Waterfowl Web of Life

Objective:

To learn how sea ducks fit into both marine and freshwater habitats as secondary consumers.

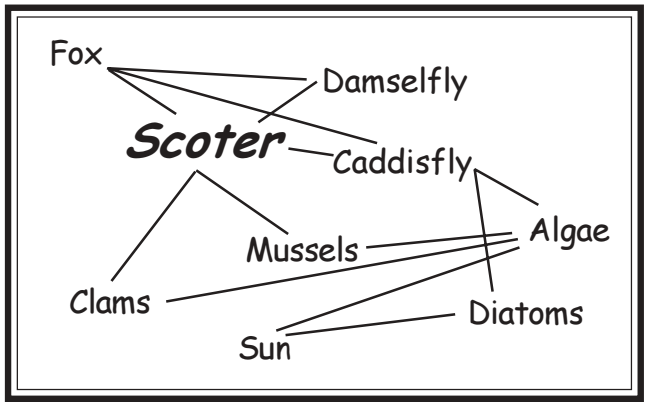
Concept:

Sea ducks spend three-quarters of their lives in a marine ecosystem and one-quarter in a freshwater wetland or forest environment. They capitalize on the abundance of marine invertebrates in nearshore coastal waters in their wintering grounds and on the abundance of freshwater invertebrates and insects in their more inland breeding grounds. Their presence is intricately intertwined with many organisms throughout the marine food web.

You Will Need:

- *Sea Duck Species Cards*
- *Sea Duck Food Chain Cards*
- *ball of yarn*
- *wire or lightweight rods for mobiles*
- *fishing twine or lightweight thread*
- *tagboard*
- *pencils, markers, colored pencils*
- *for Food Chain Game:*
  - *Six to eight quarts of popped corn*
  - *Ziploc plastic sandwich bag per student*
  - *Colored sash or colored name tags*
    - *60% green*
    - *35% blue*
    - *35% red*
  - *A stopwatch or wristwatch*
  - *Data board*
  - *Marker*

*The **Sea Duck Food Chain Cards** were reprinted from: Alaska Department of Fish and Game. 2001. Alaska Ecology Cards. Anchorage, Ak: Alaska Department of Fish and Game.*



What to Do:

Introductions:

Assess the students' pre-knowledge of food chains and food webs. Refresh students' understanding of food chains and food webs by going over a simple food chain involving their own eating habits. Make a diagram on the board of all the foods the students eat and their links to plants and animals in the food web. Brainstorm ideas about what sea ducks might eat on their wintering grounds and their breeding grounds. Review habitat types of the arctic tundra, boreal forest, interior streams and nearshore coastal waters (bays and inlets). Make a list of possible species of producers, primary consumers and secondary consumers. See how many food chains and webs you can construct on the board.

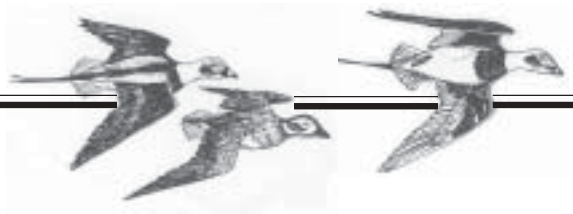
Procedures:

Hand out the chart on page 22 showing what sea ducks eat and review it with the students.

Do the Web of Life Activity as a group.

Have the students construct Food Chain Mobiles individually.

Play The Food Chain Game (you need a big space such as a gym or playground)



Waterfowl Web of Life continued...

Web of Life Activity:

Objective: Students will demonstrate a typical marine food web using four species of sea ducks.

Using the Sea Duck Food Chain Cards provided, copy and laminate enough cards to be distributed to each member of the class. Be sure to include organisms from each level of the food web.

Punch a hole and tie a string in each card so the students can easily wear them.

Use the ball of yarn to play the Web of Life Game.

