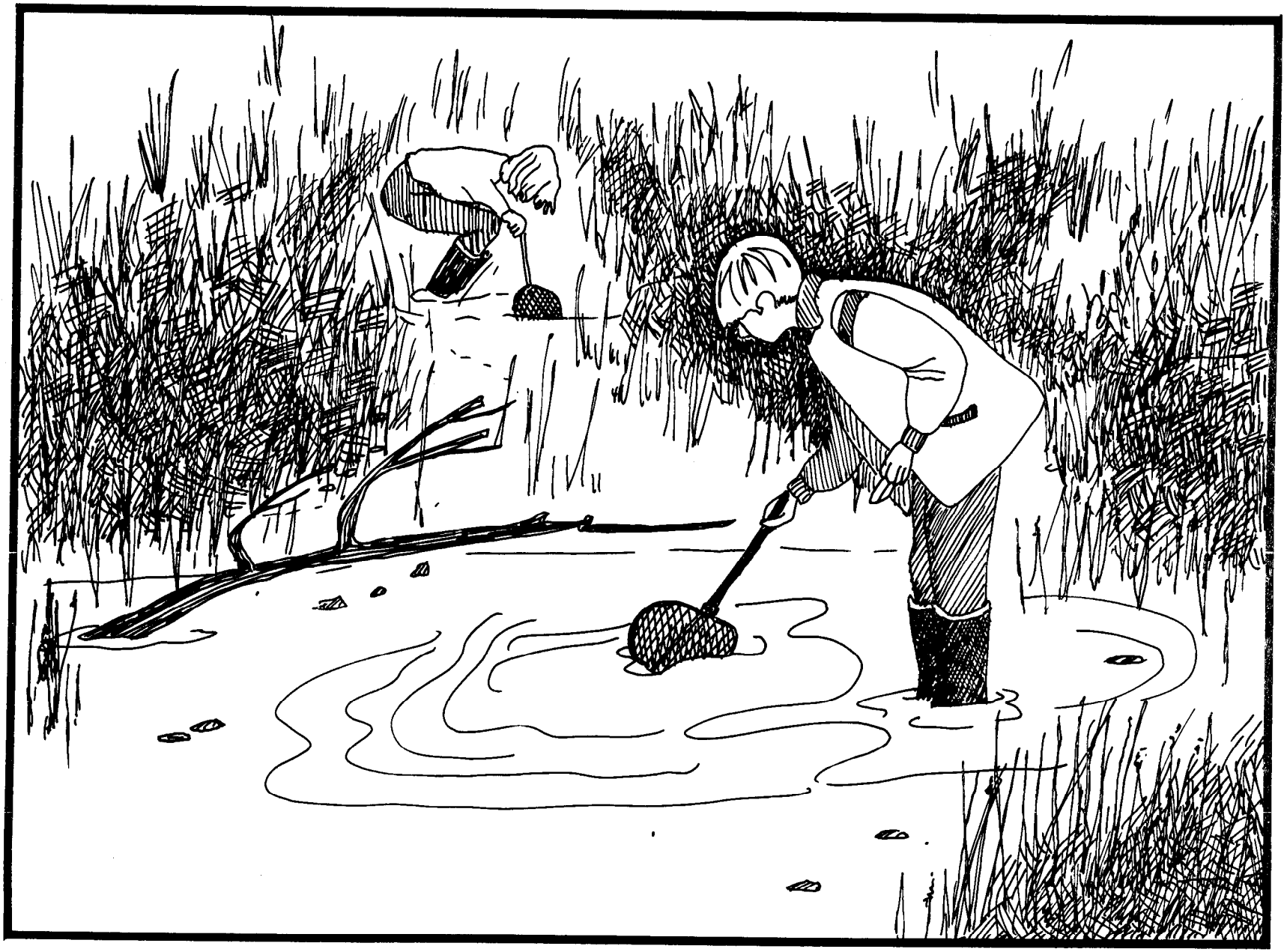
Unit Four
Freshwater Invertebrates

Objectives:

To enable students to:

- Make a mural of pond or stream life (Activity 1).
- Use the invertebrate worksheets to improve counting and coloring skills (Activity 1).
- List basic needs for living things (Activity 1).
- Explain how organisms change with the seasons (Activity 1 and 2).
- Recognize and investigate freshwater invertebrates including worms, leeches, clams, snails, amphipods and insects (Activities 1 and 2).
- Practice wetland safety procedures (Activity 2).
- Go on a wetland treasure hunt (Activity 2).
- Sing songs, play games, and have wetland animal races (Activity 2).
- Search for wetland pollution and discuss solutions (Activities 2 and 3).
- Assist in making a model freshwater wetland (Activity 3).
- Compare freshwater and saltwater environments (Activity 3).



UNIT FOUR: Freshwater Invertebrates. Exploring with nets and sharp eyes will turn up a variety of invertebrate species in any healthy pond or stream and will afford an opportunity to learn about the interdependence of life forms in wetland habitat.

Children are fascinated by water, and a pond teeming with life is ideal for exploring. Ponds are an important component of wetland habitat, supporting a diverse animal and plant population--everything from moose to waterlilies, from ducks to dragonflies. Wetlands are areas where the ground is wet at least part of the year. They support plants and animals that prefer wet soil. Marshes, rivers, lakes, ponds, streams, wet tundra, barrier islands, river deltas, tidelands, muskegs and bogs are all types of wetlands.

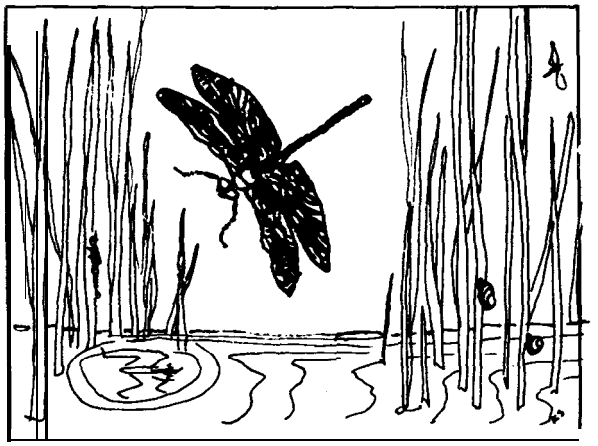
Critical for fish and wildlife survival, wetlands provide recreation as well as water and food for humankind. They act as natural storm buffers, helping to prevent flooding by soaking up heavy rains. Wetlands also filter out pollution (within limits!) and are abundant sources of such edibles as fish, birds, crabs, shrimp, clams, moose, caribou, berries, and other plants.

If ponds are not available in your area, substitute a nearby stream for your field studies. Stream animals are accustomed to a high level of oxygen because of the cool, moving water in which they live. Use an air pump if you keep them in an aquarium to ensure that they get enough oxygen.

The following activities will help your students to explore a local pond or stream. It may be enough for many of them to learn basic information such as the fact that "bugs live in water." But plenty of background on freshwater invertebrates has been included for you to refer to if your class wants additional information on a particular animal. This is an opportunity for them to use all their senses in the enjoyment of a still or running water environment.

Because their natural habitat is standing water, the smaller pond critters are particularly well suited for freshwater aquariums. With care, they can be kept for a long time.

Activity 1
What Lives in a Pond?



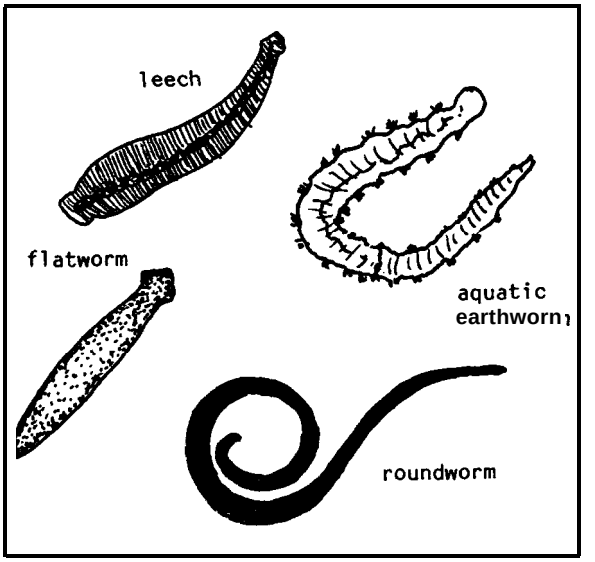
Background:

Many invertebrates live in freshwater ponds. Sometimes you can even find sponges and tiny jellyfish--but they're not very common. There are lots of worms, however. Most freshwater flatworms (Platyhelminthes) are parasitic. Tapeworms and flukes inhabit the food canals of fish and animals. The free-living freshwater forms that you are likely to find in ponds are planarians. Generally about one centimeter (½ inch) long, flatworms are grey or black and avoid light in the daytime. They can be found on the undersides of stones, leaves or other debris.

Roundworms (Nematoda) usually are abundant in bottom mud, sand or debris. Less than one-half inch long, they are noticeable because of their constant whip-like, S-shaped thrashing.

Aquatic earthworms and leeches are the two main groups of freshwater segmented worms (Annelida). These worms are common in the mud and debris of stagnant ponds, streams and lakes, and common as well in non-stagnant water. Aquatic earthworms look very similar to the land varieties. They digest bottom muds and organic material. Some varieties build little tubes and bury their heads in the mud while their tails wave above, creating a current that draws oxygen or food into the tubes.

Leeches often are abundant in calm, shallow, warm bodies of water whose bottoms are cluttered with debris. Most are predators and scavengers, although only a few species suck blood from warm-blooded animals. Leeches have head and tail suckers, are often brightly colored, and change shape rapidly by stretching or shortening their muscles. Historically, leeches were used by doctors to heal the sick by removing "bad blood."

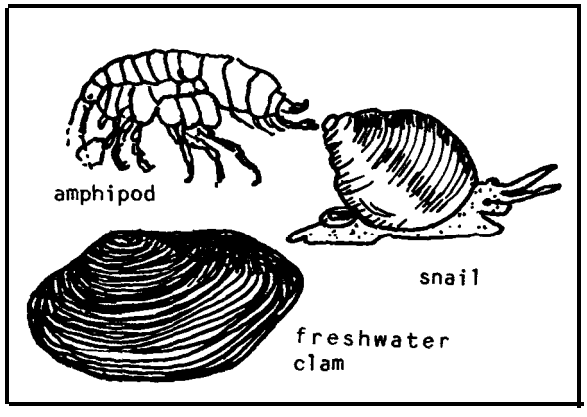


Like their saltwater relatives, freshwater mollusks are soft-bodied invertebrates covered by a hard shell including univalves, such as snails, and bivalves, such as mussels. (Further information is available on mollusks in Unit One: saltwater invertebrates. Their life history and general information sections apply to this unit as well.)

Snails are most frequently found in ponds and streams, but are also present in lakes and rivers. Freshwater snails are herbaceous, grazing on plant stems to scrape off the algae. Some snails have gills, which are protected by a lidlike structure called the "operculum"; others breathe with a lung sac.

Although they are sometimes referred to as "clams," all freshwater bivalves are true mussels. In Alaska, you may find tiny fingernail "clams" as well as larger ones up to six inches long.

Alaska's ponds and streams are rich in freshwater crustaceans. Members of the crustacean group have many legs and a hardened outer shell. Small tundra ponds or spring breakup puddles are often packed with tiny fairy shrimp or tadpole shrimp. Amphipods like the sand flea, which have one set of feet for walking or jumping and one set for swimming, are quite common.

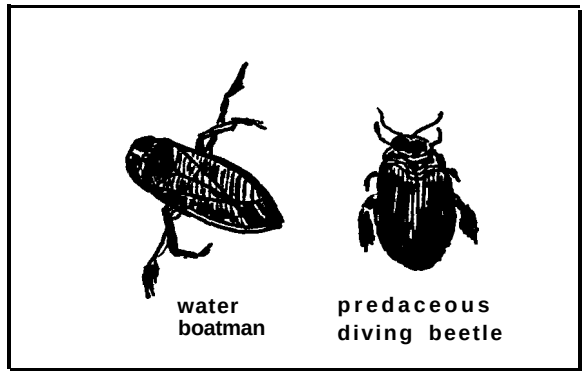


Insects inhabit fresh water both as adults and as young nymphs or larvae. Among the most successful life forms on earth, insects live even in arctic snow and ice. They are extremely rare in the oceans, however; so we have no saltwater examples with which we can compare our freshwater species.

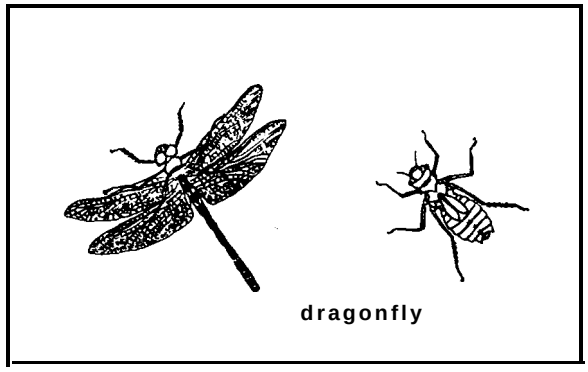
Each adult insect has a body segmented in three parts, six legs, a hard outer covering and (as adults) wings. Immature insects are more variable. Some resemble worms; others look much like adult insects.

The topic of insects is covered in detail in Volume Three of the Sea Week Curriculum Series, with pictures and brief description of some of the common insects that your students might find in ponds.

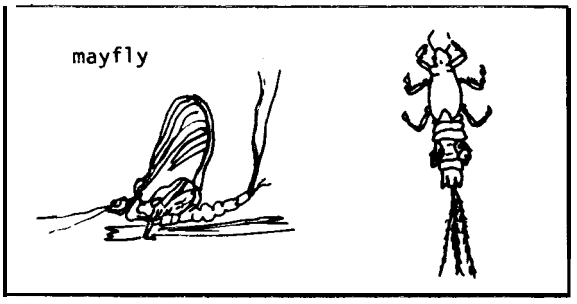
The water boatman is a great swimmer. It dives down, its body wrapped in a blanket of air, and anchors one claw of its middle leg onto a plant stem. There it can feed upon diatoms and algae.



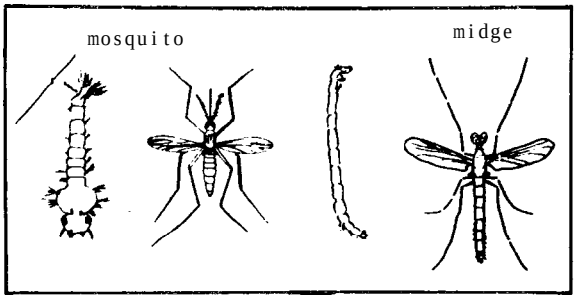
Dragonflies and predaceous diving beetles, both adults and young, are ferocious predators, eating anything they can catch!



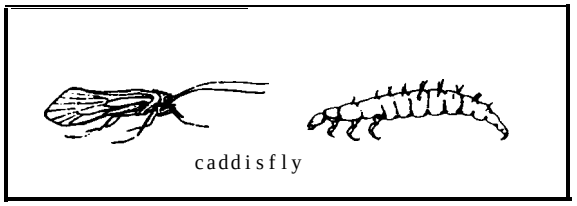
Mayflies are excellent fish food both as nymphs and as adults. They spend most of their lives as nymphs and only a few hours or, at most, a few days, as adults. The ephemeral adults don't eat. They mate and lay their eggs, then die on the water's surface becoming food for eager fishes.



Mosquitoes are all too well known to Alaskans. Adult midges are similar in appearance to mosquito adults, but most of them don't bite. Mosquito larvae (wrigglers) float on the water's surface; and midge larvae (bright red worms) are found in bottom muds.



Caddis fly larvae are interesting because most build homes out of sand grains, bark or vegetation. Caddis fly adults look like moths because their wings are folded similarly--like a tent over their backs.



