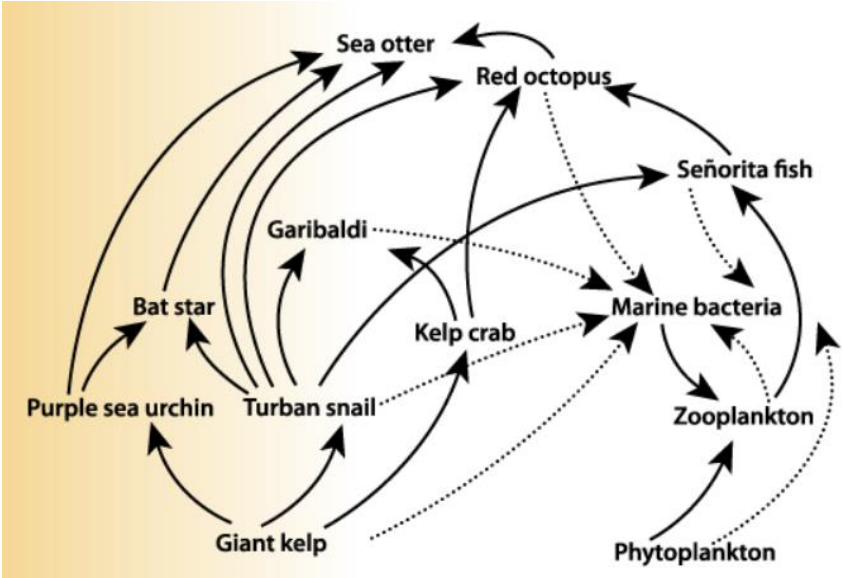


Prey: *a living animal that is hunted and eaten by another animal.*

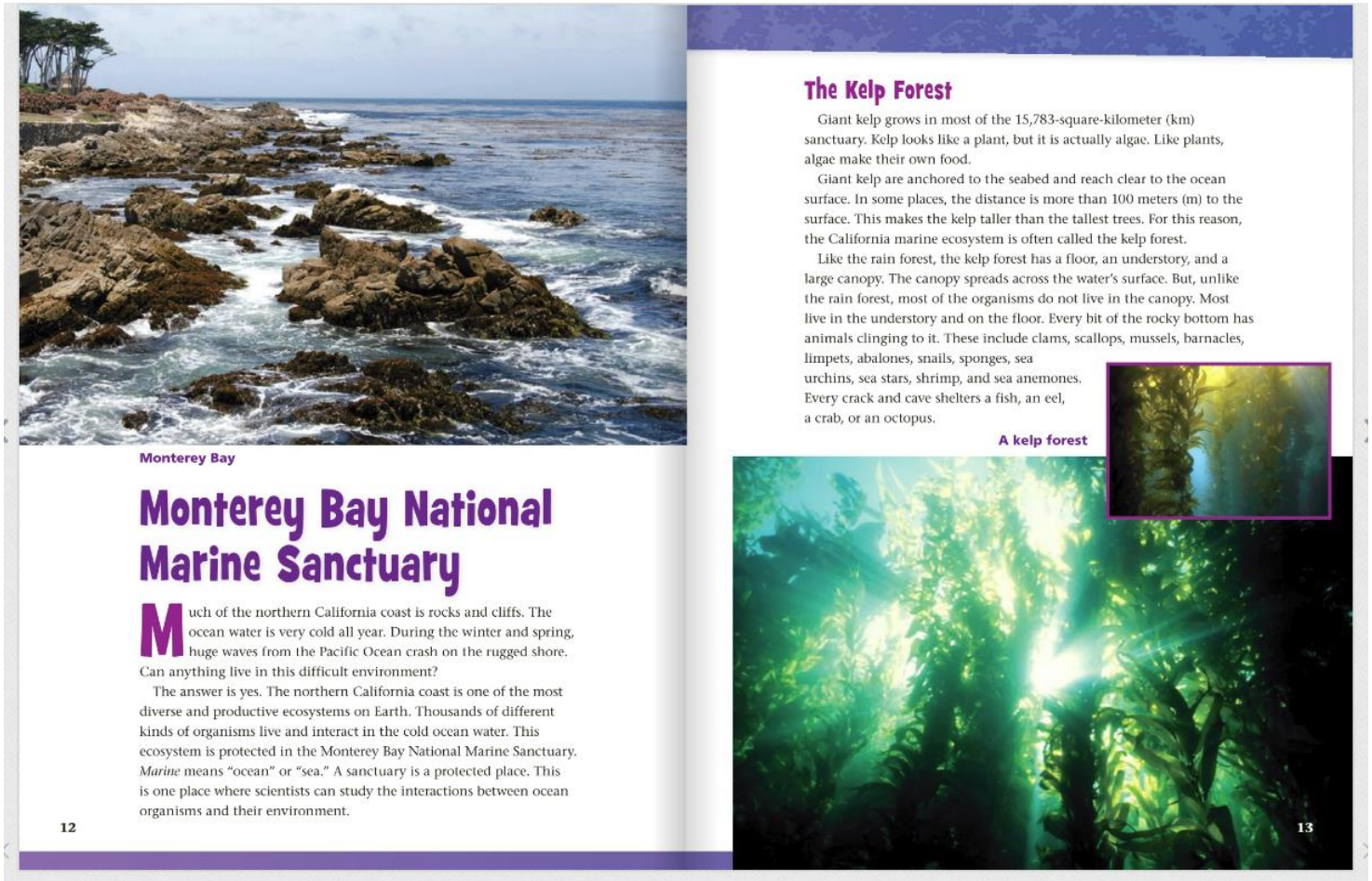
Read aloud:

Many of the animals in the kelp forest eat more than one kind of organism. And some organisms are eaten by many animals. When you show ***all the possible feeding interactions****, you no longer have a simple food chain but rather a food web, with lines going off in different directions.*

TASK: In your groups, create one food web using all the Monterey Bay Food Web cards. Draw the food web in your notebook.



Read “**Monterey Bay National Marine Sanctuary**”.
(Article posted on our classroom website).
Answer “Thinking About” questions #1-3



Monterey Bay

Monterey Bay National Marine Sanctuary

Much of the northern California coast is rocks and cliffs. The ocean water is very cold all year. During the winter and spring, huge waves from the Pacific Ocean crash on the rugged shore. Can anything live in this difficult environment?

The answer is yes. The northern California coast is one of the most diverse and productive ecosystems on Earth. Thousands of different kinds of organisms live and interact in the cold ocean water. This ecosystem is protected in the Monterey Bay National Marine Sanctuary. *Marine* means “ocean” or “sea.” A sanctuary is a protected place. This is one place where scientists can study the interactions between ocean organisms and their environment.

12

The Kelp Forest

Giant kelp grows in most of the 15,783-square-kilometer (km) sanctuary. Kelp looks like a plant, but it is actually algae. Like plants, algae make their own food.

Giant kelp are anchored to the seabed and reach clear to the ocean surface. In some places, the distance is more than 100 meters (m) to the surface. This makes the kelp taller than the tallest trees. For this reason, the California marine ecosystem is often called the kelp forest.

Like the rain forest, the kelp forest has a floor, an understory, and a large canopy. The canopy spreads across the water's surface. But, unlike the rain forest, most of the organisms do not live in the canopy. Most live in the understory and on the floor. Every bit of the rocky bottom has animals clinging to it. These include clams, scallops, mussels, barnacles, limpets, abalones, snails, sponges, sea urchins, sea stars, shrimp, and sea anemones. Every crack and cave shelters a fish, an eel, a crab, or an octopus.

A kelp forest

13

End session

Review What We Have Learned:

• A **marine ecosystem** is an ocean ecosystem. A kelp forest is a marine ecosystem. The main producer is kelp (seaweed).

•**Plankton** are microscopic organisms drifting in the water. The primary producer is phytoplankton; plantlike organisms that produce their own food. Zooplankton are microscopic animals.

•Some organisms are predators, others are prey. While others can be both predator and prey.

What organisms are both predators and prey in the kelp forest ecosystem?

What organisms are both predators and prey in the kelp forest ecosystem?