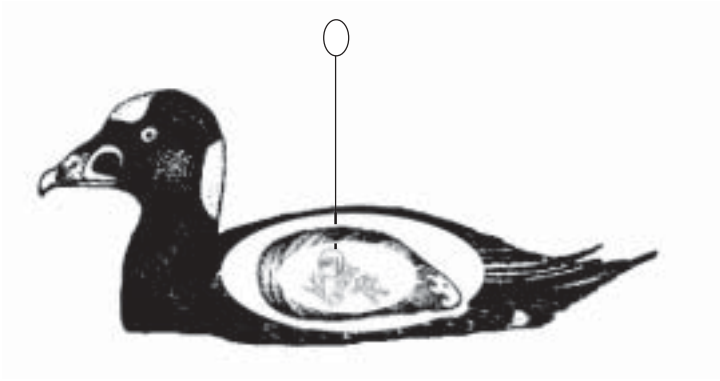
Students form a large circle, shoulder-width apart. Explain that you will be making a simple food web that will show how all of their organisms are linked together in one way or another. Give one end of the string to the "Sun" to begin the process. The Sun then GENTLY tosses the ball of yarn to a student who represents an organism that uses the sun to make food (a producer), who then GENTLY tosses the ball to another organism who eats it, and so on.

Make the students state their relationship to the organism that they have tossed their yarn to. For example," I make my own food from the sun, I am eaten by zooplankton," or "I eat phytoplankton, I am eaten by mussels."

As the ball of yarn is tossed from organism to organism, a large web will form. When everyone has been involved discuss how each organism is connected to another in some intricate way.

Next, introduce an impact (natural or man-made) to the ecosystem such as a disease in one of the organisms or an oil spill. Have the students who are affected by the impact tug on their string. Many students should feel the tug of the string! The interdependency of life should be obvious to the students!

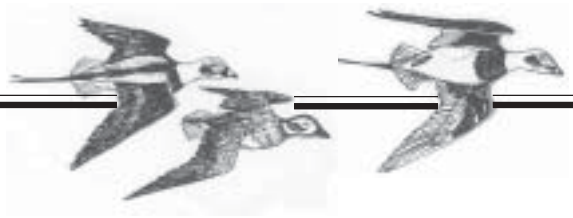
Briefly discuss the plight of some of the sea duck species you are studying. For example, the Harlequin Duck was negatively impacted by the 1989 *Exxon Valdez* Oil Spill. Have the Harlequin Duck drop its string. All other students who were connected to the Harlequin should then each drop their string. What happens to the web?



Food Chain Mobiles:

Copy the outline of the sea duck species of choice onto tagboard or construction paper. Enlarge if desired. Choose the method of mobile you would like to make.

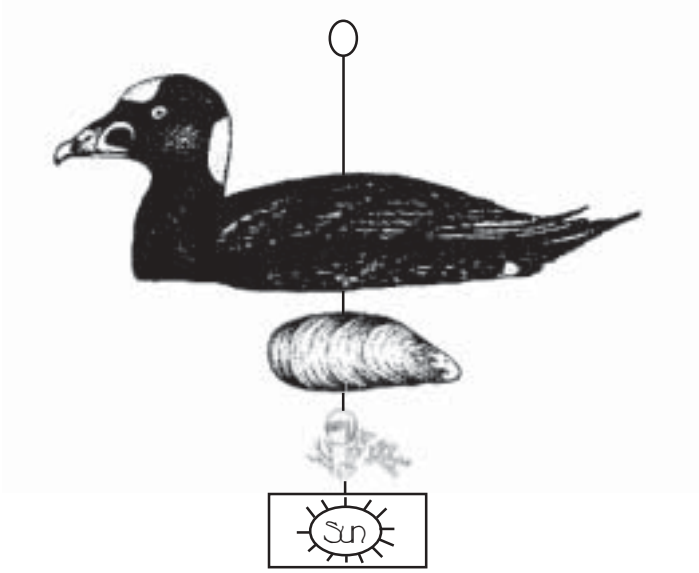
Method 1: Students cut out a large circle in the sea duck's stomach, hang the food (mussels for example) inside the stomach. Paste a picture of plankton inside the mussels. Hang the sea duck so that the mussels dangle freely inside the stomach. Make sure students color both sides of their sea ducks and inside the food item.



Waterfowl Web of Life continued...