Vocabulary:

- wetland
- flatworm
- roundworm
- segmented worm
- mollusk
- crustacean
- insect
- boatman
- dragonfly
- predaceous diving beetle
- mayfly
- mosquito
- midge
- caddis fly larvae

Materials:

- pictures of Alaskan wetlands (marshes, muskegs, tidelands and tundra with their ponds and streams, animals and plants) from magazines,
- postcards, books, slides
- chalkboard or butcher paper
- chalk or felt-tip markers
- scissors
- paste
- crayons
- paper
- worksheets :
  - ... Make Your Own Wetland (4-A)
  - ... Leeches (4-B)
  - ... Snails (4-C)
  - ... Insects (4-D)
  - ... Invertebrate Cut Out (4-E)
  - ... Freshwater Life (4-F)

Procedure:

1. Introduce the idea of wetlands. Ask the students about places nearby where they can get their feet wet. Where are local ponds and streams? What animals and plants would they find in them? Show the students pictures of Alaskan wetlands.

How do they change with the seasons?

2. Review the needs of all living things (food, water, shelter) and discuss:

   a. How living things grow and change.
   b. The different elements of nature (plants, animals, soil, water, air, and energy) and why all are necessary.
   c. What "habitat" is: an animal or plant's home.

3. Make a large class mural of one of your nearby wetlands with its accompanying ponds and streams on butcher paper or chalkboard. Include appropriate plants and animals.

4. Do worksheets: Make Your Own Wetlands; Leeches; Snails; Insects; Invertebrate Color, Cut Out and Paste; and Freshwater Life. The students will need scissors, paste, crayons, and extra paper.

5. Share this poem with your students, and invite them to write poems of their own.

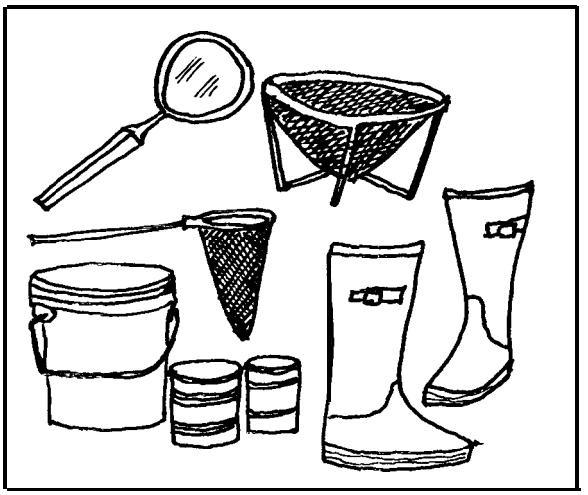
SNAIL

Snail upon the wall,
Have you got at all
Anything to tell
About your shell?

Only this, my child--
When the wind is wild,
Or when the sun is hot
It's all I've got.

John Drinkwater

Activity 2
Visiting a Pond or Stream



Background:

Ponds can be described simply as shallow, quiet bodies of water with aquatic plants growing across them. There are millions of ponds in Alaska. If you're lucky enough to have a pond near your school, you may want to visit it several times during the year. Go to a stream if a pond is not available. If you can arrange only one trip, be sure to check the later units on amphibians and freshwater mammals beforehand.

To help plan your field trip, read over the suggestions for the beach trip in the teacher background for Unit 3, Activity 2.

Vocabulary:

- pollution
- mayfly
- minnow

Materials:

- large kitchen strainers
- magnifying lenses

- buckets, big cans
- clear plastic boxes, containers or plastic bags
- minnow traps
- sweep nets
- rubber boots, hip boots
- task cards for volunteer teachers
- snack
- paper bag for each group of students

Procedure:

1. Ask your students what they think they will find when they visit the wetlands. Have students draw pictures of their predictions. Will they see moose, an eagle, bear, salmon?

2. Discuss safety; have students decide how to keep warm and dry; how to avoid falling in ponds, streams, or bogs; how to keep from getting lost. Invent some risky situations and have the students tell you how they would act to get through safely.

3. If the area is close enough to visit regularly, make your first visit a short exploratory one. Encourage students to use all their senses to understand the pond or stream.

   - What animals live there?
   - What plants can you find?
   - What can you discover about the water?
   - What do you notice about the area around the pond?

   Remind students about the differences between invertebrates and vertebrates. What animals can they find that have backbones? (birds, frogs, muskrats, beavers, fish, people, etc.). What animals don't have backbones? (insects, univalves, bivalves --most animals in the world are invertebrates). Students can return to the classroom with questions that will be good incentives for finding out more about wetlands.

4. Use various kinds of sampling equipment for your next venture. Set a minnow or blackfish trap the day before your trip (first get the permission of the Alaska Department of Fish and Game). Put on hip boots and use a sweep net to sample the water column. Have the students use kitchen strainers, large tin cans, and sweep nets to capture what they can along the pond's edge. Collect a bucket of pond water, a bit of pond bottom, pondweed and a few critters (not big fish--they take too much oxygen) to take back for a classroom aquarium.

5. Select task cards, each of which contains instructions for a student activity. Have your volunteer assistants present these to the students one at a time.

Task Cards

Hot or Cold

Put your hand in the water and keep it there for several seconds. Then hold your hand on the pond shore for the same amount of time. Finally, hold it in the air. What did you notice? Which was the coldest place? The warmest?

The Adventures of a Water Bug

Find a water insect. Sit quietly and watch it for a few minutes. What is it doing? Tell us a story about its adventure.

Pondweed

Touch some pondweed (without tearing it out of the bottom). How does it feel? How much of the plant is covered by water?

The Beach at _____

Go beachcombing. Tell us about your beach. What is it made of? What have you found there?

Bug Moves

Find an insect in the pond and put it in a "field aquarium." Watch it and see if you can figure out how it breathes, how and what it eats, how it moves, and what part of the pond it lives in. Do you think it sleeps? Then put it back in its own habitat (the pond!)

Pond or Stream Bottom

Pick up a handful of pond or stream bottom material. What does it feel like? What is it made of? Walk around the pond or along the stream. Is the bottom the same everywhere?

Wind

Is the wind blowing? How can you tell? Use your breath as a "wind" to move things around you.

Tracks

Find some tracks in soft mud. Who made them? What happened?

Pebbles

Are there any pebbles around your pond or in your stream? Find as many different-colored stones as you can.

Driftwood

Find some driftwood.
- ...with no bark...
- ...with one branch...
- **...with two branches...**
- **...with three branches...**

Water Color

What color is the water? How deep is the pond or stream? Is it over your head? How big is the pond or stream? Is it bigger than your classroom? Bigger than your school?

Under a Log

Find a log on the edge of the pond or stream. Carefully turn it over. What do you see? Return the log to its original place afterwards so that you don't disturb any animals underneath.

Snailing

Find a snail by looking closely at pond vegetation or bottom debris. Place the snail in your field aquarium and watch it closely. Are you ready for some snail races? Find another snail and try a race between the two. But you'll have to be patient!

Bird Watching

How many birds can you see? What are they doing? Why do they like this pond? Pretend you are a bird. Fly around. What are your needs? Where will you find shelter? Food? Water?

6. Try a treasure hunt. Have group leaders check off each item as found, so students don't have to take live animals away from their habitats. Some ideas: something brown, green, red, blue or black, snail, bug, worm, dried-up plant, feather, driftwood, pebble, green plant, pondweed and litter (which they can collect and dispose of!)

7. Introduce the word "pollution." Is this pond polluted? What kinds of things can harm the animals and plants in this habitat? Tell us about any places you know of that are polluted. Is there any way we can help?

8. Review the seasons. Which season is this? What will the pond look like in winter, summer, fall, spring? How does it change? How do we change?

9. Have a leech race! Students can't move their hands until their feet are touching the ground. They can't move their feet until their hands are on the ground! Then try an amphipod race. Students slump over and run forward and backward with their hands trailing on the ground.

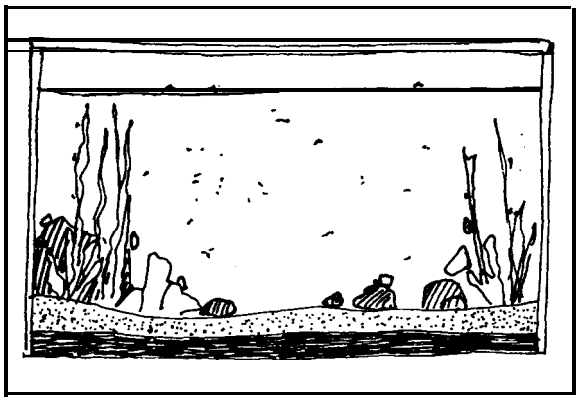
10. Try a pond version of "Duck, Duck, Goose." Introduce it with the following jingle sung to the tune of "Round and Round the Mulberry Bush":

"Round and round the little pond
The minnow chased the mayfly.
All at once the minnow went "gulp,"
"Pop" goes the mayfly!"

Substitute- the names of animals you have found and make up several verses. Then stop the song long enough to seat the children in a circle. Designate one as "mayfly." As the children start singing the minnow-and-mayfly verse again, have the "mayfly" walk around the outside of the circle tapping each child on the head and repeating "mayfly" at each tap. The student tapped as the word "pop" is sung becomes the "minnow" and chases the "mayfly" around the circle and back to the minnow's slot. Whoever gets there first is now "It." The loser takes a seat in the center of the circle until replaced by the next loser.

11. End the field trip by recalling what has been learned. As the children get more expert at this exercise, ask each one to say something different. Let the other children help if anyone has trouble, so that the day ends on a positive note.

Activity 3
Bringing Wetlands to the Class



Background:

By making a freshwater aquarium, students will have a chance to closely observe the inner workings of a pond and nearby wetlands in miniature. Aquariums can be constructed even in the winter using a hole drilled in the ice, a grappling hook to bring up pondweeds and a bucket to haul up water. A minnow trap baited with sardine pieces will catch insects overnight. If the aquarium is well balanced with the proper proportion of plants, animals and sunlight, it can be sealed. We've heard of sealed ones lasting a year.

Vocabulary:

. aquarium

Materials:

- construction paper
- twigs, grass, moss, pebbles
- an aquarium or gallon glass jar
- pond or stream water, vegetation, animals, soil
- air pump (optional)
- magnifying lens or binocular scope and light
- finger bowls

Procedure:

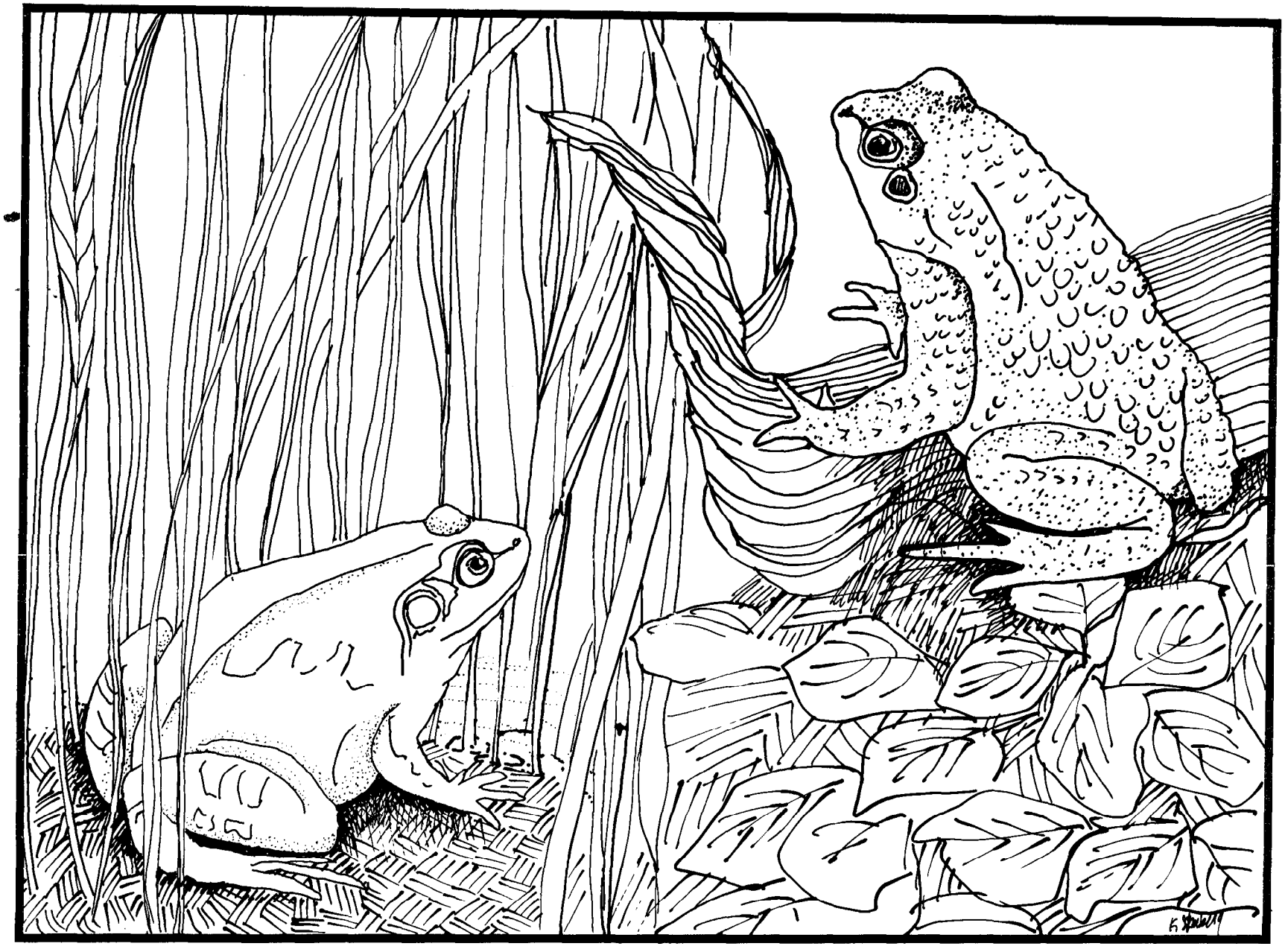
1. Review what happened on the field trip. Ask students whether they would like to have their own wetland. Have them help you set up the aquarium. Talk about each component--soil, water, animals, plants, air--as it goes in. Use soil, twigs, moss, grass and pebbles to build the shore around your pond. Set up a "wetland watch" so that whenever students have free time they can go over and watch what's happening. Make a log book to record important events. Use an air pump if one is available. Stream organisms are accustomed to higher oxygen levels.
2. Set up the magnifying lenses or binocular scope and take a close look at any critters you captured. By using the water-filled finger bowls, students will have a chance to see moving critters. (For more information on your finds, consult Sea Week Volume 3.)
3. Have students look at the wetland pictures that they drew earlier. What do they need to add? How have their ideas changed?
4. What pollution sources did your students find? Is there anything your class can do to help reduce them? What are the future plans for your wetlands?
5. If your students have also visited salt water, compare it to fresh water according to types of animals, plants, sediment, water, wind, weather, human uses.

Unit Six
Amphibians

Objectives:

To enable students to:

- Describe the life cycle of a frog or toad (Activity 1).
- Make their own pet frogs (Activity 1).
- Draw the wetland habitat of frogs and toads (Activity 1).
- Learn a legend telling about the importance of frogs in Native life (Activity 2).
- Place story events in sequential order (Activity 2).
- Draw an event from the "Legend of Six Frogs" (Activity 2).
- Act out the "Legend of Six Frogs" (Activity 2).



UNIT SIX: Amphibians. Because amphibians, like the frog and toad pictured, are cold-blooded, life in the north is hard for them. They need summer warmth for metamorphosis and suitable spots for winter hibernation.

Amphibians are vertebrate animals that are dependent upon water for survival for parts of their lives. They lay their eggs in water, and when the eggs hatch the young, or larval, stages live in the water, acquiring lungs only as adults. Some amphibians depend on moist skin for respiration. In Alaska, all amphibians hibernate during the winter. Salamanders, frogs and boreal toads inhabit Southeast Alaska. The toad and possibly one species of newt (a family of salamanders) are found in South-central Alaska. The wood frog, Rana sylvatica, is found in most parts of the state.