Web of Life: Life in the Sea
https://www.fossweb.com/video?videoID=G3931945

Video:

- Teaching the Module
- Interactive
- Investigation
- Guided Activity

Task "**Comparing Aquatic and Terrestrial Ecosystems**". (partner read). Page 16 & 17.

A terrestrial ecosystem

Comparing Aquatic and Terrestrial Ecosystems

Aquatic and terrestrial ecosystems are very different. But they are the same in some ways. Let's compare.

The **nonliving** factors of the two environments are different. **Aquatic** ecosystems are in water. Terrestrial ecosystems are on land. The temperature in an aquatic ecosystem changes slowly. The temperature in a terrestrial ecosystem can change rapidly over a short period of time. The amount of water in an aquatic ecosystem is predictable. Water in a terrestrial ecosystem can vary widely.

The organisms are different in the two ecosystems. Most aquatic organisms can live only in water. If they were moved to a terrestrial ecosystem, they would die. The same is true for terrestrial organisms moved

<u>In your notebooks</u>….

1. Define "aquatic" and "terrestrial".
2. What are some ways all ecosystems are the same?
3. Where do aquatic and terrestrial ecosystems get their energy?

Fabulous Food Chains!

https://www.youtube.com/watch?v=MuKs9o1s8h8

End session

plankton – "drifting" *microorganisms that drift in the water with current.*

phytoplankton *- producers*
"phyto" – means plant-like.
zooplankton *– consumers*
"zoo" means animal-like.

<u>prey</u>: *a living animal that is hunted and eaten by another animal.*

marine ecosystem:

an ocean ecosystem

kelp forest:

a marine ecosystem

Monterey Bay

Monterey Bay National Marine Sanctuary

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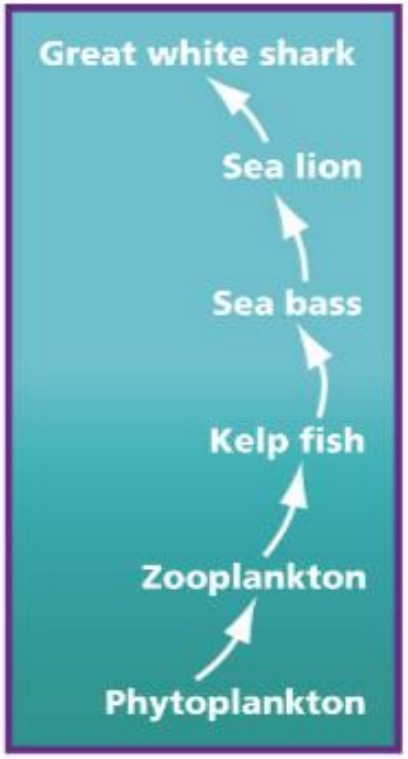
A kelp forest

Fish live in the understory. There are small fish such as anchovies and sardines, medium-sized fish such as sea bass, snappers, and perch, and large fish such as groupers and sharks. The California state marine fish is the bright orange garibaldi. It also lives here. Other animals found in the understory are squids, jellyfish, seals, sea lions, and gray whales.

The canopy provides shelter for a number of small animals that live on and around the kelp. These include snails, crabs, barnacles, and kelp fish. The canopy is a resting and hunting place for sea otters, seabirds, gulls, terns, ospreys, and ducks.

Where do all these animals get the food they need to survive? Like all ecosystems, the kelp forest depends on producers. The giant algae provide matter and energy to the ecosystem, but only a small amount. Microscopic phytoplankton are the most important producers in this ecosystem. These tiny producers (the grass of the sea) are eaten by **zooplankton**. Zooplankton are eaten by baby fish (kelp fish), clams, crabs, and thousands of other organisms. Small fish and crabs are eaten by larger fish (sea bass). The food produced by the phytoplankton eventually feeds the sea lions and sharks at the top of the food web. Marine bacteria decompose all the dead organisms in the ocean ecosystem.

An orange garibaldi



Monterey Bay food chain

Competition for Resources

There is a lot of competition for phytoplankton in the marine ecosystem. The zooplankton that have the best structures for catching phytoplankton will be most successful. This is one example of competition for food.

There is also competition for space. Waves and currents are very strong in the coastal environment. Many organisms must attach firmly to a solid surface or be washed away. The rocky bottom of the ocean is completely covered with organisms.