Food Chain Mobiles:

Method 2: Instead of cutting a circle out of the center of the sea duck, students hang the mussels from the base of the sea duck, then hang the plankton from the mussels in a vertical display. Make sure both sides of the display are colored. If choosing the vertical model you may want to use a sea duck with a longer food chain, such as the Merganser (Merganser - small fish - crustacean - zooplankton - phytoplankton)



Food Chain Game

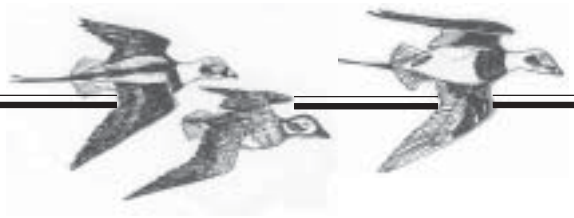
Objective: Students will be one of three animals in a marine food chain and will try to eat their prey while attempting to survive. Feeding relationships will be observed and the impacts of overfeeding, not enough resources, too many consumers, etc. will be explored. This is a very active game where the students will be scrambling to gather "food" against a clock. Their predators are waiting to capture them and steal their food, and they, as prey, will be trying to avoid being eaten as they gather food. Students can graph results. Involve the students in trying to adjust the number of animals in each group so that enough animals at each level of the food chain are represented and can therefore "survive" and keep the food chain going.

Preparation: Put a piece of masking tape on each stomach (plastic bag) so that the bottom edge of the tape is 1 1/2 inches from the bottom of the bag. Set boundaries for the game (especially if you are playing outside)

Introduction: This activity should follow at least one of the previous activities on marine food chains. Explain that the students will be playing a game of "tag" where each of the students will represent an animal in the food chain who is trying to survive. The game is divided into rounds. Play at least three rounds so that the students have a chance to try to adjust their numbers for the best survival rates. Explain that the Green Sash/Sign represents the zooplankton, the Blue Sash/Sign represents the crustaceans (shrimp, amphipods and isopods) and the Red Sash/Sign represents the Long-tailed Duck. Show the group the boundaries and scatter the popcorn around the playing area. Explain that the popcorn represents the phytoplankton which make food in their bodies by using the sun's energy plus oxygen, carbon dioxide and water. They are the base of the marine food web.

In the first round, let the students choose what they want to be. You will probably have lots of ducks - that's all right for the first round. Give everyone a plastic stomach and tell them they will store their food (the popcorn) in their stomach bags.

To play the game, set your watch for 5 minutes. At "go" the animals begin their feeding frenzy. Zooplankton can only eat popcorn (phytoplankton)



Waterfowl Web of Life continued...

crustaceans can only eat zooplankton, and the ducks can only eat the crustaceans. When the game begins each animal will try to tag the one they eat. When they do, the tagged animal must turn over the contents of their stomach. The round continues until one of the animal species is all gone. The first round usually lasts a few seconds! At the end of the round write the survival rate of each organism on the chart.

For the plankton to survive they must have popcorn in their stomach up to the *bottom* of the tape. For the crustaceans to survive, they must have popcorn in their stomachs up to the *top* of the tape. For the Long-tailed Ducks to survive, they must have the *equivalent of two crustaceans*. If at least one of each kind of animal survives, you have an ongoing food chain. Return the popcorn to the playing area and get ready for round two.

For the next, and subsequent rounds allow the students to suggests how to adjust the animal populations so that the food chain stays intact and represents more of a real life food chain. Try to allow for only one rule change per round if possible.

Some suggestions might be:

- Change the number of animal plankton and/or crustaceans and/or Long-tailed Ducks. Try 60% plankton, 20% crustaceans, 20% Long-tailed Ducks.
- Let each plankton come back one more time to feed.
- Provide a safe haven for plankton or crustaceans where they cannot be eaten.
- Try timed releases. Let plankton feed first for a certain amount of time (1 minute perhaps), then allow the crustaceans to feed (1 minute), then release the Long-tailed Ducks.

After each round record the number of animals from each group that survives and briefly discuss the implications.

The end of the game:

Review the various scenarios and their results. Which ones resulted in the most realistic representation of a healthy system? Why? Remind students of the Food Web Pyramid - the producers are more plentiful at the base of the pyramid, the consumers less plentiful and the secondary consumers even less.

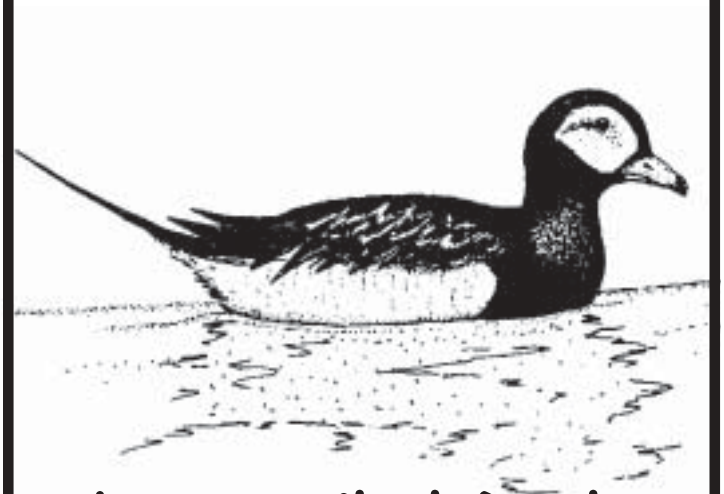
Some questions to consider:

What would happen with only half as much popcorn (phytoplankton)? What could happen to the animals that depend on this food source? If there were no crustaceans, what would happen to the phytoplankton population? To the zooplankton population? To the Long-tailed Duck population? Do Long-tailed Ducks need plants to survive? Why?

** This activity has been adapted, with permission, from Giving Back to the Earth: A Teacher's Guide to Project Puffin. The original activity is from the University of California's Outdoor Biological Instructional Strategies (OBIS) Program, devised at the Lawrence Hall of Science.*

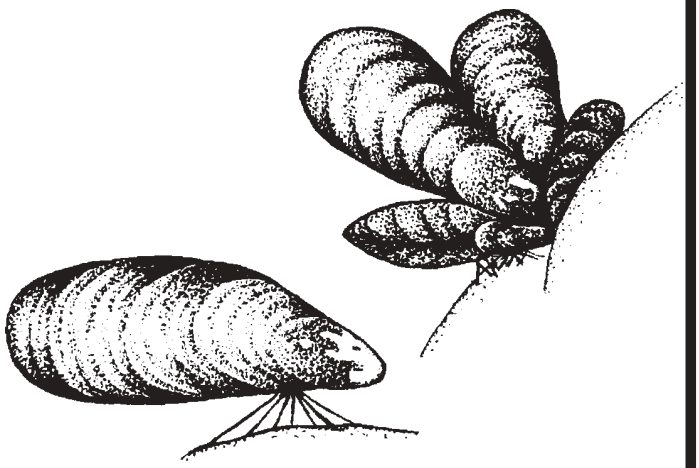
Sea Duck Species	Food Items in Marine Habitats
Spectacled Eider	Clams, mussels, shrimp, crabs
Common Eider	Mussels, horse and box crabs
Steller's Eider	Mussels, clams, other bivalve molluscs, gastropods, amphipods
King Eider	Mussels, other molluscs, king crab, other crabs, urchins, sand dollars
Black Scoter	Mussels, clams
Surf Scoter	Mussels, clams, herring roe during spring
White-winged Scoter	Mussels, clams, snails, crustaceans, and small fishes during winter, herring roe during spring
Harlequin Duck	Amphipods, molluscs, such as: limpets, chitons, mussels; small crabs, and fish eggs
Long-tailed Duck	Mainly molluscs (including mussels, clams and periwinkles) and crustaceans (including shrimp, amphipods and isopods); small fish - including sand lance
Common Goldeneye	Crustaceans
Barrow's Goldeneye	Molluscs, mainly mussels
Bufflehead	Small crustaceans (shrimps, crabs, amphipods) and small marine snails
Common Merganser	Fish
Red-breasted Merganser	Fish
Hooded Merganser	Fish

