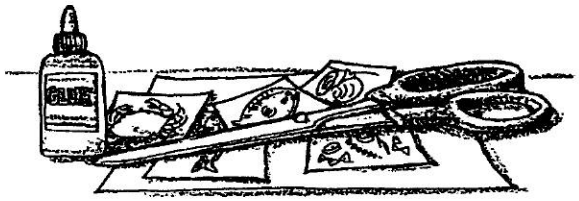
Links

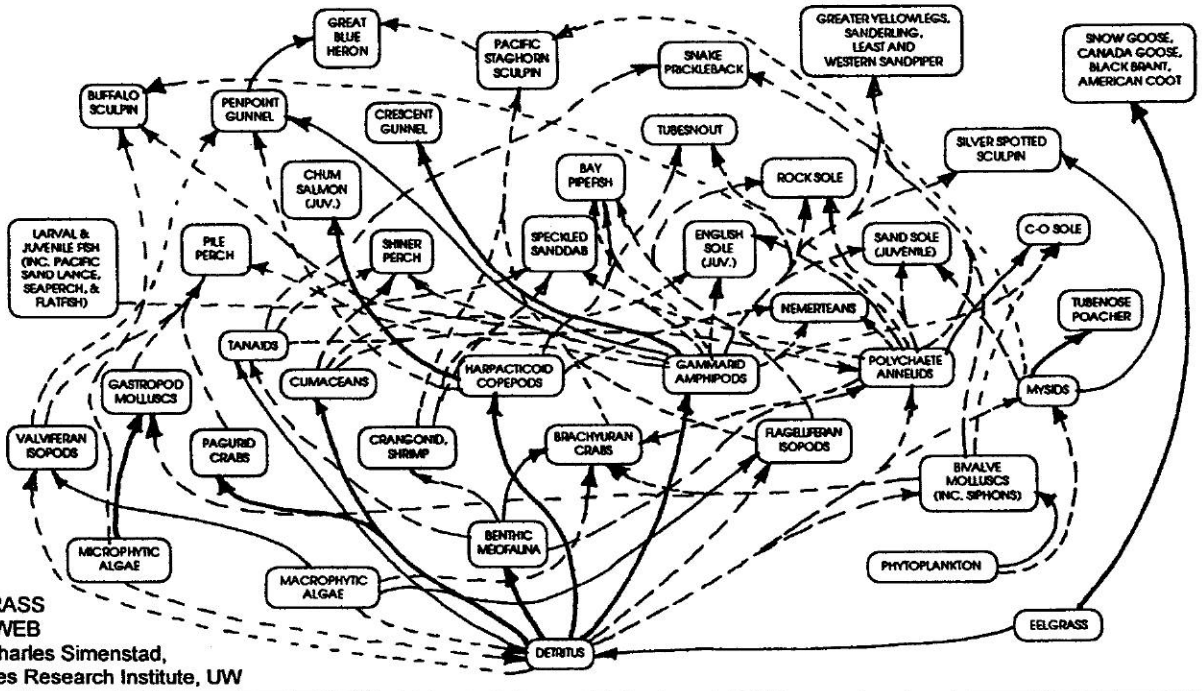
Key Concepts

1. A food chain describes the relationship of animals to the organisms they eat, and to the animals which eat them.
2. A diagram showing the interconnections between several food chains may be called a food web.
3. Food webs which describe organisms and what they eat may be modeled.
4. Food webs may be used to identify the trophic level of each organism.



Background

The simple food chains we have discussed up until now depict only a small part of a far more complex picture of the interactions between organisms at Seal Rock Campground. For the food chains studied, each of the animals represented eats more than one type of food. Adding the foods eaten by each of these animals, as well as the predators which feed on each of them, gives a more complete picture of the dynamic interactions between species. The tangle of interconnections between animals which feed on one another is known as a food web. Food webs can be terribly complex, as you can see from the example below:



EELGRASS FOODWEB
After Charles Simenstad, Fisheries Research Institute, UW

But as confusing as a picture like this may seem, it is essentially the same food chain discussed in the last lesson. It just includes a few more organisms!