Kelp forest organisms compete for shelter. Caves, cracks, and old shells are used as hiding places. There is life-or-death competition for places to attach and hide.

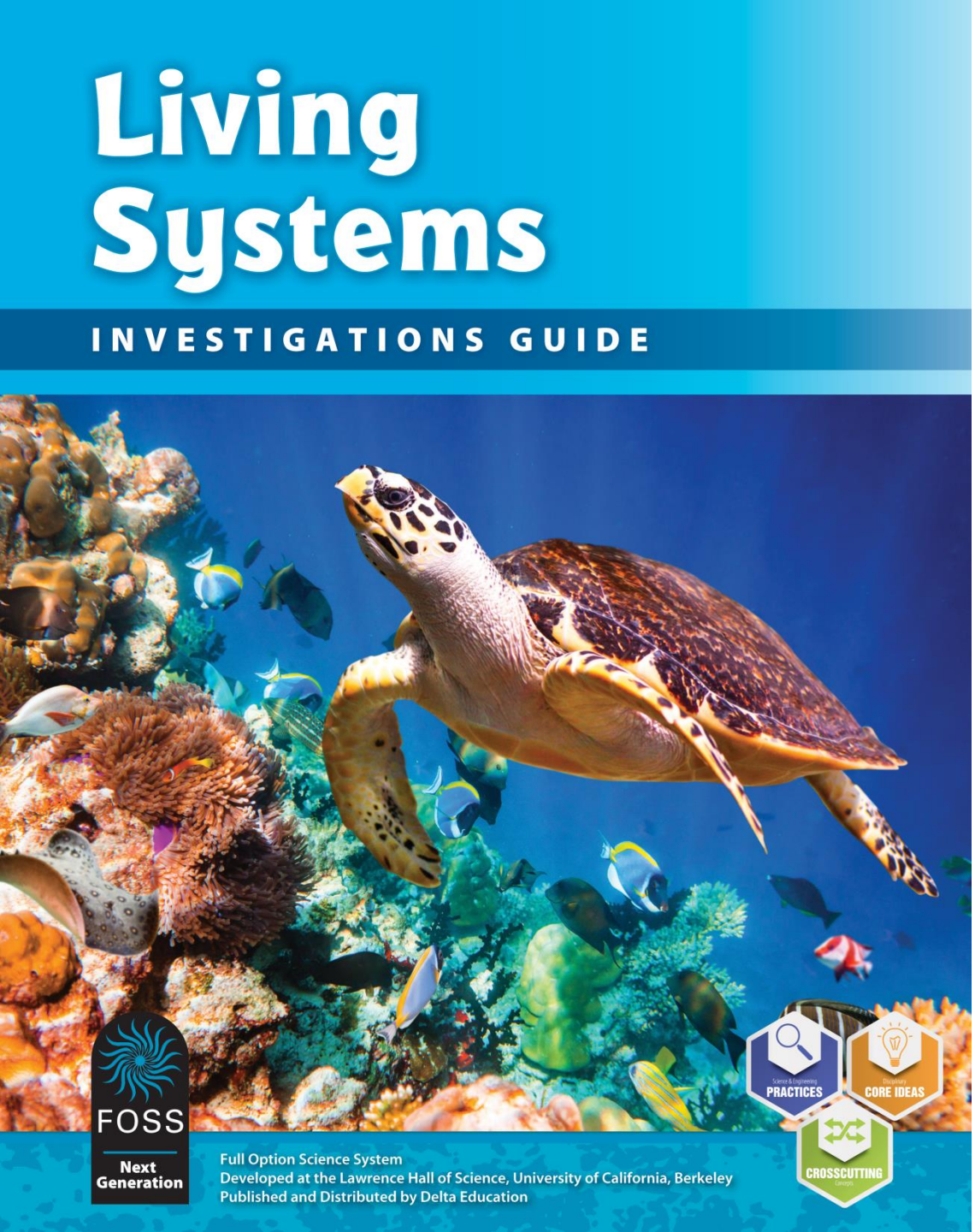
This is a hermit crab. Hermit crabs live in empty snail shells. What kind of competition do you think they have in the ecosystem?