Reptiles are similar to amphibians, but they have no aquatic larval stage. Reptiles generally need more sunlight and warmth than amphibians.

A few garter snakes have been reported along the British Columbia border and a leatherback sea turtle was caught at the mouth of the Copper River Delta (and is now on display in the Cordova Historical Museum) , but reptiles are extremely rare in Alaska.

Life in the north is difficult for amphibians. They are cold-blooded, which means that their body temperature is close to that of the environment around them. They need enough summer warmth to enable them to go through metamorphosis. They also need suitable spots for hibernation.

Wood frogs hibernate in shallow, bowl-shaped depressions that they excavate in the upper layer of the previous year's vegetation. The winter snow acts as an insulator. Light snow years result in high frog mortality. Frogs use their own body energy for fuel, losing weight during the cold winter months. Spring warmth finds frogs calling, mating, and laying eggs in ponds. The eggs hatch into gilled tadpoles. If all goes well, these metamorphose into lunged , air-breathing adults by the end of the summer.

Besides breathing through their lungs, amphibians can absorb oxygen through their moist skin. In the winter, when they hibernate in the bottom of ponds or in the ground, they take in enough oxygen through their skin to stay alive.

(For more information read R. P. Hodge's Amphibians and Reptiles in Alaska, the Yukon, and the Northwest Territories. Additional background information and activity ideas are available in the Frogs and Toads activity packet produced by the Dahlem Environmental Education Center, Jackson Community College, Jackson, Michigan.)

Activity 1
Frogs and Toads

Background:

Frogs and toads spend the first portion of their lives in ponds, as eggs and then as tadpoles. They absorb dissolved oxygen through fish-like gills. Then, as adults, they breathe air with lungs.

Each spring, after mating, female amphibians lay soft, jelly-like eggs in ponds. Frogs lay large masses of floating eggs; toads lay strings of eggs that stick to vegetation in the bottom of the pond. After a few days, the eggs hatch into tadpoles (polliwogs).

The fishlike tadpole eats small water plants, especially algae. It grows hind legs followed by front legs. Then it stops eating as its small body undergoes drastic changes: eyeballs move from the side to the top of the head; gills make way for legs and lungs; and the digestive system transforms to accommodate an insect diet. During this time, its body is supplied with nutrients from the storehouse in its shrinking tail.

Vocabulary:

- amphibian
- tadpole
- polliwog
- metamorphosis
- hibernate

Materials:

- green, smooth material
- brown, bumpy material
- construction paper
- crayons
- scissors
- brads
- butcher paper or chalkboard
- felt-tip markers or chalk
- dictionary
- worksheets:
  - ... How Does a Frog Grow? (6-A)
  - ... Frog or Toad? Which is Which? (6-B)

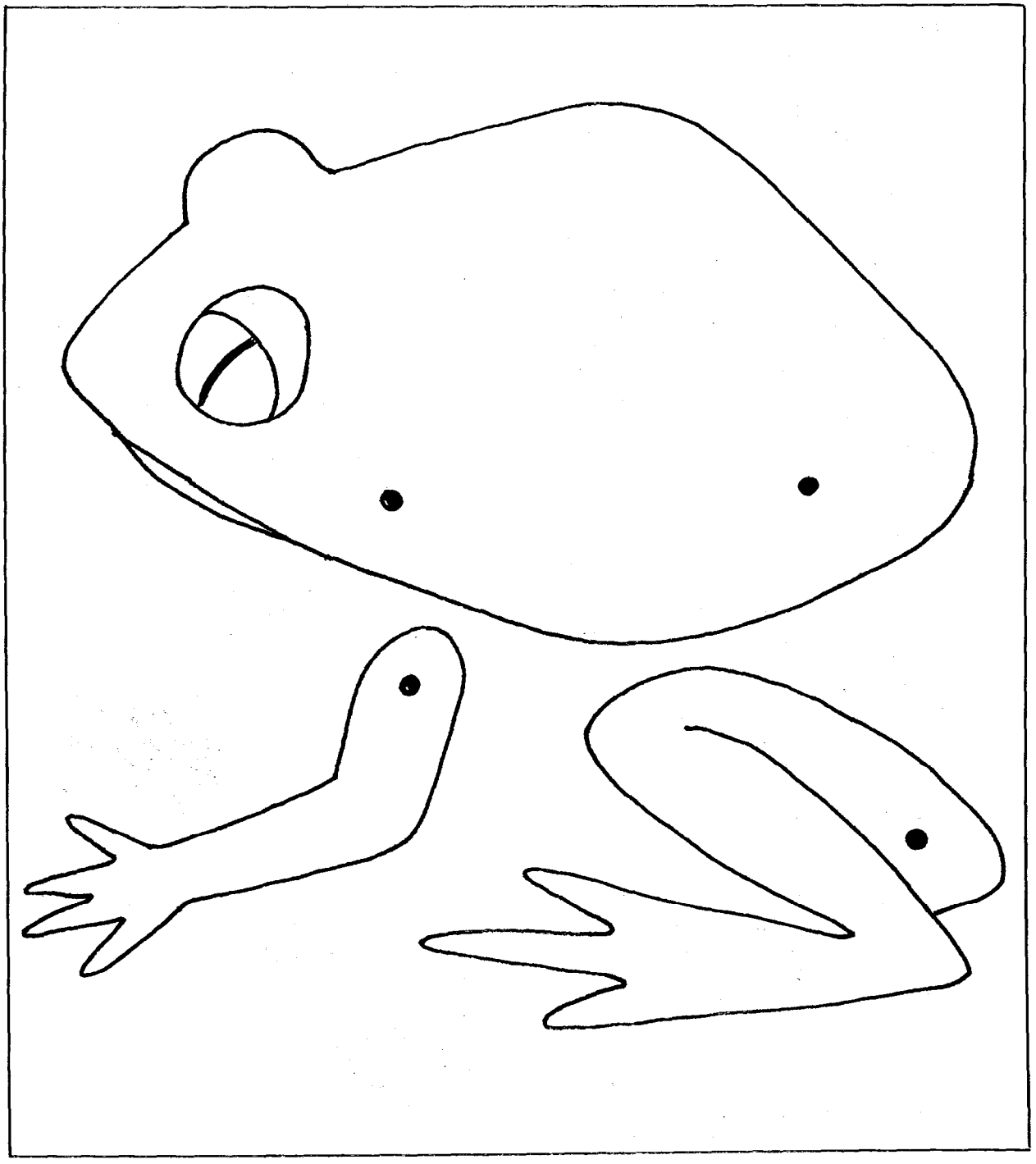
Procedure:

1. Explain to students that they are going to study one category of amphibians--frogs. Have them look up "amphibian" in the dictionary. Talk about the changes in the frog's life cycle and introduce the idea of metamorphosis. Use the worksheet and have students cut out pictures of the frog's life cycle and see if they can place them in the proper order.

2. Prepare frogs and toads before class using the pattern from the worksheet Frog or Toad? Which is Which? Cut the frogs out of smooth green material such as acetate, oil cloth or wrapping paper. Cut the toads out of bumpy brown material such as sandpaper, rough wood or cloth.

3. Toads and frogs can be safely handled by anyone, but handling frogs removes their protective mucous layer. Tell the children to be careful not to squeeze too hard when trying to keep hold of these jumpers.

Have students make pet frogs or toads by cutting out and coloring the following pattern. Use brads at the leg and arm joints for some movable, hoppy toads and frogs.



4. Distribute the worksheet Frog or Toad? Discuss the differences between frogs and toads. Pass around the frogs and toads you made, for the children to feel. Frogs are green or light brown, smooth and moist. Their color blends in with the plants that fringe ponds and streams. Because of their longer back legs, they are great jumpers.

   Toads are brown, bumpy and dry, blending in with mud and dead leaves. With their shorter rear legs, they are better than frogs at walking. Toads have kidney-shaped glands on their heads which exude a milky white poisonous fluid when predators try to eat them. They do not give people warts, and their poison will not bother people unless they try to eat the toads!

5. Discuss where frogs and toads live (their habitat). Frogs and toads breed in ponds and are usually found in or near fresh water. Marshes and the edges of ponds and streams provide them with water, food and cover. However, wood frogs, the most widely distributed amphibians in Alaska, live in grasslands and open forests and may often be found considerable distances from water. Polliwogs eat algae. Adult amphibians eat live worms and insects--thousands of them--which is a great help in Alaska in the summertime!

6. Draw a big mural on butcher paper or chalkboard of frogs and toads in their wetland habitat, showing every stage of their life cycles. Draw their food, water. and cover. Show them eating lots of mosquitoes!

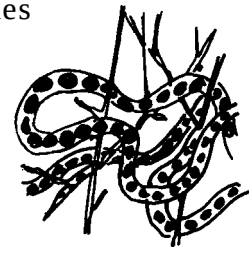
Additional activities:

1. Language Arts: One of the most famous Japanese haikus is about a frog. Use it as a model, and have the children write their own haikus.

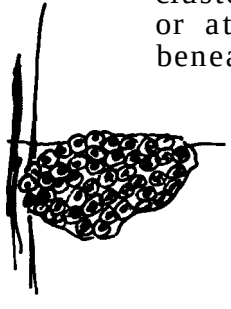
   Large pond.
   Frog jump in.
   Plop!
   -Basho

2. Science: Take a field trip to a nearby wetland area to look for frog and toad adults, polliwogs and jelly-like eggs. Listen for croaking. Evening is often the best time to hear frogs and toads, so encourage parents to take their children on flashlight expeditions.

Toad eggs--
long strings attached
to bottom vegetation
in ponds or puddles



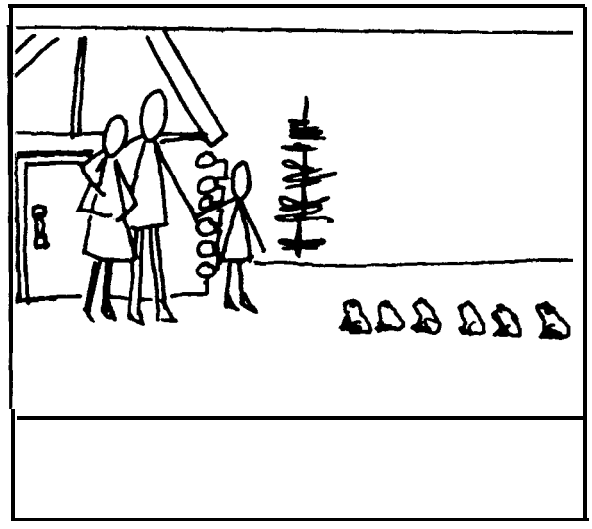
Frog eggs--
clusters floating on ponds
or attached to vegetation
beneath the surface



3. Science. Make a terrarium so that you can observe a live frog or toad for short periods. Place a layer of rocks and gravel in a large glass container or pan; add soil and plants. Set a pie pan full of water in one corner. Cover the top with plastic wrap to hold in moisture. Punch a few holes for air, and collect plenty of live insects to feed your frog or toad. Watch it move, eat and breathe. Then return your frog or toad to its wetland habitat.

Eggs or tadpoles can be kept briefly in an aquarium filled with pond water. Discard non-developing eggs and any that turn gray or white. Keep the water cool, out of direct sunlight. Feed the tadpoles cornmeal, cooked spinach, boiled lettuce, and hard-boiled egg bits. Remove leftover food. Captive tadpoles often won't complete the transition to an adult because the aquarium lacks the increasing concentration of nutrients found in an evaporating spring pond. So release the majority and give those remaining plenty of extra food.

Activity 2
The Legend of Six Frogs



Background:

This activity involves a legend from British Columbia. Alaskan Natives have similar legends and stories about frogs. Frogs are especially important in Southeast Alaskan mythology, and totem poles and gravestones often have carved images of frog-like or toad-like figures. In the stories, frog is a guardian spirit, a bringer of good fortune, the embodiment of wisdom, a guide through treacherous country and the symbol of secret societies. Also, in this tradition, a frog's owner is supposed to be endowed with singing power.

Vocabulary:

. legend

Materials:

- copy of "The Legend of Six Frogs"
- cloth or colored paper to
- make student costumes
  paper

- crayons
- scissors
- worksheet:
  - Legend of Six Frogs (6-C)

Procedure:

1. Read students "The Legend of Six Frogs."

2. Have students cut out pictures of the specific story events on the worksheet Legend of Six Frogs. Ask them to recall the story, then to match the following captions with the pictures and place the pictures in proper sequence.

   a. seven children asking father permission to go hunting
   b. seven children in canoe waving farewell to father
   c. children eating lunch by pond and noticing wrapped food
   d. six children eating food and dried fish
   e. seven children--one normal size and six shrinking, part-frog children
   f. one child paddling home
   g. six frogs croaking outside the door

3. Discuss the legend. Ask, "What do you think happened to the six frogs during the winter months?" Lead into a discussion covering frog hibernation.

4. Have students draw favorite scenes from the legend.

5. Assign parts to the students and act out the "Legend of Six Frogs." Students can make costumes and invite parents or friends to see the play.

Additional activities:

1. Language Arts, Social Studies: Have the children try to discover and record local legends and carvings of frogs and toads. How does the "Legend of Six Frogs" differ from local legends? Show the children on a map where the "Legend of Six Frogs" originated (The Saanich Reserve is near Sidney, Vancouver Island, British Columbia, Canada).

2. Language Arts, Science: Have the children write a class story about frogs and toads, weaving in lots of facts and anecdotes about their experiences with amphibians.

LEGEND OF SIX FROGS

Joan Morris,
Told by her grandmother

Once upon a time there lived a family at the West Saanich Reserve, near a pond. There were seven children in this family from the ages of seven to four teen years old.

One day they all decided to go hunting together, so they asked permission of their parents.

Just as they were leaving the father took them aside and told them if they stopped at the pond to eat their lunch, they were not to eat *anything they found there. After this they bade farewell to their father and set out in their canoe.*

As they were approaching the pond one of them asked if they should stop and eat, as he was very hungry. So they all stopped and ate some of their lunch.

As they were eating one of them noticed a piece of paper with something wrapped inside it. So, they all went to see what it was.

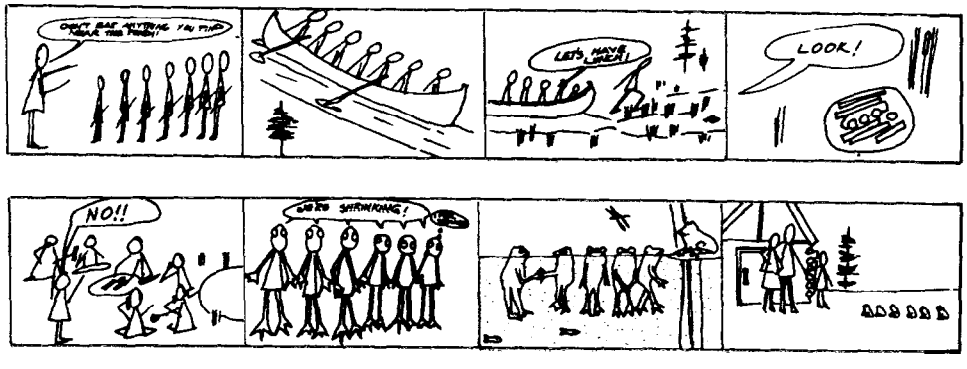
When one of *the bigger boys opened it they found all sorts of food and dry fish. It looked so delicious that six of the boys started eating, but* one of *them remembered what his father had told them and he tried to stop his brothers. But they laughed at him and said that he was superstitious, like their father.*

Not long after that they *all felt strange. Then looking at one another they noticed that each one was getting smaller and small-*er. Gradually *all six* of them *changed in to little green frogs.*

The one that did not change got in the canoe and paddled home to tell his father what had happened.

After supper the father told the mother the sad news. Suddenly they heard the croaking of frogs outside and going out they noticed six *little frogs.* These little *frogs stayed there until winter.*

That is how the frogs came to the West Saanich Reserve.