Sea Duck Food Chain Cards

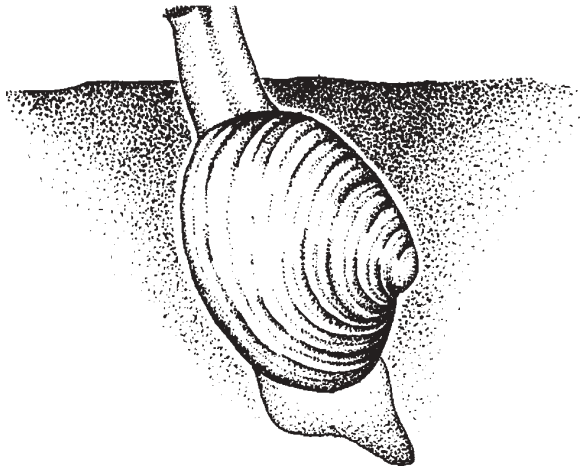


Long-tailed Duck

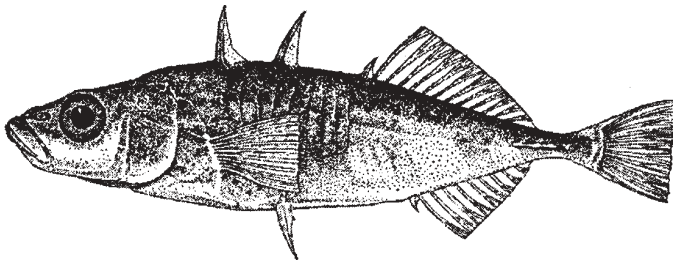
Common Merganser



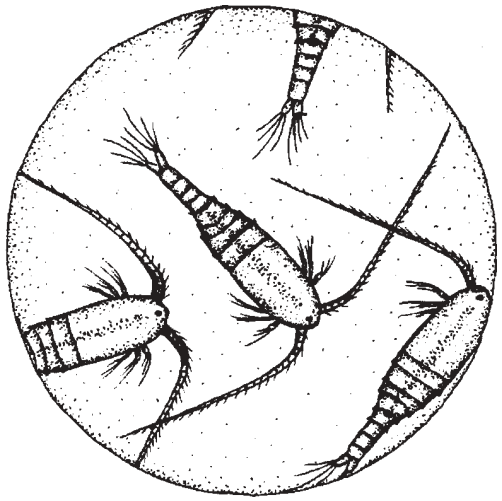
Mussels



Clam



Three-Spine Stickleback



Copepod

Sea Duck Food Chain Cards

Common Merganser

Trait: long bill with saw-tooth edges
Feeds on: sticklebacks, sculpins, herring, frogs, crustaceans, snails, insects, leeches
Is eaten by: foxes, weasels, gulls

Long-tailed Duck

Trait: stocky, diving duck
Feeds on: mussels, clams, snails, and crustaceans. In fresh water: larvae of craneflies, caddisflies and other insects
Is eaten by: foxes, weasels, gulls, jaegers, ravens

Clam

Trait: bivalve invertebrate - mollusc
Feeds on: filter detritus, algae, small crustaceans, insect larvae from the water
Is eaten by: snails, sea stars, diving ducks, shorebirds, sea otters, humans

Mussels

Trait: bivalve invertebrate - mollusc
Feeds on: filter detritus, algae, small crustaceans, insect larvae from the water
Is eaten by: snails, sea stars, diving ducks, shorebirds, sea otters, humans

Copepod

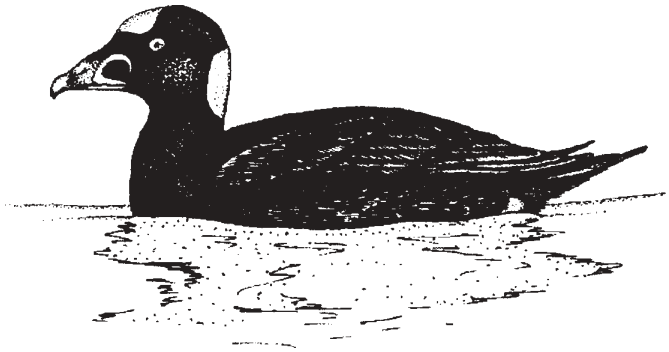
Trait: invertebrate - crustacean
Feeds on: filter detritus or algae from the water, some eat small zooplankton, some are parasitic
Is eaten by: fish and other aquatic animals, including whales

Three-Spine Stickleback

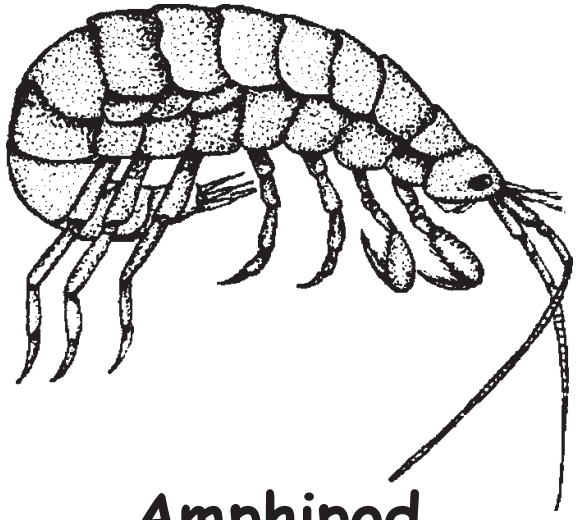
Trait: vertebrate - fish
Feeds on: copepods, water fleas, molluscs, amphipods, leeches
Is eaten by: salmon, Dolly Varden, loons, grebes, mergansers, adult sticklebacks