In "Links", your students construct a Seal Rock Campground food web and identify the role of each organisms as producer, first order, second order, or third order consumer.

Lesson Plan

Student Objectives:

- The students will build a model of a Seal Rock Campground food web using a set of cards which describe some important campground organisms and what they eat.
- They will identify the trophic level of each organism in this food web.

Materials:

- One set of Seal Rock Campground Critter Cards per pair of students
- Scissors, one pair per student
- Glue or glue sticks, one per pair of students
- Large sheets of butcher paper, one per pair of students
- "Links" activity pages, one set per student

Procedure:

1. Review with your students the terms Producer, 1st Order Consumer, 2nd Order Consumer, and 3rd Order Consumer before having them begin "Links".
2. Have students work in pairs for this activity. Give each pair of students a large piece of butcher paper for their food web. After they have read the directions on the student hand-out, they will then cut apart the set of 30 Seal Rock Campground Critter Cards cards. Have the students arrange the cards on the paper in a pattern which represents who eats whom, by placing each organism to the right of the animal or plant it feeds on. The students will find it easiest if they begin by placing the sun at the far left and gradually work to the right, positioning cards as Producers, First Order Consumers, Second Order Consumers, and so forth. When all organisms are positioned adjacent to both their food and their predator have the students draw arrows connecting prey to predator, have them glue down the cards, and finally write beneath each organism its role as Producer, etc. Completing the food web provides the information they need to be able to answer the text questions.

Essential Academic Learning Requirements in Science

3. The student understands and uses scientific concepts and principles. (1.1, 1.2, 1.3)
4. The student knows and applies the skills and processes of science and technology (2.1, 2.2)

Answer Key:

1. The original source of the energy that drives the Seal Rock Campground food web is the sun.

2. Plants use sunlight or solar energy to make food via photosynthesis.
3. Producers include phytoplankton, sea lettuce, dead sea plants (detritus), evergreen huckleberry, salmonberry, western hemlock, and Douglas fir.
4. 1st order consumers include the Canada goose, ghost shrimp, copepod zooplankton, segmented worms, clams, small mud fauna, Pacific oyster, mussel, black-tailed deer, black bear, white-footed deer mouse, raven, and plant eating insects.
5. 2nd order consumers include the shiner perch, salmon smolt, C-O sole, sculpin, red rock crab, English sole, moon snail, sandpiper, acorn barnacles, mussel, black bear, harlequin duck, glaucous-winged gull, reg-legged frog, and man.
6. Third order consumers include the great blue heron, kingfisher, harbor seal, man, raccoon, river otter, hooded merganser, glaucous-winged gull, and marbled murrelet.
7. The animals students label as "Forest" may vary depending upon their knowledge of the life history of these organisms. The following "Forest" animals sometimes eat "shoreline" or "Open Water" animals:

   raccoon - ghost shrimp

   raven - clams, mussels

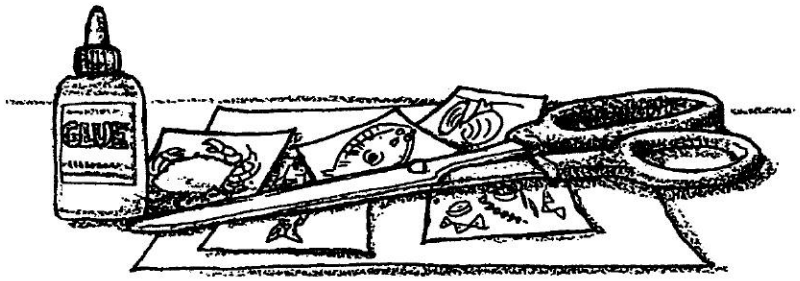
   hooded merganser - shiner perch (nests in forests, feeds on shore, at sea)

   harlequin duck - red rock crabs, clams (nests in forests, feeds on shore, at sea)

   marbled murrelet - salmon, red rock crabs (nests in old growth forests, lives at sea)

8. Choice of the organism whose removal would have the greatest impact on the Seal Rock Campground food web may vary. Since the question asks for an opinion, accept any answer that is supported by reason. However, generally the greatest impact will be felt by the removal of a primary producer (phytoplankton, sea lettuce, dead sea plants (detritus), evergreen huckleberry, salmonberry, western hemlock, or Douglas fir) since primary producers form the base of the food web.