Thinking about Marine Ecosystems

1. What do you think happens to waste and dead animals in marine ecosystems?
2. What is the most important producer in both freshwater and marine ecosystems?
3. Identify three ways organisms compete in marine ecosystems.

https://quizlet.com/_3zwrsk

Assigned in Google Classroom



Investigation 1 - Systems

PART 4: Recycling

NGSS Standards:
5-PS3-1
5-LS2-1
5-ESS2-1

4 sessions

Investigation 1, Part 4:

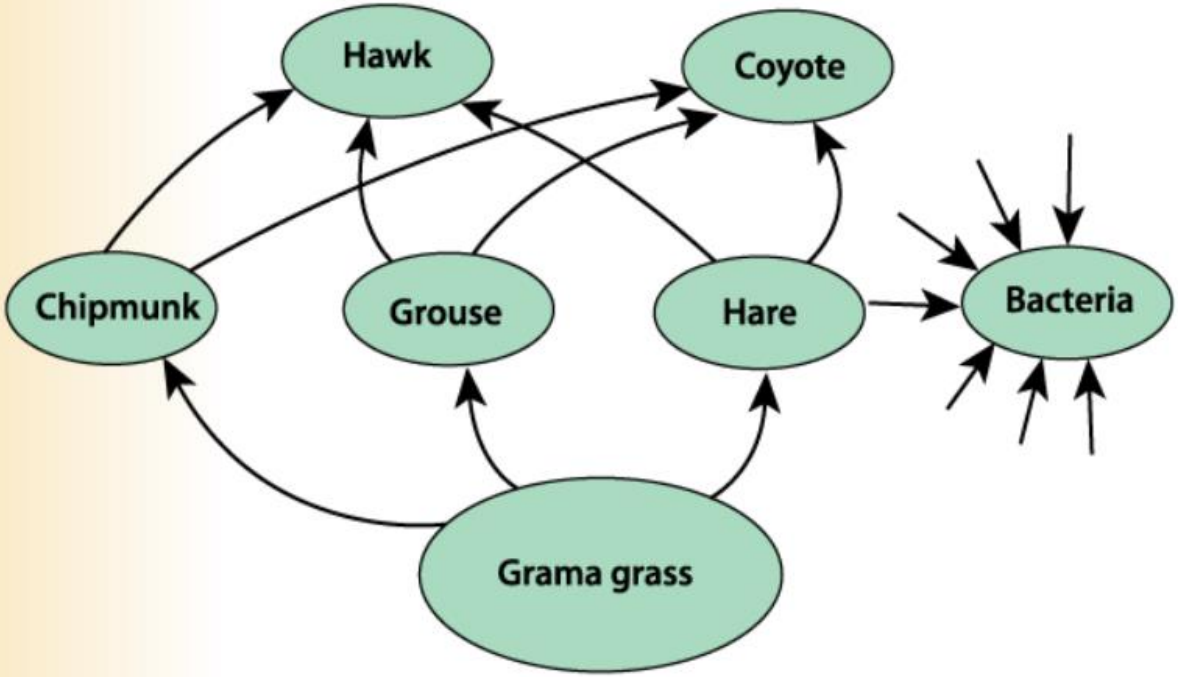
Recycling

What happens when compost worms interact with organic litter?

Reviewing Food Webs

REVIEW

Which organisms in this woods ecosystem food web are producers, which are consumers, and which are decomposers?