Sea Duck Food Chain Cards

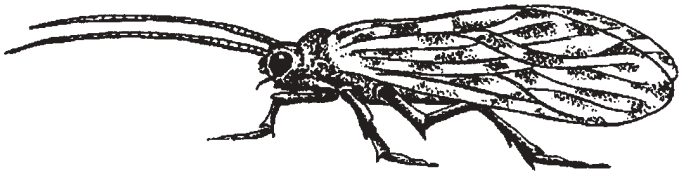
Harlequin Duck



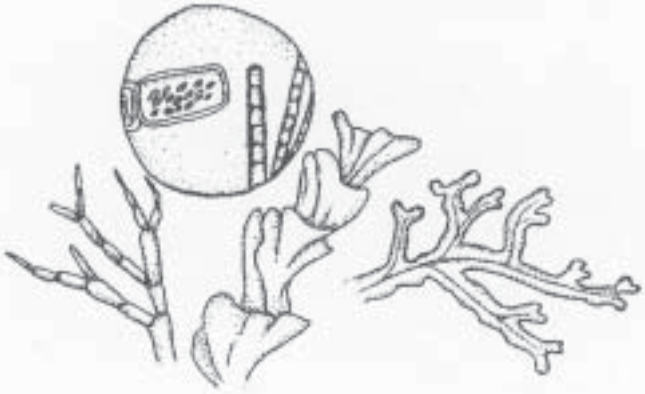
Surf Scoter



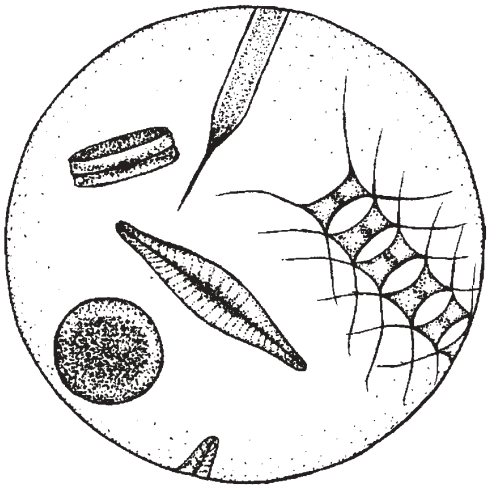
Amphipod



Caddisflies



Green Algae



Diatoms

Sea Duck Food Chain Cards

Surf Scoter

Trait: stocky, short necked, diving duck
Feeds on: mussels, clams, some crustaceans. In fresh water: insects (caddisflies, damselflies, dragonflies, beetles, water boatmen)
Is eaten by: bears, foxes, weasels, jaegers, bald eagles

Harlequin Duck

Trait: colorful, small, diving duck
Feeds on: amphipods, molluscs, small crabs some fish and eggs. In fresh water: larvae of craneflies, caddisflies and other insects
Is eaten by: mink, bald eagles, coyote

Caddisfly

Trait: insect and freshwater macroinvertebrate
Feeds on: Adults: flower nectar. Larvae: aquatic plants, algae, diatoms, aquatic insect larvae
Is eaten by: diving beetles, frogs, fish, waterfowl, shorebirds

Amphipod

Trait: invertebrate - crustacean
Feeds on: detritus and small invertebrates
Is eaten by: fish, water birds, whales

Diatoms

Trait: microscopic, single-celled producer
Feeds on: makes own food by photosynthesis
Is eaten by: small crustaceans, larvae of invertebrates, fish

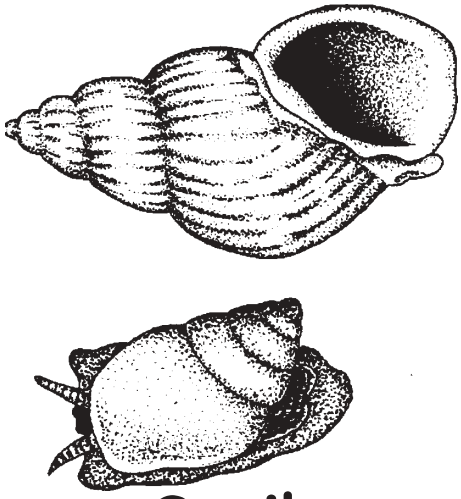
Green Algae

Trait: producer
Feeds on: makes own food through photosynthesis
Is eaten by: small crustaceans, some molluscs, aquatic invertebrates, fish, geese, ducks