Links



Now that you have become an old hand at working with food chains, its time to take a look at the bigger picture of life at Seal Rock Campground. The bigger picture will take you beyond just the copepods, salmon and herons. You will now pull in many other "campground critters" and build this simple food chain into a complex food web.

Directions:

- Use a large sheet of paper for your food web.
- At the far left side of the paper, draw a picture of the sun and label it ENERGY SOURCE.
- Cut the pages of animal and plant pictures into individual cards.
- Notice that each animal card tells you what the animal eats. Use this information to arrange your cards on the paper. Place each animal to the right of the plant or animal it eats.

(Hint: Begin with the far left side of the paper which you have labeled ENERGY SOURCE. Next, look for the cards which are PRODUCERS. and place them to the right of the ENERGY SOURCE. Continue working to the right, placing the card of each predator to the right of its prey.)

Here is an example of just a part of your food web. From the cards, you can see that English sole eat small mud fauna, and that small mud fauna eat dead sea plants, or detritus. You would therefore arrange them like this:

Sun	detritus (dead sea plants)	small mud fauna	English sole
Energy Source	Producer	1st Order Consumer	2nd Order Consumer

But many other animals also eat detritus. You already know that copepods do. You must add all of these animals to the picture too. Of course you must also add the animals that eat small mud fauna and the animals that eat copepods. You probably already suspect that this picture could get complicated! It will! For that reason, be sure to take your time carefully planning the arrangement before gluing down any of the cards.

When you have placed all organisms next to both their food and their predator, you still have a few things to do to complete your web:

- First, draw arrows connecting prey to predator.
- Then, glue down the cards.
- Next beneath each organism write its role as Producer, First Order Consumer, etc.
- Finally, write "Forest" beneath those animals and plants you'd most often find in the forest, "shoreline" for those you'd most often find along the shore, and "Open Water" for those you'd most often find in the open water, away from the shore.

Use your completed food web to answer these questions:

1. What is the original source of all the energy that drives this food web?

2. You know a plant doesn't actually "eat" sunlight. What does a plant get from the sun?

3. Which cards did you label as Producers?

4. Which cards did you label as 1st Order Consumers?

5. Which did you label as 2nd Order Consumers?

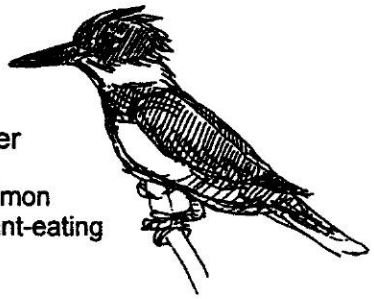
6. Which did you label as 3rd Order Consumers?

7. Look at the animals you've labeled "Forest"'. Do any of these animals sometimes eat "shoreline" or "Open Water" animals? If so, list these animals and their prey.

8. Look at your completed Seal Rock Campground food web. While the removal of any one of the food web organisms has an effect on the web, the size of the effect may differ from organism to organism. Which organism's removal do you think would have the greatest impact on the Seal Rock Campground food web? Why do you think so?