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Unit Eight
Freshwater Mammals

Objectives:

To help students:

- Compare and contrast the river otter, beaver, mink and muskrat with each other and with other animals (Activity 1).
- Count different and similar animal tracks found near a freshwater pond or stream (Activity 1).
- Find a stick cut by a beaver (Activity 2).
- Construct a miniature beaver lodge in the classroom (Activity 2).

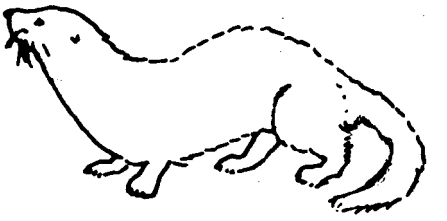
UNIT EIGHT: Freshwater Mammals. Clockwise from lower left: Two beavers, muskrat, river otter, mink.

The mammals making their homes in Alaska's freshwater environment are much like their saltwater relatives. They all breathe air, give birth to live young, which they nurse, have fur or hair and are supported by a backbone. However, freshwater mammals differ from their saltwater counterparts in that they are more amphibious (at home both in the water and on land).

The river otter has a long, slender body, short legs, and scent glands that it uses to mark a territory or to repel enemies. The otter may travel on land between bodies of water. By running and sliding on the snow in winter it can move as fast as 15 miles per hour. In water, it propels itself by flexing its body and using its webbed feet. The river otter eats snails, clams, mussels, sea urchins, insects, crab, octopus, frogs, fish and plants. It is found as far north as the Brooks Range and Point Hope.

River Otter

Mink are smaller than otters and the hind feet are only slightly webbed. Their fur is dark chocolate brown and they have fuzzy tails. They eat many of the same foods as river otters and are found throughout the state except in the Arctic Slope, Kodiak, and the Aleutian and Bering Sea islands. Mink are equally at home on land or in the water when hunting for food. Their rapid movements contrast with the otter's easy lope.



Mink

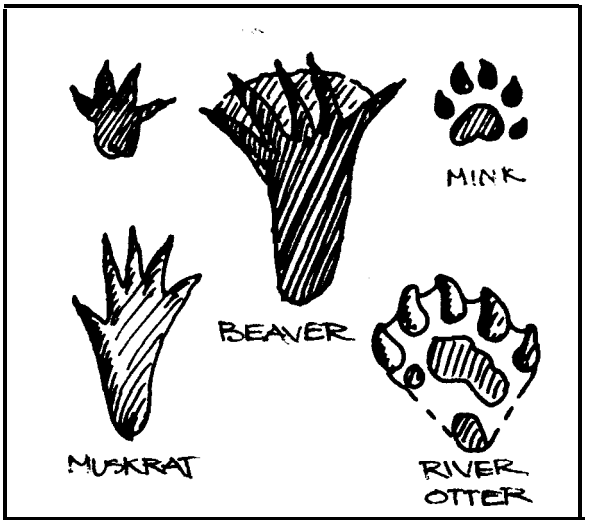
Muskrats and beavers are related; both are members of the rodent family. The muskrat looks something like a large, plump, furry common rat and is found throughout most of Alaska. Its tail is about 11 inches long and is adapted to an aquatic habitat by being flattened on each side. The muskrat eats lilies, sedges, roots, grasses and other vegetation.

Muskrat

Beavers are the largest rodents in Alaska and range throughout the state's wooded areas. Animal engineers, they are known for their mud and stick dams, which create ponds in which the beavers build their lodges. Beavers eat small twigs and bark of trees and shrubs, and roots and stems of aquatic plants. They are well adapted to their watery environment with their thick, dark brown fur, large webbed feet, nose and ear valves to shut out water, and broad, flat tails.

Beaver

Activity 1
Counting Animal Tracks



Background:

Tracks are one of the most common signs that animals are around. By watching tracks, students can learn to be careful observers, and can figure out not only what kind of animal has visited an area, but what it was doing there. Olaus Murie's Field Guide to Animal Tracks is the classic treatise on tracks and other animal signs.

One of the best places to spot tracks is in the muddy areas around the edges of streams and ponds. The size and shape of tracks and the space length between them are all important for identification. Other clues to identification are habitat, scats (droppings), browse and scent. Burt and Grossenheider's Field Guide to the Mammals provides additional information on identification.

Vocabulary:

- webbed
- mammal (review)

Materials:

- resource materials from library (filmstrips, books, magazines)
- biologists, trappers, hunters, elders from the community who are familiar with freshwater mammals
- copies of track cards
- rulers
- worksheets:
  - ... River Otter (8-A)
  - ... Mink (8-B)
  - ... Muskrat (8-C)
  - ... Beaver (8-D)

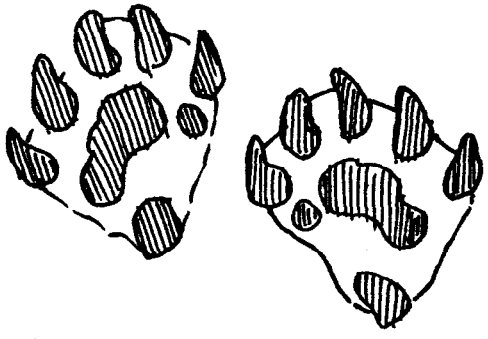
Procedure:

1. Discuss freshwater mammal characteristics and compare them with those of marine mammals.

2. Ask a local expert to help your class with its studies. Use the River Otter, Mink, Muskrat and Beaver worksheets. Both front and hind feet of the river otter are webbed. Beavers have webbed hind feet and muskrats feet are partly webbed, while mink have just a little bit of webbing in their hind feet. Discuss the purpose of webbed feet. Refer to the similarity between a scuba diver's flippers and webbed feet.

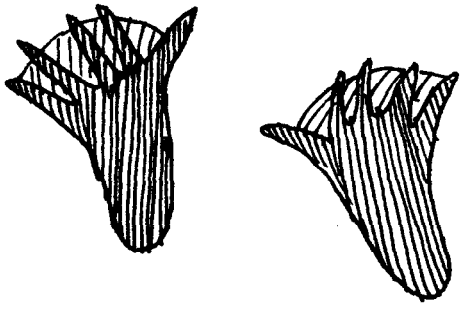
3. Take a trip to a freshwater pond or stream near your school to look for tracks. Count the kinds of tracks and measure and record their sizes. Include man-made tracks and bird tracks. If a pond or stream is not available, take a walk around the school, counting various tracks. Make copies of the track cards, first cutting off the labels. Place them around the classroom or school grounds. (Be sure students realize that these tracks are much smaller than normal.)

4. Discuss the importance of wetlands habitat (with its interspersion of ponds and streams) to otters, mink, muskrats and beavers. Wetlands are a source of food and shelter for all these animals.

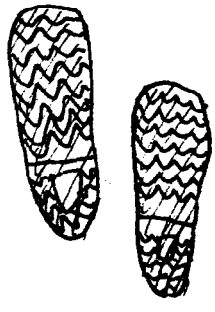


RIVER OTTER TRACKS

DOG TRACKS



BEAVER TRACKS

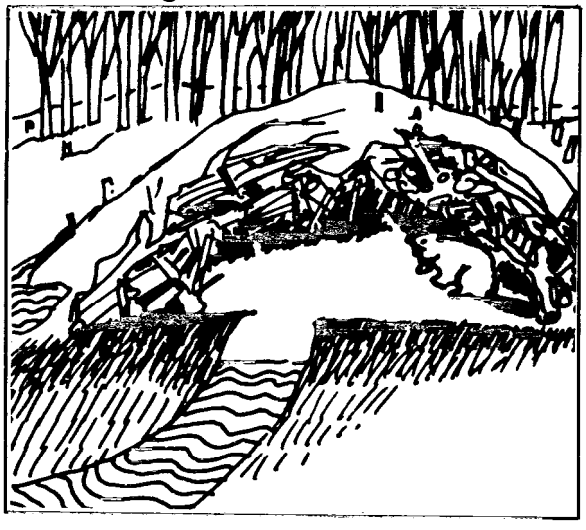


PEOPLE TRACKS

MINK TRACKS

MUSKRAT TRACKS

Activity 2
Constructing a Beaver Dam and Lodge



Background:

Beavers have been important to the Alaskan economy for many years. Their pelts provide cash for subsistence hunters, who sell beaver furs to be made into hats and coats. Beaver meat is eaten by people, and is much prized as food for dog teams. Trappers along the Iditarod dog team race route save their beaver carcasses to sell to the racers. Beaver Roundup is a big celebration every year in Dillingham.

Most adult beavers weigh 40 to 70 pounds and live about 10 to 12 years. Their heavy, chestnut brown coats and soft underfur keep them warm. The beaver's nose and ear valves close automatically under water. Their lips are loose and can be drawn tightly behind the protruding teeth, so that the animal can cut and chew wood underwater without getting water in its mouth.

Young beavers (kits) are born from late April through June; they can swim immediately. They stay with their parents for two years, then leave to make their own homes. Life depends primarily on food supply. Beavers eat tree bark, aquatic plants, roots and grasses. When an area is cleared of food, the family migrates.

Abandoned, with no one to maintain its dam, the old beaver pond drains and turns into a meadow. Then trees begin to sprout, and the area eventually becomes a forest. But in the meantime, the pond has provided habitat for a variety of aquatic life and added many nutrients to the soil from feces and silt from upstream, built up behind the dam. (This background material was adapted from the Alaska Department of Fish and Game's Wildlife Notebook Series.)

Materials:

- aquatic plants
- sticks and mud
- water
- large baking sheets (with edges)
- worksheets :
  - Water Mysteries (8-E)
  - Freshwater Mammal Puzzle (8-F)

Procedure:

1. Take a trip to a local pond or stream to look for beaver signs and old or new lodges and dams. Collect small sticks cut by beavers and note their teeth marks. Collect mud and a few aquatic plants, too. If a pond or stream is not accessible, collect mud and twigs around the school grounds.

2. Back in the classroom, construct a beaver dam and lodge with the sticks, mud and aquatic plants. Use a

cookie sheet or baking pan with edges. Then see if your dam will hold water!

3. Discuss with students how beavers create wetland habitats with their buildings. Their dams flood an area and make more room for fish, water birds, pondweed and moose. Beavers are master engineers, as students will discover when they try to construct a mud dam that holds water. Beavers are fast builders; often, if a hole is knocked out of one of the dams, they can rebuild it overnight.

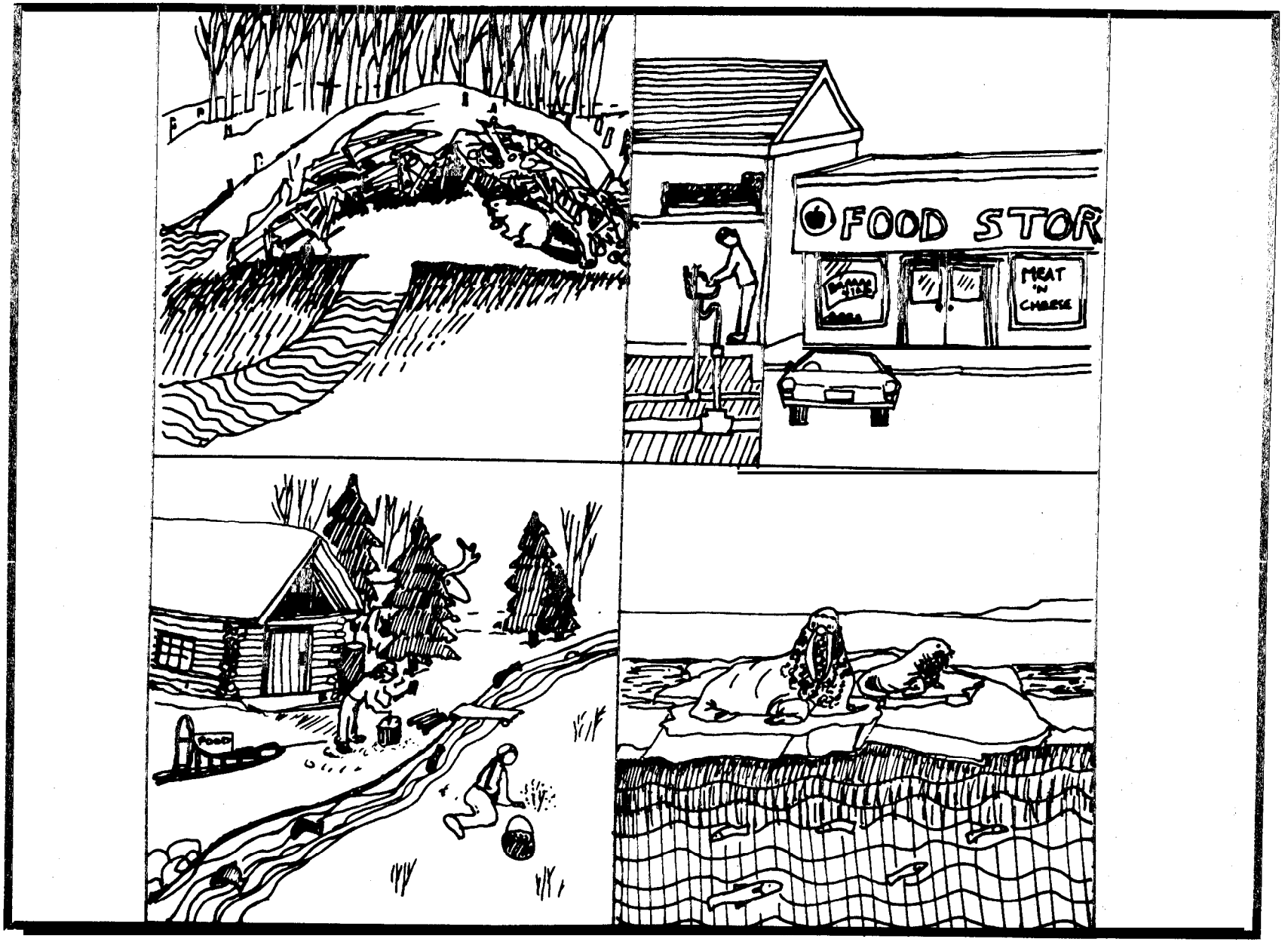
4. Use the worksheets Water Mysteries and Freshwater Mammal Puzzle as a review of this unit. Water Mysteries is based on actual relationships. Muskrats often use old beaver lodges for dens. Mink eat muskrats. And otters (although it is not mentioned on the worksheet) often tear holes in beaver dams, lowering the water and exposing beavers to predators. In the Freshwater Mammal Puzzle, have students color, cut out, and match the different names and characteristics.

Unit Nine
From Wetlands to the Sea

Objectives:

To help students:

- Define the term "habitat" (Activity 1).
- Understand that all animals need food, water and cover (Activity 1).
- Identify and compare animal and human habitats (Activity 1).
- Imitate different forms of underwater locomotion (Activity 2).
- Place Sea Week food signs on food. from the seas, rivers, and wetlands in a local grocery store (Activity 2).
- Draw a mural of local habitats (Activity 3).
- Role play the animals living in a particular habitat (Activity 3).
- Compose and perform a song about local habitats (Activity 3).
- List potential changes and ways people can help care for these animals and their habitats (Activity 3).



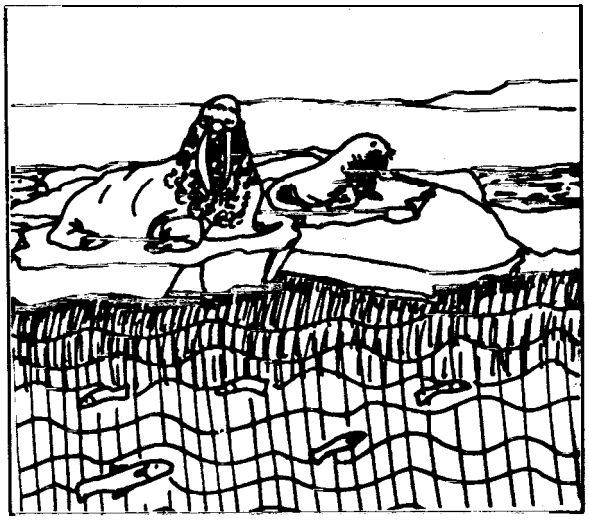
UNIT NINE: From Wetlands to the Sea: Beavers, fish, whales, human beings and all other animals must live in habitat that has the necessary ingredients for life: food, water and cover. Within each type of habitat are concentrations of plants and animals whose lives are closely woven together.