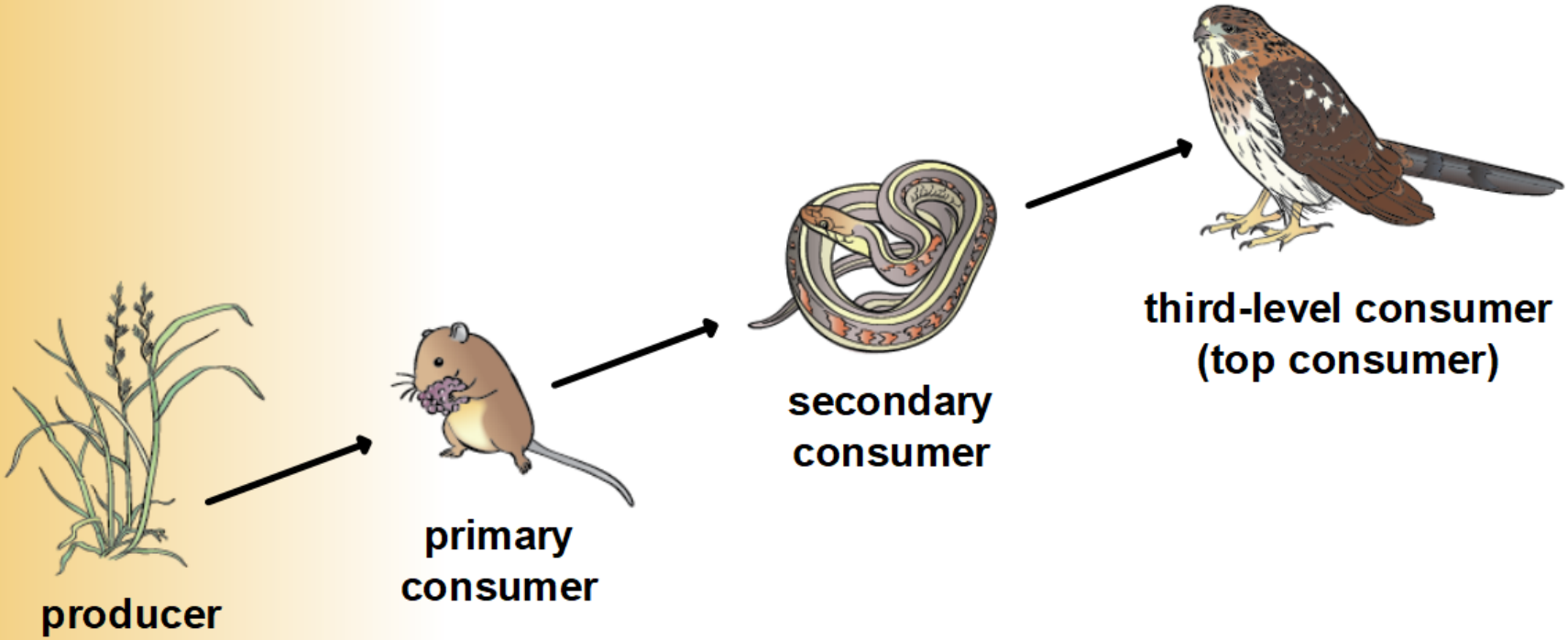
Why do animals eat other organisms?

NOTES: Most food webs start with plants. Because plants make their own food, using energy from the Sun, they are called **producers**.

Consumers

REVIEW

- Animals that eat plants only are primary consumers.
- Animals that eat primary consumer animals are secondary consumers.
- Animals that eat plants and animals are third-level consumers.
- Animals at the top of the food web are top consumers. They are rarely taken and eaten for food.



NOTES: Animals can't make their own food, so they get their food by eating producers or other animals. Animals are **consumers**.

Decomposers

REVIEW

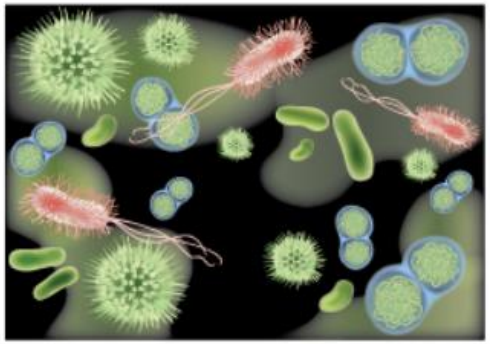
What happens to the system when the top consumers and individual members of other food levels are not eaten?

What happens to organisms that are not eaten by other animals when the organisms die?

The organisms that clean up the ecosystem are called decomposers. There are two groups of decomposers:

Grinders

Finishers

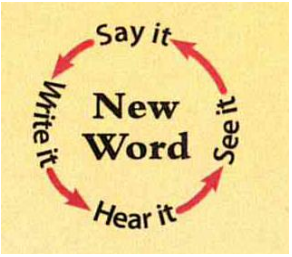


NOTES: The organisms that clean up the ecosystem are called **decomposers**. Decomposers consume all the waste and dead plant and animal material in an ecosystem.