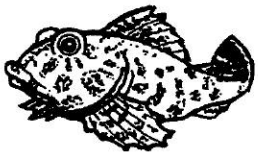
Kingfisher

eats salmon
eats plant-eating insects



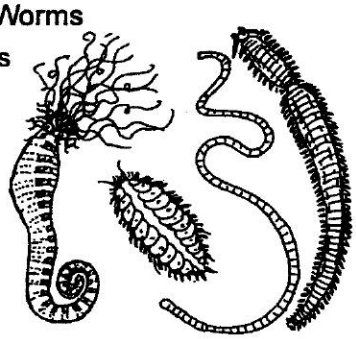
Sculpin

eats shrimp



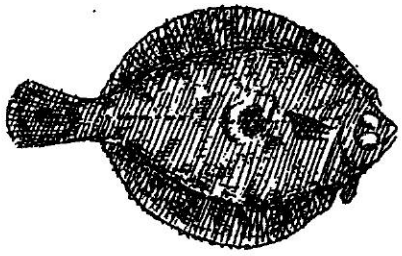
Segmented Worms

eats detritus



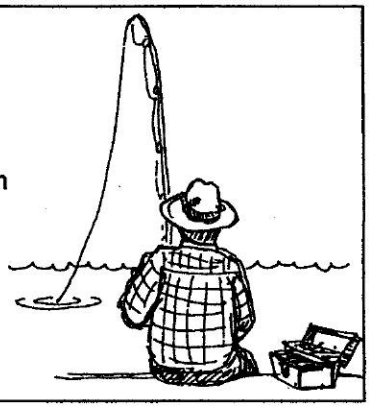
C-O Sole

eats segmented worms



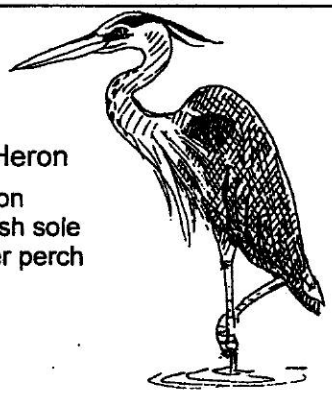
Human

eats salmon
eats deer



Great Blue Heron

eats salmon
eats English sole
eats shiner perch

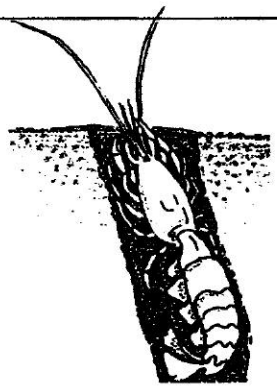


Mussel

eats zooplankton
eats phytoplankton

Ghost Shrimp

eats small mud fauna

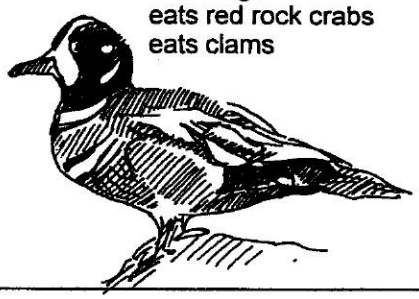


Moon Snail

eats clams
eats oysters

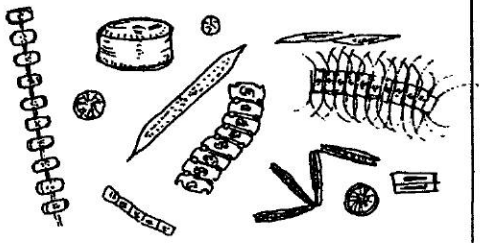
Harlequin Duck

eats frogs
eats red rock crabs
eats clams