Alaska's water animals live in many different communities within our seas, rivers and wetlands. A community is a group of plant and animal species whose lives are closely woven together so that they are interdependent.

From the ocean to the tundra, each animal inhabits a certain place (called its habitat) that has all the necessary components for life: food, water and cover. The range may be very small, like that of a clam, or very large, like that of a bald eagle., which soars over an entire saltwater marsh, tideland, and adjacent forest to seek food, water and shelter.

Each animal is specifically adapted to its habitat. Water animals breathe oxygen taken from the water and move differently from their relatives on land, since water is denser than air and gives the animals more support.

Activity 1
Aquatic Habitat



Background:

Studying the walrus and beaver, two typical Alaskan aquatic animals, will help students to understand the term "habitat ."

The walrus lives in the ocean, primarily along the coasts of the Bering and Chukchi Seas; its habitat is composed of ice floes, rocky islands and the surrounding salt water. Walrus eat clams, other bottom marine life and, occasionally, seals.

Beavers live in wetlands; in fact, they often add to wetland habitat by damming up small streams to form ponds. They live in lodges which they build of sticks, or they burrow into riverbanks. Beavers eat small twigs and bark of willow, alder and poplar trees and are found all over Alaska except for the far northern and western sections of the state.

Vocabulary:

- habitat
- needs

Materials:

- pictures : from Alaskan magazines, calendars or photos
- pencils
- crayons
- paper
- worksheet:
  - Animal and Human Habitats-(9-A)

Procedure:

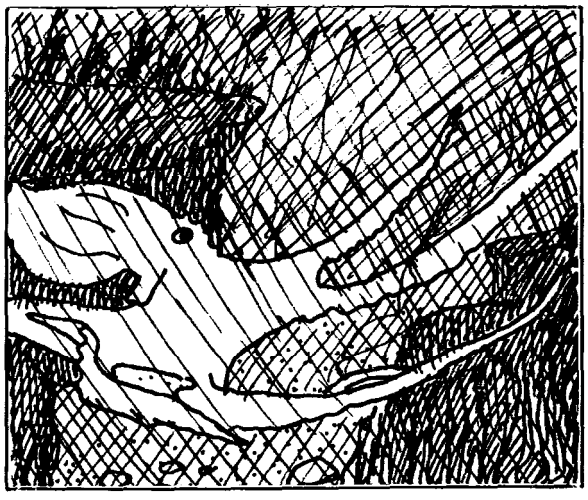
1. Ask students what they like best about the seas, rivers, or wetlands around them.

2. Show pictures of different Alaskan aquatic environments from magazines, calendars, or photos. Explain that these are called "habitats." What animals live in these places, and what do they need for life? (food, water, cover).

3. Use the worksheet Animal and Human Habitats to compare walrus, beaver, and human habitats. What does each species eat? Where does each live? Color water blue, food yellow, and cover (space or shelter) red in each of the three worksheets. Which animal needs the most water, the most food and the most cover? Which animal makes the most changes in its habitat? List the good things and the bad things that result from these changes.

5. Have the class choose another aquatic animal and draw its habitat.

Activity 2
Swimming in an Underwater World



Background:

Seals, sea lions, walrus, beavers, mink and muskrats breathe through mouths and noses as we do, and must come to the water's surface for air. Whales and porpoises breathe through a special blowhole on the top of their heads. The blowhole opens when the animal surfaces; old air is expelled and fresh breath is drawn in. Fish, however, use their gills to "breathe" oxygen out of the water that is constantly moving over their gills.

Movement in the water is quite varied :

- Fish move through the water by flexing their tails from side to side. Fins help them to keep their balance and sometimes to move in special ways.

- Whales and porpoises flex their bodies and move their flukes (tails) up and down when they swim.

- Sea lions, otters and seals flex their bodies or use their powerful forelimbs to propel themselves.

- Beavers, otters, muskrats, frogs and toads use webs between their feet to help them swim.

- Crabs walk over the sea floor as if on tiptoe. The pointed tips of their legs help keep them poised and yet ready to run and escape if the need arises.

- Sponges, anemones, mussels and barnacles anchor themselves firmly to the sea floor. Water currents cannot dislodge them, but instead bring the animals a steady supply of plankton and drifting organic debris for food.

- Clams and worms may burrow deep into the sea floor. This gives them protection and keeps them from being moved about by currents.

- Scallops, jellyfish, octopi and leeches use various techniques to move through the water:
  Scallops clap the valves of their shells together.
  Jellyfish cause their bells to pulsate.
  Octopi can spread the webs located between their arms for gliding, or they can jet away by expelling water from their siphons. Like sea stars or urchins, they also use suction discs to move over the sea floor. These discs let them hold on tight so that they won't be dislodged by strong currents.
  Leeches loop through the open water by alternately stretching and shortening their segmented bodies. They also have head suckers that they use to move along in inchworm style.

Vocabulary:

- breathe
- gill
- move
- blowhole
- fluke
- webbed feet

Materials:

Large space indoors or outdoors where students can move freely.

Procedure:

1. Prepare the children for an undersea voyage. Ask them to imagine water moving around them and to imagine what they would see underwater.

2. Pretend that you are various undersea animals. Pretend to breathe, move and eat like those animals. What are your needs? What is your habitat like?

   Use the teacher background material for ideas. This activity should be a good review of animals studied in previous units. If students have further questions about the animals, have them look up the answers in the library, or ask their parents.

3. Have each student pick a sea animal to imitate and see if the others can guess its identity.

Activity 3
Look at Your Habitat

Background:

Streams flow into rivers on their way to the sea. Lakes and ponds occasionally interrupt the faster current of the stream and river water. Along the banks of these water systems are wetlands of one kind or another: wet tundra, marshes, tidelands, river deltas, bogs, swamps, or muskegs. Practically all of Alaska is wetland except for the mountains and upland forests. Throughout this book, the students have been studying the animals that live in wetland habitats. Now is the chance to apply their knowledge to their own locality.

Materials:

- scissors
- butcher paper
- felt-tip markers
- paper
- crayons
- worksheet
  - Invertebrate or Vertebrate? (9-B)

Procedure:

1. Review with the children the different animals that they have studied. Distribute the worksheet Invertebrate or Vertebrate?. Have the students color the animals, then cut out and separate them into two piles: invertebrates (anemones, insects, sea stars, crabs, leechs, clams, snails) and vertebrates (beavers, frogs, whales, birds, seals, fishes, otters).

2. Go over the different aquatic habitats which these animals live (ocean river, wetlands). Make a list of the different types of habitat found locally (mudflats, rocky intertidal, marsh, river, open ocean, lake, muskeg, tundra), and the different animals in each. Talk about the importance of each area. What kinds of habitat support human recreation, jobs, water for drinking or transportation, clothing? What food comes from each area?

3. Make Sea Week food signs. Take them to the grocery store and put them on all the food that comes from the sea, rivers, or wetlands. (Suggested by Jan Kecklove, Craig Elementary, Craig.)

4. Make a large class mural of different habitats and the animals in each. Divide the class into small groups, and have each work on a section of the mural.

5. Then make up a song to go with your mural. Use "Old MacDonald had a Farm" or a similar model.

"In Alaska we have a (name a habitat)

E-i-e-i-o

Or try "Row, Row Your Boat."
"Row, row, row your boat
Gently (across the ocean,)
Merrily, merrily, merrily, merrily,
(Don't forget the motion!)

(Songs suggested by Lynn Fry, Weller Elementary, Fairbanks.)

6. Ask students what would happen to them if there were changes in these habitats. Discuss earthquakes, floods, forest fires, roads, housing developments and gas stations. Some of these changes are natural (earthquakes, floods, forest fires), but others occur as Alaska grows and develops. Some animals such as gulls and ravens have adapted to living near humans. But others, such as bears and moose, have trouble adapting.

7. What can people do to help care for these animals and their habitats? (Some ideas: taking care when walking through areas populated by animals not to disturb their "living room"; not killing more than is needed for food or clothing; not polluting the animal's water, air or land; not using more of the animal's land than needed; picking up litter and keeping the wildlands clean.)

8. Later, have each group pick one kind of habitat and role play the animals living in it. Let the other students guess which kind of habitat they are imitating. The children can add drama by imagining a natural or human change occurring in their habitat and showing the animals' reaction.

9. As a finale, invite parents or another class to look at your mural and to watch your habit at plays. See if they can guess what animals you are imitating. Sing your song for them!

Bibliography

Compiled by Belle Mickelson, Peggy Cowan, Mary Lou King, Nancy Barr and Dr. Earl Clark, associate professor, University of Alaska, Juneau, and his students Joyce M. Roloff, Linda Edmondson, Patricia Muchnick, Dan Penrose, Chris Winter, and Tom Castagnola.

Selections from the following annotated bibliographies are included in this volume. Consult these excellent sources for additional suggestions for Sea Week books.

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A List of Books on the Marine Environment for Children and for Young People. Project Coast, 310 Willard Hall Education Building, University of Delaware, Newark, Delaware. 1971.

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UNITS 1, 2 and 3: INTRODUCTION TO MARINE INVERTEBRATES, MARINE INVERTEBRATE SPECIES AND BEACH FIELD STUDIES

Children's Literature

Angel, Heather. Life on the Sea Shore. Illustrated by Richard Hook and John Sibbeck. MacMillan Education, Morristown, N. J., 1976. 23 p.

Gorgeous illustrations of seashore animals in their varied seashore habitats.

Asimov, Issac. ABC's of the Ocean. Walker and Co., New York, 1970. 48 p.

Alphabet book with marine subjects. Carefully and accurately done, with photographs and black-and-white drawings.

Beauregard, Sue and Jill Fairchild. Ocean Animals and Ocean Floor Animals. Sea Library Series. Cypress Press, Glendale, Calif., 1977. 32 p.

Simple, informative, large-print narrative with photographs.

Behrens , June. Look at the Sea Animals. Childrens Press, Chicago, 1975. 40 p.

Instructive, easy text provides the distinguishing characteristics of creatures including starfish, sponges, octopi and dolphins. Colorful, page-size photographs accompany text.

Bendick, Jeanne. Exploring an Ocean Tide Pool. Garrard Publishing Co., Champaign, Ill., 1976. 69 p.

Describes tidepool life and interrelationships. Includes line drawings, photographs and an index.

Buck, Margaret Waring, Along the Seashore. Abingdon Press, New York, 1964. 72 p.

A simple seashore encyclopedia, using line drawings for identification. Covers plants, invertebrates, fish and birds.

Carrick, Carol. Lost in the Storm. Illustrated by Donald Carrick. Seabury Press, New York, 1979. 32 p.

Description of two youngsters' day at the beach in a well-done text with pictures.

Cartwright, Sally. Sand. Illustrated by Don Madden. Coward, McCann and Geoghegan, New York, 1975. 31 p.

Picture book providing information on the characteristics of sand. Entertaining cartoon illustrations. Includes projects using sand.

Cartwright, Sally. The Tide. Illustrated by Marilyn Miller. Coward, McCann and Geoghegan, New York, 1970. 46 p.

Explains tides, spring tides, neap tides and their causes. Illustrated with diagrams.

D' Ahilo, Anthony. Seashore Life Coloring Book. Dover Publishing Co., 1973. 47 p.

Pictures of ocean creatures from around the world, including Alaska.

Dos Santos, Joyce Audy. Sand Dollar, Sand Dollar. J.B. Lippincott, Philadelphia, 1980. 32 p.

Peter and his dog Urchin spend a day at the beach building a castle, exploring the shoreline and contemplating the magic in the sand dollar.

Garlick, May. Down to the Beach. Illustrated by Barbara Cooney. Four Winds Press, New York, 1973. 42 p.

A gentle, lyrical book describing a day at the beach. Children discover waves, tides, tidepools, shells, crabs, boats, buoys and a foghorn. Beautiful watercolor illustrations.

Golding, Augusta. The Sunlit Sea. Illustrated by Paul Galdone. Thomas Y. Crowell Co., New York, 1968. 33 p.

Interdependence and the food chain are the themes. Presents sealife including vegetation and animals. Simple illustrations and vocabulary highlighted with capital letters.

Holling, Holling Clancy. Pagoo. Illustrated by the author and Lucille Webster Holling. Houghton Mifflin Co., Boston, 1957. 87 p.

Pagoo the hermit crab, with his life and adventures set off by beautiful illustrations. Accurate information about Pagoo and his marine neighbors. Engrossing narrative.

Huntington, Harriet E. Let's Go to the Seashore. Doubleday and Co., New York, 1941. 89 p.

Included in the American Library Association's list of 1,000 basic books for elementary school libraries. Photographs of marine animals and an informative text.

Hurd, Edith T. Starfish. Thomas Y. Crowell Co., New York, 1962. 40 p.

A Let's Read and Find Out book with brief, careful explanations of life cycles, feeding habits and regeneration. Fascinating two-color illustrations.

Kinney, Jean. What Does the Tide Do? Illustrated by Cle Kinney. Young Scott Books, New York, 1966. 36 p.

The tide rises and recedes as a boy fishes from a wharf, observing the exposed marine animals. Causes of tides are explained.

Komin , Marine W. The Beach Before Breakfast. Illustrated by Leonard Weisgard. G.P. Putnam's Sons, New York, 1964. 47 p.

Sensitive account of the relationship between father and son as they explore a beach, observing life there while digging for clams. Simple beach scene illustrations set the mood.

Lasky, Kathryn. My Island Grandma. Illustrated by Emily McCully. Frederick Warne and Co. , New York, 1979. 32 p.

This account of a summer by the sea will charm readers of any age.

List, Ilka K, Grandma's Beach Surprise. Illustrated by Ruth Sanderson. G.P. Putnam's Sons, New York, 1975. 47 p.

Father and daughter explore a beach, looking for treasures for the child's grandmother, learning about their finds. Illustrations set a serene mood.

List, Ilka K. Questions and Answers About Seashore Life. Four Winds Press, New York, 1970. 123 p.

Answers to questions about common marine invertebrates, with attractive woodcuts.

MacDonald, Golden. The Little Island. Illustrated by Leonard Weisgard. Doubleday and Co. , Garden City, New York, 1946. 40 p.

The seasonal cycle of life on and around a small ocean island, explained in simple text, with captivating illustrations. Weisgard won a Caldecott award for this book.

McClung, Robert M. Sea Star. William Morrow and Co, , New York, 1975. 48 p.

Life cycle of the star fish is described through adventures. Large print and illustrations.

Morse, Doug. The Sea Book. Illustrated by Joel Snyder. Storyfold, Newbury, Mass., 1974.

Combination of a mural and foldout story. Colored pictures on one side with the text, black-and-white illustrations with facts and activity ideas on the reverse side.

Myers, Arthur. Sea Creatures Do Amazing Things. Illustrated by Jean Day Zallinger . Random House, New York, 1981. 70 p.

Descriptions of clams, anemones, octopi, crabs and sea urchins. Illustrated with blue line drawings. A "step-up" book.

Peet , Bill. Kermit the Hermit. Houghton Mifflin Co., Boston, 1965. 48 p.

Detailed drawings contribute to this rhyme about a hermit crab and the effects of a young boy's kindness.

Pittman, Al. Down by Jim Long's Stage -- Rhymes for Children and Young Fish. Illustrated by Dan Hall. Breakwater Books, Portugal Course, Newfoundland. 1976.

Creative, illustrated nonsense rhymes about sea creatures.

Rinkoff, Barbara. No Pushing, No Dunking: Safety in the Water. Lothrop, Lee and Shepard Books, New York, 1974. 40 p.