Compost Worms

Compost worms live in the ecosystem in the space between the soil's surface and the top of the layer of leaf litter.

"**Compost**" is decaying organic material.



What happens when compost worms interact with organic litter?

NOTES: "Organic" means from living or once living organisms. Example: Newspaper is nonliving but was derived from trees that were once living, so it is organic!

End session

Video Prep:
How to set up compost worm habitat.

https://www.youtube.com/watch?v=V8miLevRI_o

Investigation 1, Part 4

A Redworm Habitat

1. Put about 1 to 2 cm of garden soil in the jar.
2. Tear two sheets of newspaper into strips and moisten the paper.
3. Fill the jar with the damp newspaper strips until it is almost full.
4. Add some natural leaf litter and a small amount of fresh household waste.
5. Once everything is in the jar, screw on the lid and give the jar a good shake—but not a violent shake—to mix the contents.
6. Moisten the contents if needed.
7. Count 15 to 18 **redworms** and put them into the container.

Blocking the Light

In their natural habitat, worms live under layers of dead leaves where it is dark.

Create a light barrier on the worm habitat.

a. Open a black plastic bag.

b. Place the worm habitat in the bag.

c. Draw the mouth of the bag around the neck of the jar.

d. Secure the mouth of the bag with a rubber band.

TASK: In your notebooks, answer the following five questions…..

Investigation 1, Part 4

The Worm System

Full Option Science System FOSS

1. Is the worm habitat a system? Why or why not?

2. Write a list of the parts of the system in your notebook.

3. How is your worm habitat like a subsystem?

4. What do you think will happen in your worm habitat?

5. What questions do you have about this system?

End session

Read "**Nature's Recycling System**". (Article posted on our classroom website). Pages 18 - 20
Answer "Thinking About" questions #1-3

Nature's Recycling System

Think of a tree. Like any organism, the tree will eventually die and fall to the forest floor. What happens to it? Does it pile up with other dead trees, plants, and animals, year after year?

When a tree falls in the forest, it is used for food by decomposers. Organisms that feed on dead trees are called **detritivores**. Some detritivores, such as beetle larvae and worms, dig into the trunks and eat the dead bark and wood. As they eat through the wood, the tree starts to fall apart. Other detritivores, such as termites, dig in and consume more of the wood. As the wood is exposed, fungi and bacteria move in. They consume the last of the wood and the waste left behind by the first decomposers. After several years, all that remains is minerals.

Animal bones, dead leaves, twigs, and fruit are organic matter called detritus.

Let's look more closely at the recycling system. In the deciduous forest of the eastern United States, **detritus** is most visible in fall. Then you are sure to see a layer of dead leaves and twigs, a few large tree limbs, and whole fallen trees. You might see a feather or a clump of fur left behind by a bird or raccoon, or scat (a pile of animal waste). You might find seeds and fallen fruit. You could find a piece of snake skin, or the bones of an animal. All of these bits of organic matter are detritus, and detritus is part of every healthy ecosystem.

You might think that detritus is waste and trash. But decomposers use this accumulation as food. The first decomposers to use the detritus are the detritivores. They concentrate on the largest parts of the detritus layer. Animals like termites, beetle larvae, isopods, and worms start to eat the fallen leaves, and dead wood. As they eat the dead matter, the mass of detritus decreases slowly. The detritivores leave waste of their own, which becomes detritus.

Termites eat wood and other detritus.

The Dirt on Decomposers

https://www.youtube.com/watch?v=uB61rfeeAsM

End session

BIG IDEAS

Look back at your notebook, tag the 3 most important things you have learned in this investigation.

- What is a system?
- What is a subsystem?
- How is Earth a system?
- What are the four main subsystems of the Earth system?
- What are food chains and food webs?
- What organisms make up the different levels of a food web?
- What is the role of decomposers?

compost – decaying organic material. *One kind of decomposer organism is the **compost worm**.*

organic *– "from living or once living organisms". Newspaper is nonliving but was derived from trees that were once living, so it is organic.*

<u>redworms</u> – *a decomposer organism. They are* ***grinders****.*