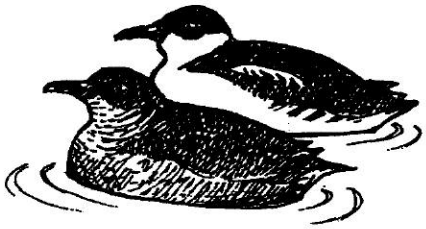
Phytoplankton

makes its own food using sunlight



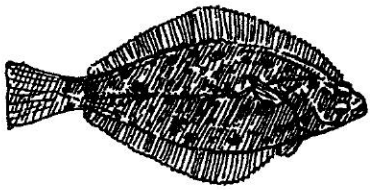
Marbled Murrlet

eats salmon
eats red rock crabs



English Sole

eats small mud fauna



Red Rock Crab

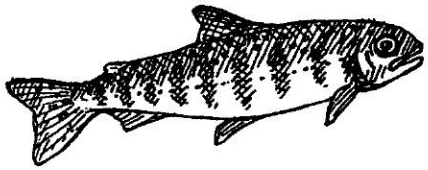
eats small mud fauna

Sea Lettuce

makes its own food using sunlight

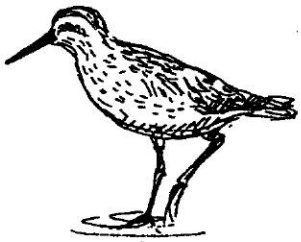
Salmon

eats copepods/zooplankton



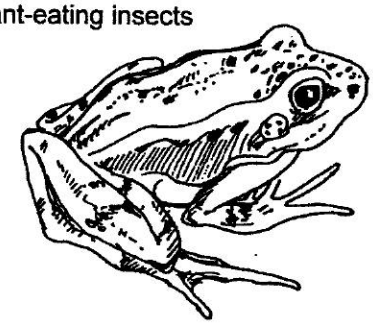
Western Sandpiper

eats segmented worms



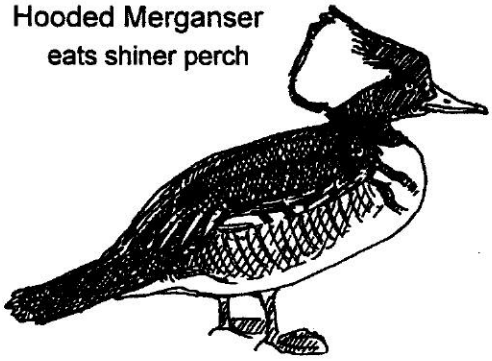
Red-legged Frog

eats plant-eating insects



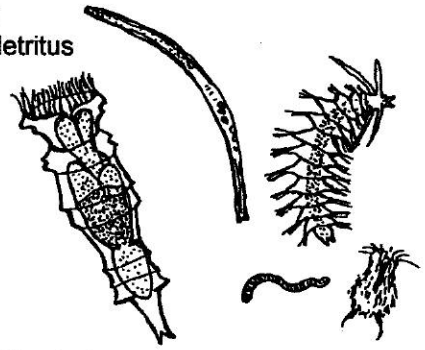
Hooded Merganser

eats shiner perch



Small Mud Fauna

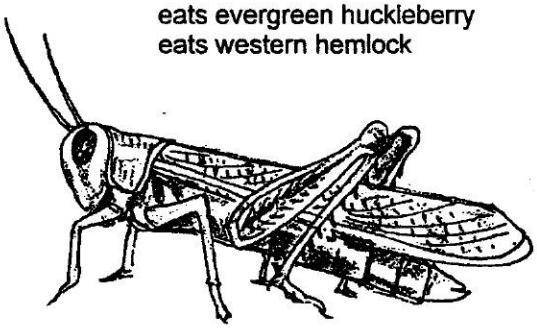
eats detritus



Plant-eating Insects