Two children swim, fish and go boating while learning about water safety and the dangers of water. Color illustrations.

Russ, Lavina. Alec's Sand Castle. Hlustrated by James Stevenson. Harper and Row, New York, 1972. 30 p.

Picture book story of Alec's use of mind-over-matter when grown-ups take over his sand castle.

Schultz, Charles M. Snoopy's Facts and Fun Book about Seashores. Random House, New York, 1980. 33 p.

Combines humor and facts in portraying the seashore environment.

The Sea World Alphabet Book. Sea World Press, San Diego, Calif., 1979. 32 p.

Features one-page sea photos together with couplets like, "B is for Beluga, one kind of whale, that's all white as snow from its head to its tail."

Selsam, Millicent E. and Joyce Hunt . A First Look at Animals without Backbones. Illustrated by Harriet Springer. Walker and Co., New York, 1976. 32 p.

Delineates vertebrates and the major groups of invertebrates in clear and simple manner. Emphasis is placed on observation skills.

Selsam , Millicent E. Animals of the- Sea. Illustrated by John Hamberger. Four Winds Press, New York, 1975. 40 p.

Clear explanations of the ocean food chain and different animals' part in it. Color illustrations integrated into the text.

Selsam , Millicent . Sea Along the Shore. Illustrated by Leonard Weisgart, Harper and Row, New York, 1961. 50 p.

Answers often-asked questions about the seashore, in text and with colorful illustrations. Explains the origin of sand and why the sea is salty; discusses tides, tracks, shells and insects.

Shepard, Elizabeth. Tracks Between the Tides. Lothrop, Lee and Shepard Books, New York, 1972. 95 p.

Discussion of tracks left on the sand and the animals that make them. Written for the East Coast, but also includes animal groups represented in Alaska.

Silverstein, Alvina and Virginia. A Star in the Sea. Illustrated by Symean Shomin. Frederick Warne and Co., New York, 1969. 40 p.

The life of a sea star from conception on. Explained accurately and enhanced with beautiful illustrations.

Smith, Boyd. The Seashore Book. Houghton Mifflin Co. , Boston, 1912.

Classic children's text with outstanding illustrations.

Tresselt , Alvin. Hide and Seek Fog. Illustrated by Roger Duvosin, Lothrop, Lee and Shepard Books, New York, 1965. 32 p.

Lovely watercolor paintings lend a mystical, magical quality to this story.

Tyler, J. The Children's Book of the Seas. Usborne Publishing, London, 1976. 32 p.

Quality introduction to oceans, accompanied by attractive and interesting illustrations.

Vasiliu , Mirea. A Day at the Beach. Random House, New York, 1977. 30 p.

Show-and-tell format gives cursory information on plants and animals found on the beach.

Vevers, Gwynne. Life in. the Sea. Illustrated by Barry Driscoll. McGraw-Hill Book Co. , New York, 1965. 32 p.

Introduces sea life through an outline discussion of topics including tides, pools, shores, animals, food chains and aquariums.

Waters, John F. A Jelly Fish Is Not A Fish. Thomas Y. Crowell Co. , New York, 1974. 34 p.

Careful description augmented by good illustrations describes a jelly-fish.

Teacher's Reference:

Abbott, R. Tucker. Seashells of North America. Golden Field Guide series. Golden Press, New York, 1968. 280 p.

Describes shell species for purposes of identification. Color drawings. Includes general background information on shells.

Abbott, R. and H. S. Zim. Seashells of the World. Golden Press, New York, 1962.

Well-illustrated guide to the most common shells of the world.

Amos, W.H. The Life of the Seashore. McGraw-Hill Book Co., New York, 1966. 231 p.

Stresses ecological relationships, includes color photos and line drawings of marine life. One of the Our Living World of Nature series developed in cooperation with The World Book Encyclopedia.

Ayres, J. and D. McLachlan. Field book of Pacific Northwest Sea Creatures. Naturegraph Publishers, Happy Camp, Calif., 1979. 208 p.

Explains similiarities and differences between classes and phyla of shallow-water sea creatures. Presents species in photos and text.

Barr, Lou and Nancy. Under Alaskan Seas: The Shallow Water Marine Invertebrates Alaska Northwest Publishing Co., Anchorage, 1983. 208 p.

Specific to Alaskan waters, this book is the perfect complement to the Sea Week Curriculum Series. Its excellent photos are supplemented by descriptive text that includes species descriptions, ranges and natural history.

Brown, Joseph E. Wonders of a Kelp Forest. Dodd, Mead and Co., New York, 1974. 80 p.

Discusses the classification of invertebrates by describing life in kelp beds.

Brown, Vinson. Exploring. Pacific Coast Tide Pools. Photographs by Ernest Braum. Naturegraph Publishers, Happy Camp, Calif., 1966. 56 p.

Narrative text brings interest to marine life. Deals with rocky tidepools. Photos of specimens and illustrated list in back helpful for identification.

Brusca, Gary J. and Richard C. Brusca. Drawings by Sue Macias. A Naturalist's Seashore Guide: Common Marine Life of the Northern California Coast and Adjacent Shores. Mad River Press, Inc., Eureka, Calif., 1978. 205 p.

Excellent introductory section on intertidal ecology. Good glossary. Black-and-white line drawings. Many of the particular species, however, do not occur in Alaska.

Buchsbaum, R. Animals. Without Backbones. University of Chicago Press, Chicago, 1948. 405 p.

Clearly written, well-illustrated, elementary college text on invertebrate animals.

Calvin, J. and H. Ricketts. Between Pacific Tides. (1948). 4th Ed. Stanford University Press, Stanford, 1968. 614 p.

In-depth descriptions of various shore types and their invertebrate inhabitants. Photographs and line drawings.

Campbell, A.C. The Wonderful World of Life in the Sea. The Hamlyn Publishing Group, New York, 1978. 96 p.

Large picture format covering seashore animals and plants, shallow seas, coral reefs, open seas, deep seas. Many color photographs.

Carefoot, T. Pacific Seashores. University of Washington Press, Seattle, 1977. 208 p.

Excellent introduction to intertidal ecology. Easy to read and profusely illustrated. Covers mariculture, marine pollution and sand dunes.

Carl, George C. Guide to Marine Life of British Columbia. British Columbia Provincial Museum, Victoria, Canada, 1978.

Includes a variety of information on seashore animals, including birds and fish. Line drawing illustrations.

Carson, Rachel. The Sea Around Us. Oxford University Press, New York, 1951. 230 p.

Clearly written and informative, enjoyable reading. Provides a comprehensive look at the sea.

Cornwall, Ira E. Barnacles of British Columbia. British Provincial Museum, Victoria, B.C., 1955. 69 p.

Everything you ever wanted to know about barnacles. One of the British Columbia Provincial Museum of Natural History handbooks.

Crowley, Walt. The Seattle Aquarium Guide to Life in the Sea. Seattle Aquarium, Seattle, 1981. 79 p.

Ecological relationships and scientific concepts explained, using color photos and drawings.

Duggins, David and James Quinn. The Intertidal Life of Bartlett Cove: Glacier Bay National Monument, Gustavus, Alaska. U.S. Dept. of the Interior, Washington, 1979. 38 p.

Guide to intertidal life. Easy to understand with good line drawings.

Ellis, Davud W. and L. Swan. Teaching of the Tides: Uses of Marine Invertebrates by the Manhousat People. Theytus Books (76A Bastion Street, Nanaimo, B.C., Canada V9R 3AI), 1981. 118 p.

Ethnozoology of Native Indians from the west coast of Vancouver Island.

Engel, Leonard and the Editors of Time-Life Books. The Sea. Time-Life Books, Alexandria, Va., 1979. 128 p.

Many color drawings and a few photographs complement the text, which overviews oceanography, invertebrates, sharks, marine mammals, and man and the sea's future.

Field, Edward, ed. and trans. Eskimo Songs and Stories. Illustrated by Kiakshuk and Pudlo. Delacorte, New York, 1973. 102 p.

Songs and stories portray daily life and beliefs of the Netsilik Eskimos. Collected by Knud Rasmussen on the fifth Thule expedition.

Flora, C. J, The Sound and the Sea: A Guide to Northwestern Neritic Invertebrate Zoology. Washington State Dept. of Printing, Olympia, 1977. 474 p.

Species-by-species description of seashore animals. Black-and-white photographs of nearly every species make this volume easy to use as a field guide.

Friese, J. Erich. Marine Invertebrates. TFH Publications, Neptune, N.J., 1967.

Beautifully illustrated book describing all types of marine invertebrates.

Furlong, Margorie and Virginia Pill. Starfish: Guide to Identification and Methods of Preserving. 2nd Ed. Ellison, Edmonds, Wash., 1973. 104 p.

Includes species from Alaska to Mexico; also includes Hawaii. Color illustrations of each species in dried condition.

Graham, Ada. Foxtails, Ferns and Fishscales: A Handbook of Art and Nature Projects. Illustrated by Dorothea Stoke. Four Winds Press, New York, 1976. 128 p.

Botanical information provided with suggestions for decorative crafts made from natural materials. Includes sand painting, driftwood mobiles, and leaf and fish prints.

Harbo, Rick M. Tidepool and Reef: Marine Life Guide to the Pacific Northwest Coast. Hancock, House Publishers, Vancouver, B.C., 1980. 55 p.

Descriptions and beautiful color photographs.

Hoyt, John H. Field Guide to Beaches. Houghton Mifflin Co., Boston, 1971. 46 p.

Discusses tides, currents, sand, and beach geology. Line drawings.

Kohns , Bernice. The Beachcomber's Book. Illustrated by Arabelle Wheatley . The Viking Press, New York, 1970. 96 p.

Filled with ideas on crafts, identification of collections, recipes, and identification of common shells and seaweeds.

Kozloff, Eugene N. Seashore Life of Puget Sound, the Strait of Georgia, and the San. Juan Archipelago. University of Washington Press, Seattle, 1974. 282 p.

Delightful reading, excellent source of information. Clear color plates and line drawings.

Langstaff, Nancy and John. Jim Along, Josie: A Collection of Folk Songs and Singing Games for Young Children. Illustrated by Jon Pienkowski. Harcourt Brace Jovanovich, New York, 1970. 128 p.

Collection of folk songs includes sea chanties and ballads such as "Who Built the Ark," "Bobby Shaftoe," "The Jackfish, "" The Allee-Allee-O," and "Floating Down the River. "

MacGinitie, G. E. and N. MacGinitie. Natural History of Marine Animals. McGraw-Hill Book Co., 1949.

Engagingly written college text on West Coast invertebrates and their interrelationships. Full of interesting facts.

McDonald, Gary R. and James W. Nybakken. Guide to the Nudibranchs of California: Including Most Species Found From Alaska to Oregon. American Malacologists (P.O. Box 2255, Melbourne, FL 32401), 1980. 72 p.

Excellent color plates and thorough coverage.

Morris, Robert H., Donald P. Abbott, and Eugene Haderlic, eds. Intertidal Invertebrates of California. Stanford University Press, Stanford, 1980. 690 p.

Encyclopedic coverage of marine invertebrates of Pacific waters. Thirty-three scientists writing on their specialties. Nearly 1,000 photos of marine habitats, animals and anatomical details.

Morris, Percy A. A Field Guide to Shells. Houghton Mifflin Co., Boston, 1966. 297 p.

Identification of mollusks of the Atlantic and Pacific coasts and Hawaii.

Niesen, Thomas M. The Marine Biology Coloring Book. Illustrated by Wynn Kupit and Lauren Hanson. Barnes and Noble Books, Harper and Row, New York, 1982. 96 p.

Ninety-six detailed plates illustrate marine biology concepts and structure of marine life. In-depth coverage of marine biology presented in the text.

Ricketts, Edward F. and Jack Calvin. Between Pacific Tides: An Account of the Habits and Habitats of Some Five Hundred of the Common. Conspicuous Seashore Invertebrates of the Pacific Coast Betwen Sitka, Alaska and Northern Mexico., 4th Ed. Stanford University Press, Stanford, 1968. 614 p.

Weather information on species and ecology, organized according to habitat type.

Robinson, Gayle. Beach Animals. Erco (P.O. Box 91648, Tacoma, WA 98491), 1974. 27 p.

Handy pocket picture book of Pacific Northwest marine invertebrates, written especially for elementary school teachers.

Ross, Arnold. Wonders of Barnacles. Dodd, Mead and Co., New York, 1974. 78 p.

Informative and easily converted for student comprehension.

Selsam, Millicent E. Underwater Zoos. Illustrated by Kathleen Elgin. William Morrow and Co., 1961. 96 p.

Appropriate animals, plants and water conditions for building and maintaining fresh and saltwater aquariums. Simple drawings.

Smith, L.S. Living Shores of the Pacific Northwest. Pacific Search Press, Seattle, 1976. 149 p.

Description of marine shore habitats and their inhabitants. Illustrated with color and black-and-white photographs. Includes a simple picture key and tables showing intertidal distribution of the different species.

Snively, Gloria. Exploring the Seashore in British Columbia, Washington and Oregon: A Guide to Shorebirds and Intertidal Plants and Animals. The Writing Works, Mercer Island, Wash., 1978. 240 p.

Lucidly describes a variety of seashore organisms. Organized by habitat. Illustrated with line drawings and color photographs.

Texas A and M University Sea Grant College Program. Fairy Tales of the Sea. College Station, Tex., 1981.

These Eskimo, Indian, African, Asian and European stories illustrate perceptions of the sea throughout the world. A separate teacher's guide suggests activities for incorporating the tales into the classroom.

Zim, Herbert S. and Lester Ingle. Seashores. Golden Pocket guide. Golden Press, New York, 1955. 160 p.

A handbook for exploring the ecology of any shore. Classification charts and color illustrations aid in identification.

Recordings:

Sounds of the Sea. No. 3 of Droll Yankees Seaport Series. 33 RPM, LP by Droll Yankees, 1962.

Sea sounds, from boats and ports to wind and waves.

UNIT 4: FRESHWATER INVERTEBRATES

Children's Literature:

Carrick, Donald and Carol. The Pond. MacMillan Co., New York, 1970. 33 p.

Watercolors portray pondlife in style of oriental silkscreens. Brief, poetic text.

Crosby, Alexander L. Pondlife. Illustrated by Jean Zallinger. Garrard Publishing Co., New York, 1964. 64 p.

Depicts the birth of a pond and its inhabitants, Separate chapters on insects, frogs, fish, herons, muskrats and others.

Faber, Norma. Small Wonders. Illustrated by Kazue Mizumura. Coward, McCann and Geoghegan, New York, 1979. 31 p.

Poems celebrating small things. Beautiful imagery. Includes freshwater and saltwater topics.

Robinson, Carmelia K. . Gordon E. Burks and Irving Leitmar. Life in a Pond. Illustrated by Marjorie Hartwell. Golden Press, New York, 1967. 28 p.

Labels a pond's living things, from insects and snails to fish and birds. Simple text.

Seuss, Dr. McElligot's Pool. Random House, New York, 1947. 56 p.

Fanciful rhyme moves reader from a small meadow pond to a stream and finally into the sea.

Teacher's Reference:

Amos, William H. The Life of the Pond. McGraw-Hill Book Co., New York, 1967.

Stresses ecological relationships with many color photos and line drawings. One of the Our Living World of Nature series developed in cooperation with the World Book Encyclopedia.

The Audubon Nature Encyclopedia, Vol. 8. "Ponds." Curtis Publishing Co., New York, 1965. pp. 155-1563.

Describes the living community patterns of ponds. Clear, brief definitions and explanations.

Cooper, Elizabeth K. Science on the Shores and Banks. Harcourt , Brace and World, New York, 1960. 187 p.

Useful guide for observing, gathering and studying a variety of plants and animals in shallow, fresh and salt waters.

Furlong, Marjorie and Virginia Pill. Edible? Incredible ! Pondlife. Nature-graph Publishers, Happy Camps, Calif. , 1972. 95 p.