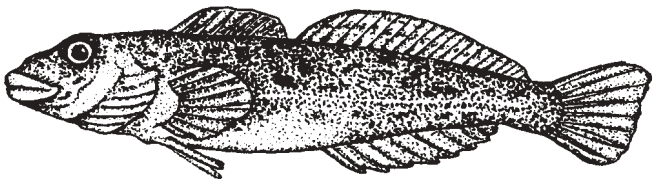
Sea Duck Food Chain Cards

Red Fox

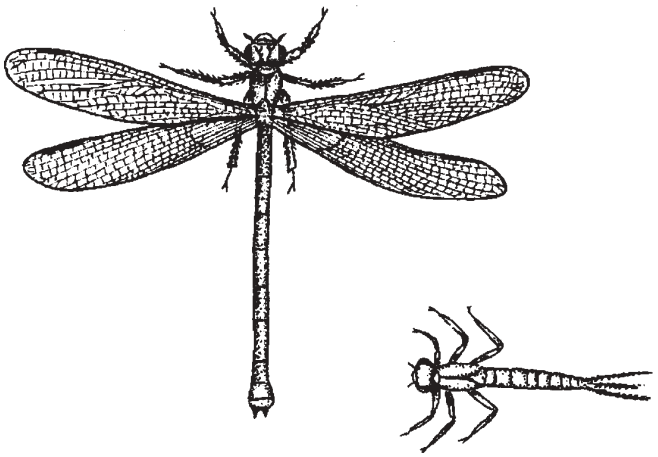
Mink



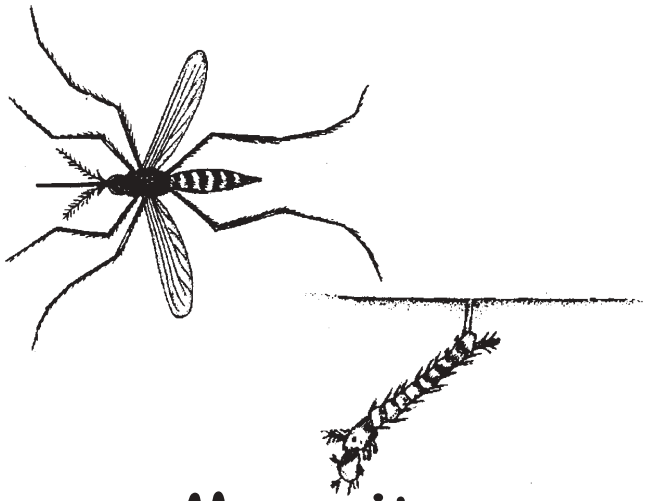
Snails



Slimy Sculpin



Damselfly



Mosquito

Sea Duck Food Chain Cards

Mink

Trait: mammal with large canine teeth
Feeds on: muskrats, voles, lemmings, eggs and young of ducks, geese and shorebirds, fish, frogs, mussels, aquatic insects
Is eaten by: hawks, owls, lynx, foxes, coyotes, wolves

Red Fox

Trait: mammal
Feeds on: voles, lemmings, hares, birds, eggs, insects, berries, carrion (dead animals)
Is eaten by: wolves, coyotes, lynx, wolverine

Slimy Sculpin

Trait: vertebrate - small fish
Feeds on: larvae of flies, mayflies, caddisflies, dragonflies, amphipods, also some eggs and young fish
Is eaten by: greebes, loons, mergansers, other fish

Snails

Trait: invertebrate - mollusc
Feeds on: Fresh water: algae, aquatic plants, detritus, fungi. Salt water: other marine animals, including other molluscs
Is eaten by: crustaceans, fish, birds, mammals

Mosquito

Trait: insect and freshwater macroinvertebrate
Feeds on: Adult: female sucks blood from birds and mammals, males feed on flower nectar. Larvae: algae, detritus
Is eaten by: Adults: dragonflies, fish, birds, bats. Larvae: fish and water birds

Damselfly

Trait: insect and freshwater macroinvertebrate
Feeds on: Adults: flying insects, including midges and mosquitos. Nymphs: mosquito larvae, tadpoles and small fish
Is eaten by: diving beetles, frogs, fish, waterfowl, shorebirds