eats evergreen huckleberry

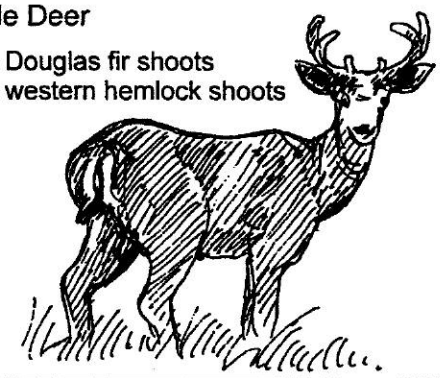
eats western hemlock



Mule Deer

eats Douglas fir shoots

eats western hemlock shoots

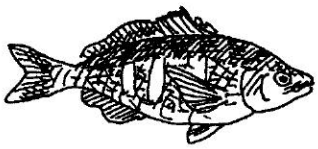


Acorn Barnacles

eats copepod/zooplankton

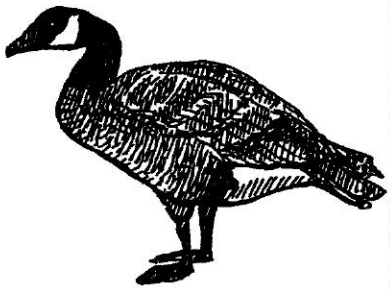
Shiner Perch

eats segmented worms



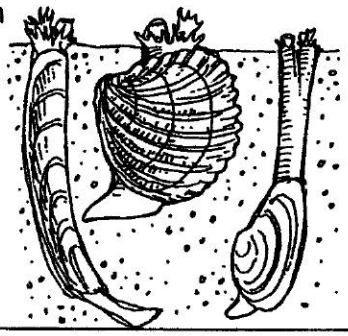
Canada Goose

eats sea lettuce



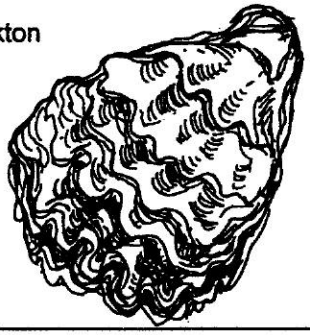
Japanese Littleneck Clam
Native Littleneck Clam
Geoduck Clam
Butter Clam
Basket Cockle

eats phytoplankton



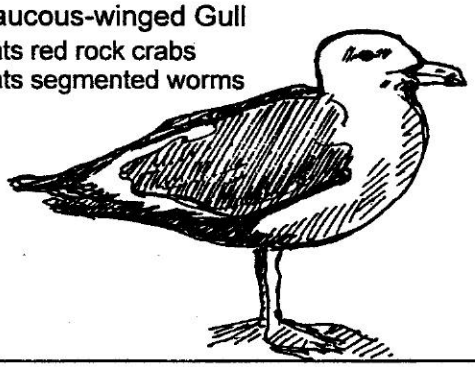
Pacific Oyster

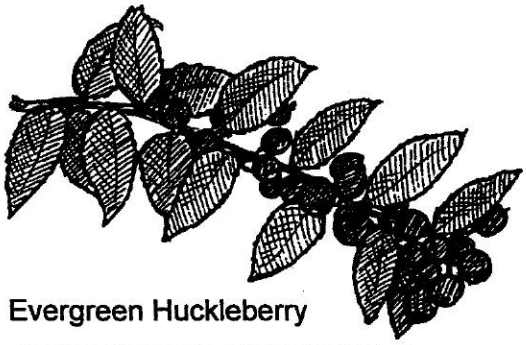
eats phytoplankton



Glaucous-winged Gull

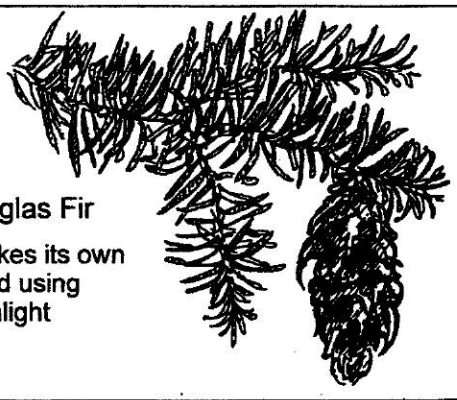
eats red rock crabs
eats segmented worms