Photographs and text describes pondlife and how to prepare as food. Helpful hints on where to find species.

Klots, E.B. A New Field Book of Freshwater Life. G. P. Putnam and Sons, New York, 1966.

Excellent descriptions and line drawings of a wide variety of wetland plants and animals. Stresses invertebrates.

Reid, G.K. Pondlife. Golden Nature Guide series. Golden Press, New York, 1967. 160 p.

The best pocket guide to life in and around ponds and streams. Packed with color drawings.

Sisson, Edith A. Nature With Children of All Ages. Prentice-Hall, Englewood Cliffs, N.J., 1982. 195 p.

Teaching tips and activities on plants, seeds, trees, invertebrates, fish, amphibians, birds and mammals. Overall guidelines for taking children into the out-of-doors as well as step-by-step plans on specific topics.

Snow, John 0. Secrets of Ponds and Lakes. Guy Garrett Publishing Co., Portland, Maine, 1982. 94 p.

Interesting facts and stories written for the East Coast but also applicable to Alaska. Author an avid naturalist and high school biology teacher . Illustrated with line drawings and black-and-white photographs.

UNIT 5: FISH

Children's Literature:

Beauregard, Sue and Jill Fairchild. Open Ocean Fish and Coral Reef Fish. Cypress Press, Mankato, Minn., 1977. 32 p.

Sea Library series. Photographs illustrate simple, informative, large-print narrative.

Figdor, George and Barbara Figdor. Salmon Fishing. State of Alaska Dept. of Education, Educational Program Support Section, Juneau, 1978. 48 p.

Excellent photographic illustrations and creative text explaining what is involved in commercial salmon fishing.

Goffstein, M.B. Fish for Supper. Dial Press, New York, 1976. 31 p.

Grandmother's day fishing from 5 a.m. breakfast to cooking the fish for dinner. Charming, simple text accompanied by Caldecott honor illustrations.

Lionni, Leo. Fish is Fish. Pantheon Books, New York, 1970. 32 p.

A fish imagines the world outside the pond as described by a frog. Engaging illustrations.

Lionni, Leo. Swimmy. Pantheon Books, New York, 1968. 28 p.

Swimmy, the sole survivor of a tuna's predation on his school, searches the ocean for another school. His search discovers many wonders of the ocean and the realities of predation. Interpreted in enchanting watercolors.

McGovern, Ann. Sharks. Illustrated by Murray Tinkelman. Four Winds Press, New York, 1976. 47 p.

Easy-to-read text explains basic information about sharks.

Phleger, Fred. Red Tag Comes Back. Illustrated by Arnold Lobel. Harper and Row, New York, 1961. 64 p.

Fictional life of a salmon tagged by a scientist. An Easy to Read book.

Selsam, Millicent E. A First Look at Fish. Illustrated by Harriet Springer. Walker and Co., New York, 1972. 32 p.

See-and-do book teaches similarities and differences between several kinds of fish.

Shaw, Evelyn. Fish Out of School. Illustrated by Ralph Carpentier. Harper and Row, New York, 1970. 60 p.

Behavior of fish schools and underwater life woven into story of a herring lost from its school. A nicely illustrated I Can Read book.

Spizzirri, Linda ed. An Educational Coloring Book of Fish, An Educational Coloring Book of Prehistoric Fish, An Educational Coloring Book of Sharks. Spizzirri Publishing Co., Medinah, Ill., 1981.

Full-page pictures of animals in underwater settings. Facing pages provide information in outline format.

Walcott, Patty. Tuna Fish Sandwiches. Addison-Wesley, Reading, Mass. 2 p.

Attractive illustrations. Ten words engagingly explain an ocean food chain, with humans as the ultimate users.

Waters, John F. Hungry Sharks. Illustrated by Ann Dalton. Thomas Y. Crowell Co., New York, 1973. 33 p.

Sharks' eating habits, sensory perceptions, and eating instincts simply explained. Mood-setting illustrations.

Waterton, Betty. A Salmon for Simon. Illustrated by Ann Blades. Antheneum, New York, 1980. 27 p.

Simon tries to return a salmon, dropped into a tidepool by an eagle, to the sea. His endeavors introduce the reader to various features of the ocean environment.

Wheeler, Alwyne. Fishes. Usborne Publishing, London, 1982. 24 p.

Superb descriptions of fish and their adaptations. Gorgeous color drawings, simple story line.

Teachers Reference:

Alaska Geographic Society (Box 4-EEE, Anchorage, AK 99509). Vol. 10, No. 3, 1983, Alaska's Salmon Fisheries. Jim Reardon, ed.

Excellent description of Alaska's salmon fisheries. Many photographs.

Alaska Sport Fish Identification Handbook. Alaska Dept. of Fish and Game (free from Public Communications Section, P. 0. Box 3-2000, Juneau, AK 99801).

Explains basic fish anatomy and how to identify common fresh and salt-water sport fish. Includes line drawings and weight information.

Alaska Wildlife Notebook Series. Alaska Dept. of Fish and Game, Juneau. 1980. (free)

Portfolio of 60 one-page sheets on fish and other animal species. Excellent line drawings and range maps.

Browning, Robert J. Fisheries of the North Pacific: History, Species, Gear and Processes. Alaska Northwest Publishing Co., Anchorage, 1974. 408 p.

Good overview of all aspects of commercial fishing in the North Pacific. Covers Alaska commercial fishing species, vessels and gear, as well as fisheries management, processing and marketing.

Childerhose, R.J. and M. Trim. Pacific Salmon and Steelhead Trout. University of Washington Press, Seattle, 1979. 158 p.

Large picture-book format detailing salmon species, life cycles, hatchery techniques and pollution problems. Color photos.

Commercial Fish Species of the Pacific West Coast and Alaska. Alaska Fisheries Development Foundation, Anchorage. 1982. 56 p.

Fact-filled booklet with beautiful water colors of fish species, line drawings of fishing gear, and range maps. Written in English, French, German, Spanish and Japanese.

Cooperative Extension Service, University of Alaska, Fairbanks, AK 99701.

P-468	Easy Steps for Canning Salmon (12 p.)
P-24	Pickling Fish (4 p.)
P-25	Smelt (4 p.)
P-26	To Salt Fish (2 p.)
P-27	The Fisherman Returns (67 p.) (cookbook)
P-128	Pressure Canning Alaska Fish at Home
P-229	All About Alaskan Clams (2 p.)
P-040	Hypothermia - Cold Blooded Killer (26 p.)

Useful pamphlets on fish and fishing.

Davis, J. Charles. Fish Cookery. A.S. Barnes and Co., South Brunswick, N.J., 1967. 226 p.

A surprising collection that, in addition to good advice on standard fish cooking, gives many interesting and exotic recipes. If you bring anything home from fishing--from an octopus to a whale--this will tell you how to prepare it.

Dennon, Jerry. The Salmon Cookbook. Pacific Search Press, Seattle, 1978. 127 p.

In addition to giving many delicious recipes, this book discusses cooking and cleaning techniques, and goes into the history, spawning and migration patterns of salmon. Highlighted with pen and ink drawings.

Hart, John L. Pacific Fishes of Canada. Bulletin 180, Fisheries Research Board of Canada, Ottawa, 1973. 740 p.

Best reference available for Alaska saltwater fish. Detailed species descriptions and illustrations.

Hartman, Wilbur L. Alaska's Fishery Resources : The Sockeye Salmon. Fishery Leaflet 636, U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Seattle, 1971. 8 p.

Presents information on the life history and management of the sockeye salmon. Contains a good graphic of the salmon's life cycle.

Lynch, Kathleen. Fishwheels and How to Build Them. Illustrated by the author . Adult Literacy Lab, Anchorage Community College (2533 Providence Avenue, Anchorage, AK 99504), 1979. 45 p.

Excellent description of fishwheels. Large print with ample illustrations.

Meltzer , Michael. The World of the Small Commercial Fishermen: Their Lives and Their Boats. Dover Publications, New York, 1980. 88 p.

Describes the life histories and harvesting methods for Pacific salmon, New England lobster, cod, halibut, whitefish, tuna, menhaden, mollusks and crustaceans. Includes some first-person narratives. Chapters on fishing vessels, fishing gear, and ethnic fishing communities. Many good photographs, engravings and drawings.

Morrow, James E. Freshwater Fishes of Alaska. Alaska Northwest Publishing co., Anchorage, 1980. 248 p.

Describes distinctive characteristics, range, abundance, and habits of freshwater species and their importance to humans. Includes line drawings and maps of the range of each species in Alaska, plus a selection of color photographs.

Morrow, James E. Illustrated Keys to the Freshwater Fishes of Alaska. Alaska Northwest Publishing Co., Anchorage, 1974. 78 p.

Handy field guide. Line drawings and brief descriptions.

Reid, Gerald M. Alaska's Fishery Resources: The Pacific Herring. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Seattle (for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402).

Good source of information on the life cycle, biological characteristics, and population dynamics of herring as well as on the commercial herring industry itself. Lacks information, however, on the Bering Sea herring fisheries.

Scott, William B. and E. J. Crossman. Freshwater Fishes of Canada. Bulletin 184, Fisheries Research Board of Canada, Ottawa, Canada, 1973. 966 p.

Detailed descriptions and line drawings of fish and their ranges (includes Alaska).

Stewart, Hilary. Indian Fishing: Early Methods on the Northwest Coast. University of Washington Press, Seattle, 1977. 188 p.

Numerous superb line drawings and photographs accompany text on the life of the people of the Northwest coast. Describes the use of hooks, lures, and floats, spears and harpoons, nets, traps and weirs; methods of cooking and preserving fish; songs, customs, and ceremonies.

Periodicals, Posters and Games:

Alaska Fish Tales and Game Trails, Alaska Dept. of Fish and Game (quarterly, free upon request to Public Communications Section, P. 0. Box 3-2000, Juneau, AK 99801).

Game Fishes of Alaska. (Division of Sport Fish, P.O. Box 3-2000, Juneau, AK 99801.)

Colorful poster of many of the freshwater fishes of Alaska, including salmon.

Marine Fishes of the North Pacific (Stock no. 003-020-00051-7) and Mollusks and Crustaceans of the Coastal U. S. (Available from the Superintendent of Documents, U. S. Government Printing Office, Washington, DC 20402 - Stock No. 003-020-00087-8).

Large, beautiful color posters depicting these animals in their habitats.

Marine Life Posters. Alaska Sea Grant College Program, University of Alaska, Fairbanks, AK 99701.

Blue-and-white line drawings of the life cycles of king crab, ocean perch, Pacific halibut, pink shrimp, and scallop.

National Bilingual Materials Development Center, University of Alaska (2223 Spenard Road, Anchorage, AK 99503).

Sets of 11" x 17" posters on fish and crustaceans, and bilingual books on a variety of topics.

Salmon Game. Western Education Development Group, University of British Columbia, Vancouver, Canada V6T lW5.

Board game based on the salmon life cycle.

Salmon Kit, Alaska State Museum (Pouch FM, Juneau, AK 99811).

Salmon Legends. Alaska State Museum, Juneau.

Legends include "Nakani Stealing Fish" from Ingalik Mental Culture by Cornelius Osgood; "Red Stone Shaman Brings Back the Salmon" from Ingalik Social Culture by Cornelius Osgood; "Moldy End," Haida legend adapted from The Wolf and Raven: Totem Poles of Southeastern Alaska, by Viola Garfield and Linn Forrest; "The Prince Who Was Taken Away by the Salmon People ," from Once Upon a Totem by Christie Harris; and "Coyote Helped the People" from Indian Legends of the Pacific Northwest by Ella E. Clark.

Salmon Posters. B.C. Wildlife Federation (5659 176th St., Surrey, BC V3S 4C5).

Full-color 18" x 21" posters of the five Pacific salmon species and steelhead.

Sharks of the World. National Geographic Society (17th and M Streets NW, Washington, DC 20036).

Source of a shark chart and a shark filmstrip.

Splash! National Park Service (709 W. 9th Street, Juneau, AK 99801).

Game on folding sheet of heavy 17x22" paper that focuses on the hazards to migrating salmon. (Also available is a coloring book, Life of the Salmon, on the same topic.)

UNIT 6: AMPHIBIANS

Children's Literature:

Blassingame, Wyatt. Wonders of Frogs and Toads. Dodd, Mead and Co., New York, 1975. 80 p.

Descriptions of frogs and toads. Life cycles and categories of frogs explained in text and photographs.

Chenery, Janet. The Toad Hunt. Illustrated by Ben Shecter, Harper and Row, New York, 1967. 64 p.

Easy-to-read narrative about two little boys in their garden discovering frogs, toads and salamanders.

Hawes, Judy. Why Frogs are Wet. Illustrated by Don Madden. Thomas Y. Crowell Co., New York, 1968. 35 p.

Topics include variations in kind, size, ancestry, reproduction, growth and hibernation. A Let's Read and Find Out book, illustrated with vitality and humor.

Kepes, Juliet. Frogs Merry. Pantheon Books, New York, 1961. 28 p.

Light-hearted story discusses the interactions of pond life. Lively illustrations recreate a pond atmosphere.

Potter, Beatrix. The Tale of Jeremy Fisher. Dover, New York, 1974. 60 p.

The adventures of Jeremy the frog are chronicled in this classic, finely illustrated story.

Selsam, Millicent E. and Joyce Hunt. A First Look at Frogs, Toads and Salamanders. Illustrated by Harriet Springer. Walker and Co., New York, 1976. 32 p.

Classification of amphibians and distinguishing characteristics portrayed in clear text and simple drawings, Puzzles and matching game included.

Zim, Herbert S. Frogs and Toads. Illustrated by Joy Buba. William Morrow and Co., New York, 1950. 65 p.

Engaging storybook narrative provides information on eating, mating, sleeping and protection. Simple drawings and easily understood text.

Teacher's Reference :

See Unit 3 - pond references

Hodge, Robert P. Amphibians and Reptiles in Alaska, the Yukon and Northwest Territories. Alaska NW Publishing Co., Anchorage, 1976. 89 p.

Natural history and guide to identification. Range maps, photos and drawings.

Recordings :

Voices of the Night: The Calls of 34 Frogs and Toads of the United States of America. Produced by Peter Paul Kellogs and Arthur Allen. Houghton Mifflin Co. , Boston.

One croak after another.

UNIT 7: MARINE MAMMALS

Children's Literature:

Armor, Buris. Bully the Blue Whale. Illustrated by John Mack. Criterion Books, New York, 1964. 76 p.

Yearly cycle of blue whale. Information on size, food habits, predation by killer whale and humans.

Armour, Richard. Sea Full of Whales. Illustrated by Paul Galdone. McGraw-Hill Book Co., New York, 1974.

Humorous poems entertain and convey facts about blue, killer, humpback, finback, right, pilot and sperm whales, narwhals, dolphins and porpoises. Charming sketches.

Behrens, June. Whale Watch. Children's Press, Chicago, 1978. 32 p.

California schoolchildren on a whale watch learn about the habits and environment of the grey whales. National Geographic photos illustrate this easy reader picture book.

Benchley, Nathaniel. The Several Tricks of Edgar Dolphin. Harper and Row Publishers, New York, 1970. 63 p.

Edgar's curiosity and cleverness get him captured by men aboard a ship, and also leads to his escape. Funny, lively tale.

Bradey, Irene. Elephants on the Beach. Charles Scribner's Sons, New York, 1979.

Sketches and observations of a bull-elephant seal, his harem and calves. Done with warmth, humor and realistic details.

Bridge, Linda McCarter. The Playful Dolphins. Photos by Lowell George. National Geographic Society, 1976. 33 p.

Glorious color photographs and simple text.

Compere, Mickie. Dolphins. Illustrated by Irma Wilde. Viking Press, New York, 1967. 39 p.

Appealing and simple information on dolphin habits.

Conklin, Gladys. Journey of the Grey Whales. Illustrated by Leonard Fisher. Holiday House, New York, 1977. 39 p.

Follows the activities of a whale and her calf, from birth through migration, from Mexico to the Bering Sea.

Darling, Louis. Seals and Walruses. William Morrow and Co. , New York, 1955. 63 p.

Describes the lifestyles and habits of seals and walruses, and explains measures to protect them.

Davidson, Margaret. Dolphins ! Illustrated by Irene Wilde. Four Winds Press, New York, 1964. 48 p.

Text for beginning readers. Many monochrome illustrations depict the life of the dolphin.

Fisher, Ronald M. Namu. Books for Young Explorers. National Geographic Society, Washington, 1973. 32 p.

True story of a killer whale caught in a fishing net and of its subsequent life in an aquarium. Photographs and simple text.

Goudey , Alice. Here Come the Dolphins. Illustrated by Garry MacKenzie. Charles Scribner Sons, New York, 1961. 94 p.

Dramatic presentation of scientific information. Details the way dolphins are trained. Accurate and lively drawings.

Hoff, Sydney. Walpole. Harper and Row, New York, 1977. 32 p.

The biggest walrus in the herd would rather play with baby walruses than be a leader. An Early I Can Read book.

Hurd, Edith. The Mother Whale. Illustrated by Clement Hurd. Little Brown and Co., Boston, 1972. 32 p.

Simple and precise language describes the cycle of mating, birth, and raising offspring. Illustrated with charming block prints.

Johnson, William Weber . The Story of Sea Otters. Random House, New York, 1973. 89 p.

A history of the sea otter and the fur trade. Includes background on otter habits.

Kavaler , Lucy. Life Battles Cold. John Day Co., New York, 1973. 160 p.

This discussion of the adaptations of animals, man and microbes to cold climates includes survival information and hibernation research.

Kaufman, John. Animal Travelers. Greenwillow Books, New York, 1977. 55 p.

This read-aloud book describes the migration of grey whales, as well as caribou, barn swallows, painted lady butterflies, etc.

King, Patricia. Mabel the Whale. Follett Publishing Co., Chicago, 1958. 27 p.

Short, simple, true-life account of a whale's capture and its subsequent life at Marineland.

Kipling, Rudyard. How the Whale got his Throat. Illustrated by Don Madden. Addison-Wesley Reading, Mass., 1972. 30 p.

A wise and resourceful man keeps the whale from devouring all the fish in the sea. This is one of Kipling's classic Just So Stories, available in many different editions.

Lauber, Patricia. Sea Otters and Seaweed. Garrard Publishing Co., Champaign, Ill., 1976. 64 p.

Life history of the sea otter, and ecology of its kelp-bed home. Illustrated with photographs.

Marko, Katherine. Whales: Giants of the Sea. Abingdon, Nashville, 1980.

Simple, scientific information on whales.

McCloskey, Robert. Burt Dow, Deep-Water Man. Viking Press, New York, 1963. 63 p.

Old sea salt catches a whale by the tail and winds up in its stomach. Tale of boats, the ocean and marine life.

McDearmon, Kay. A Day in the Life of a Sea Otter. Dodd, Mead and Co., New York, 1973. 44 p.

A female sea otter's day nurturing of her offspring, searching for food, and escaping from a killer whale is followed. Illustrated with photographs.

McDearmon, Kay. Polar Bear. Dodd, Mead and Co., New York, 1976. 46 p.

Life cycle and habitat of the polar bear described in story form. Illustrated with black-and-white photographs.

McDearmon, Kay. The Walrus: Giant of the Arctic Ice. Dodd, Mead and Co., New York, 1974. 45 p.

Follows the life of a female walrus and her calf. Good for sharing with the class.

McGovern, Ann. Little Whale. Illustrated by John Hamberger. Four Winds Press, New York, 1979. 43 p.

Describes the life of a humpback whale from birth to adulthood. Includes a glossary of whale words and a note about the danger of whale extinction. Attractive illustrations in earth tones.

Mites, Miska. Otter in the Cove. Illustrated by John Schoenberr. Little, Brown and Co., Boston, 1974. 47 p.

A fisherman wants to destroy otters because they eat fish and abalone. His daughter wants to save them.

Morris, Robert A. Dolphin. Illustrated by Mamoru Funai. Harper and Row, New York, 1975. 62 p.

Birth and growth of a dolphin focuses on nurturing by the mother and protection by the pod. Sensitive drawings illustrate this Science I Can Read book.

National Geographic Society. Amazing Animals of the Sea: Marine Mammals. Washington, D.C., 1981. 104 p.

Discusses the characteristics and habits of the whale, dolphin, manatee, sea otter, sea lion, seal and other marine mammals. Beautiful photographs illustrate text, which is accompanied by a classroom activities folder that includes puzzles, games, worksheets and related activities.

Overbeck, Cynthia. Splash the Dolphins. Carolrhoda Books, Minneapolis, Minn., 1976.

Brief facts about dolphins and their habits. Translated from French, illustrated with photographs.

Phleger, Fred. The Whales Go By. Random House, 1954. 62 p.

An I Can Read beginner book about the life history of the gray whale.

Pluckrose, Henry, ed. Whales. Gloucester Press, New York, 1974. 28 p.

Simple text describes whales and dolphins. Color illustrations.

Roy, Ronald. A Thousand Pails of Waters. Illustrated by Vo-Dinh Mai. Alfred A. Knopf, New York, 1978.

The son of a Japanese fisherman does not understand why his father kills whales. He sets about trying to save a beached whale by keeping the whale wet until the tide returns. Pencil and wash illustrations.

Selsam, Millicent. A First Look at Whales. Illustrated by Harriett Springer. Walker and Co., New York, 1980. 32 p.

Classification, general attributes and distinguishing characteristics of whales and fish. Text and black-and-white drawings encourage observation.

Alaska Wildlife Notebook Series. Alaska Dept. of Fish and Game, Juneau.

Excellent descriptions of Alaskan animals, including marine mammals. Includes feeding habits, range, life histories. Illustrated with line drawings. Accompanied by teacher's activity units.

Daugherty, Amita E. Marine Mammals of California. California Dept. of Fish and Game, Sacramento, 1972. 91 p.

Excellent pocket-sized paperback that describes each species. Illustrated with line drawings and a few photographs.

Dozier, Thomas A. Whales and Other Sea Mammals. Time-Life Films, 1977. 128 p.

Picture-book format, with beautiful color photos. Text based on the television series "Wild, Wild World of Animals."

Ellis, Richard. The Book of Whales. Alfred A. Knopf, New York, 1980. 202 p.

Comprehensive coverage of whale species worldwide. Large format with line drawings and color paintings.

Haky, Delphine, ed. Marine Mammals of Eastern North Pacific and Arctic Waters. Pacific Search Press, Seattle, 1978. 256 p.

Written by 21 marine mammal authorities for general audiences. Includes photos, line drawings, and distribution maps.

Kelly, John. The Great Whale Book. The Center for Environmental Education, Acropolis Books, Wash., D.C., 1981. 116 p.

A good synopsis of the whale species and their status.

Laycock, George. Beyond the Arctic Circle. Four Winds Press, New York, 1978. 116 p.

Describes northern animals, Arctic regions, Alaska development, and Eskimo life.

Lewin, Ted. World Within a World - Pribilofs. Dodd, Mead and Co., New York, 1980. 76 p.

Describes animals of the Pribilof Islands with emphasis on seals.

McIntyre, Joan. Mind in the Waters: a Book to Celebrate the Consciousness of Whales and Dolphins. Charles Scribner's Sons, New York, 1974. 240 p.

Covers topics ranging from myths to brain anatomy to the International Whaling Commission.

Shaw, Evelyn. Sea Otters. Illustrations by Cherryl Pape. Harper and Row, New York, 1980. 64 p.

An I Can Read book on how a mother sea otter takes care of her baby pup and teaches him to be independent. Examines eating, sleeping and protection. Illustrations of animals and kelp-bed home in blue, gold and gray.

Spizzirri, Linda, ed. An Educational Coloring Book of Whales. Spizzirri Publishing Co., Medinah, Ill., 1981.

Full-page pictures of whales in their environments. Facing pages provide outline information.

Steig, William. Amos and Boris. Puffin Books, New York, 1977. 32 p.

Story of how two fellow mammals, a whale and a mouse, come to each other's rescue.

Strange, Florence. Rock-A-Bye Whale. Manzanita Press, Rafael, Calif., 1977. 32 p.

Baby humpback's birth and first few days of life. Learning stages and struggles detailed in text accompanied by monoprints.

Waters, John F. Seal Hunter. Frederick Warne and Co., New York, 1973. 47 p.

A boy in Maine observes and learns about harbor seals.

Waters, John F. Some Mammals Live in the Sea. Dodd, Mead and Co. , New York, 1972. 96 p.

Clear, concise text and black-and-white photographs examine habits of sea mammals including seals, otters, and dolphins.

Winnick, Karen B. Sandra's Dolphin. William Morrow and Co. , New York, 1980. 56 p.

An easy reader based on an old folk tale from the Mediterranean. A boy's life is saved by a young dolphin.

Teacher's Reference:

Alaska Whales and Whaling. Alaska Geographic Society, Anchorage, AK. Vol. 5, No. 4.) 1978. 143 p.

Species-by-species accounts of Alaska whales and whaling history. Photographs, drawings and range maps complement the text.

Schad, Marsha C. A Field Guide to the Marine Mammals of Alaska. National Marine Fisheries Service (P.O. Box 1668, Juneau, AK 99802), July 1978.

Informative pamphlet with brief descriptions and simple line drawings.

Simon, Seymour, Life on Ice: How Animals Survive in the Arctic. F. Watts, New York, 1976. 65 p.

Survival of arctic animals despite extreme weather conditions and human threats.

Storehouse, Bernard. Animals of the Arctic; The Ecology of the Far North. Holt, Rinehart and Winston, New York, 1971. 172 p.

Story of northern ecology. More than 200 color plates of Arctic animals, past and present.

Charts and Records:

Buffy the Sea Otter and Baleena the Blue Whale. Whale Gifts, Center for Environmental Education (2100 M Street, N. W. , Washington, DC 20037).

Tapes and accompanying 16-page children's book.

Callings. Produced by Paul Winter. Two records and booklet of photos, narrative, and background on each species.

Traces the mythic journey of a sea lion pup that encounters other marine mammals. The animal's voice mingles with Winter's music.

Deep Voices : The Second Whale Record.

Includes two entirely new humpback songs, plus right and blue whale sounds.

Marine Mammals of the Western Hemisphere. National Oceanic and Atmospheric Administration. (Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 - Stock no: 003-020-00087-8).

Marine mammal chart with full-color scale drawings of whales, dolphins, and seals.

Ocean of Song: Whale Voices

Features a variety of unique songs, ocean waves, sea birds.

Songs of the Humpback Whales. Produced by Roger and Katy Payne. Capitol ST 620, 1970.

Classic recording of the great range and variety of humpback communications.

Whales and Nightingales, "Farewell to Tarwathie ," by Judy Collins, Elektra, 1970.

Haunting musical combination of whale sounds and lyrics.

UNIT 8: FRESHWATER MAMMALS

Children's Literature :

Allen, Laura Jean. Ottie and the Star. Harper and Row, New York. 32 p.

An Early I Can Read book about a river otter and his search for a star.

Cork, Barbara. Wild Animals. Usborne First Nature Books, Hayes Books, Tulsa, Okla. , 1982. 24 p.

Charming and scientifically accurate portrayal of mammals, their lives, and their distinguishing characteristics. Text interspersed with appealing drawings.

Freschet , Berniece. Year on Muskrat Marsh. Illustrated by Peter Parnall. Charles Scribner Sons, New York, 1974. 56 p.

A chronicle of the marshlands. The rhythm of the changing seasons and their effect on the marsh inhabitants.

Grahame, Kenneth. The Wind in the Willows. The Heritage Press, New York, 1966. 190 p.

Classic children's tale first published in 1908 describes the riverside adventures of Mole, Toad, Water Rat and friends.

Harris, Lorle. Biography. of a River Otter. Illustrated by Ruth Kirschner . G.P. Putnam's Sons, New York, 1978. 62 p.

Easy-to-read book describes habits and behavior of a mother otter and her babies in their first year of life.

Kingsley, Charles. The Water Babies: A Fairy Tale for a Land-Baby. Henry Alterns Co., Philadelphia. 284 p.

Classic of children's literature tells story of Tom, an over-worked chimney sweep in England, who becomes a water baby in an enchanted undersea world.

McClung, Robert M. Animals that Build Their Homes. National Geographic Society, Washington, D. C. , 1976,

Beavers are examined along with crabs, sticklebacks, flamingos and other home building animals. Basic text and color photographs.

Miles, Miska. Beaver Moon. Little, Brown and Co., Boston, 1978. 31 p.

Survival is the theme of this story of an old beaver's flight from his former lodge. Pond community including bobcat, bear and muskrat also introduced.

Schwartz, Elizabeth and Charles. When the Water Animals are Babies. Illustrated by Charles Schwartz, Holiday House, New York, 1970. 33 p.

Babies and their care described. Illustrations show natural habitats of animals that either live in water or depend on water for food--including muskrat, loon, octopus and manatee.

Tresselt , Alvin. The Beaver Pond. Illustration by Roger Duvosin. Lothrop , Lee and Shepard, New York, 1970. 32 p.

Simple, poetic description follows construction of beaver pond and interdependence of animals.

Teacher's Reference :

Alaska Wildlife Notebook Series. Alaska Dept. of Fish and Game, Juneau.

Descriptions of Alaska animals; includes games based on lives of freshwater-related animals such as as beaver, muskrat, river otter, moose. Provides feeding habits, range, life histories. Illustrated with line drawings. Accompanied by teacher's activity units.

Burt, W.H. A Field Guide to the Mammals. Peterson Field Guide series. Houghton Mifflin Co. , Boston, 1964. 284 p.

Excellent descriptions, pictures, and range maps of mammal species found north of Mexico.

Murie , Olaus J. A Field Guide to Animal Tracks. Peterson Field Guide series. Houghton Mifflin Co., Boston, 1975. 375 p.

Describes tracks and other animal signs. Fascinating stories, many of which take place in Alaska. Illustrated by line drawings.

UNIT 9: FROM WETLANDS TO THE SEA

Teacher's Reference:

British Museum of Natural History. Nature at Work. British Museum, London, 1978. 84 p.

Exquisitely illustrated book explaining ecological concepts and habitats.

Headstrom, Richard. Adventures with Freshwater Animals. Illustrated by the author. Dover Publications, New York, 1964. 217 p.

An adult helps a child on 47 adventures to a nearby pond or stream. Written for the Lower 48, but includes many Alaska animals.

Horwitz, E.L. Our Nations Wetlands. An Interagency Task For Report, 1978. 70 p. (Available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 - Stock No. 041-011-0045-9).

Describes various types of wetlands and their importance nationally. Many photos and drawings.

Iker, Sam. Look What We've Done to Our Wetlands. National Wildlife, June-July 1982. Vol. 20. 4 p.

Describes wetland importance and losses nationwide. Color photographs.

Niering, William A. The Life of the Marsh. McGraw-Hill Book Co., New York, 1966. 232 p.

Stresses ecological relationships. Color photos and fine-line drawings. One of our Living World of Nature Series developed in cooperation with The World Book Encyclopedia.

Updegraff, Imelda and Robert. Rivers and Lakes. Puffin Books, Penguin Books, New York, 1980. 24 p.

Explains basic concepts of rivers, lakes, glaciers, in large print on colorful pages. Gives worldwide examples and includes a few activity ideas. Lists only advantages of dams.

Updegraff, Imelda and Robert. Seas and Oceans. Puffin Books, Penguin Books, New York, 1980. 24 p.

Explains basic concepts of seas, oceans, and sea ice, in large print on colorful pages. Gives worldwide examples and includes a few activity ideas.

Usinger, Robert L. The Life of Rivers and Streams. McGraw-Hill Book Co., New York, 1967. 232 p.

Stresses ecological relationships. Color photos and fine-line drawings. One of our Living World of Nature Series developed in cooperation with The World Book Encyclopedia.