Evergreen Huckleberry

makes its own food using sunlight

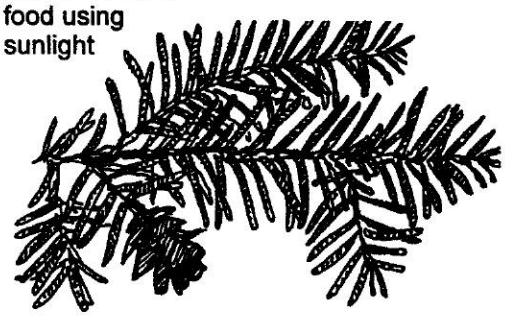


Douglas Fir

makes its own food using sunlight

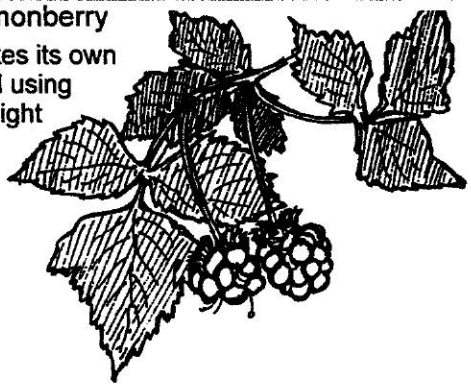
Western Hemlock

makes its own food using sunlight



Salmonberry

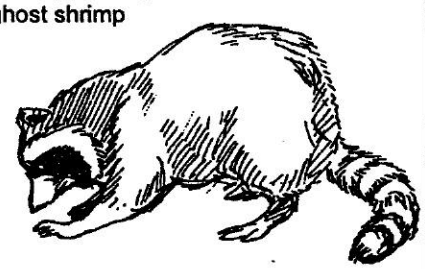
makes its own food using sunlight



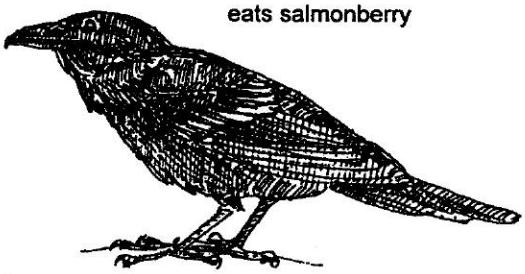
White-footed deer mouse
eats Douglas fir shoots
eats western hemlock seeds

Detritus
(decaying sea plants)
made its own food using sunlight

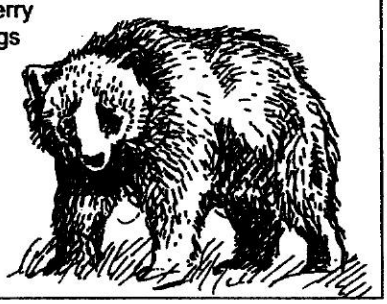
Raccoon
eats plant-eating insects
eats red-legged frog
eats ghost shrimp



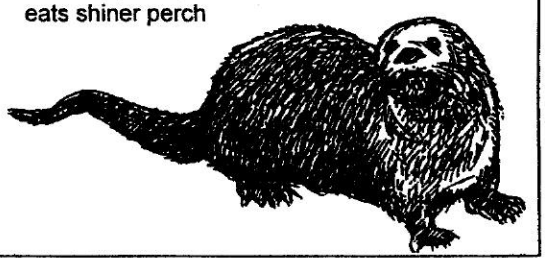
Raven
eats clams
eats mussels
eats salmonberry



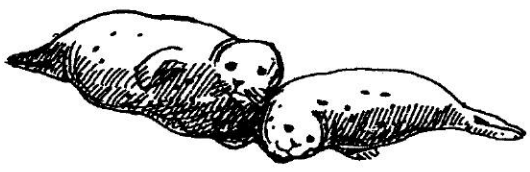
Black bear
eats evergreen huckleberry
eats white-footed deer mouse
eats salmonberry
eats raven eggs



River otter
eats red-legged frog
eats English sole
eats sculpin
eats shiner perch



Harbor seal
Eats C-O sole
Eats English sole
Eats salmon



Zooplankton
Eats detritus
Eats phytoplankton