

Unit Six

Weather

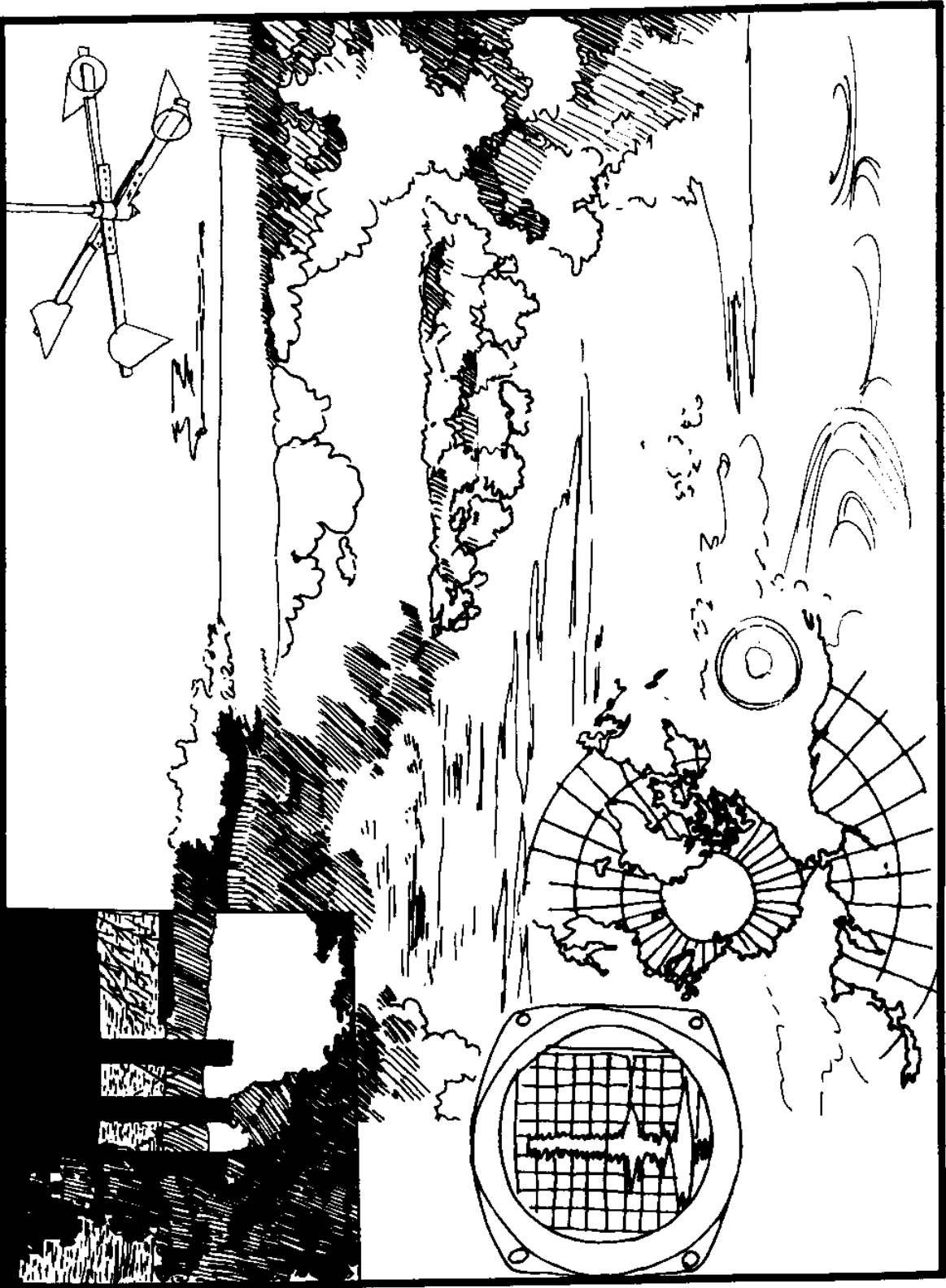
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Objectives:

To help students:

- Make a weather guide with old-time rhymes and sayings (Activity 1).
- Discover how people forecast the weather for their communities (Activity 1).
- Read about Alaska's climates (Activity 1).
- Classify clouds by their descriptions (Activity 1).
- Track a storm on a weather map (Activity 1).
- Predict local weather (Activity 1 and 2).
- Construct a weather station (Activity 2).
- Record and graph local weather conditions (Activity 2).
- Read about the ways that air pollution and weather are interrelated (Activity 3).
- Test for air particulates and acid rain in the community (Activity 3).
- Inventory family and community water uses (Activity 4).
- Practice water conservation (Activity 4).



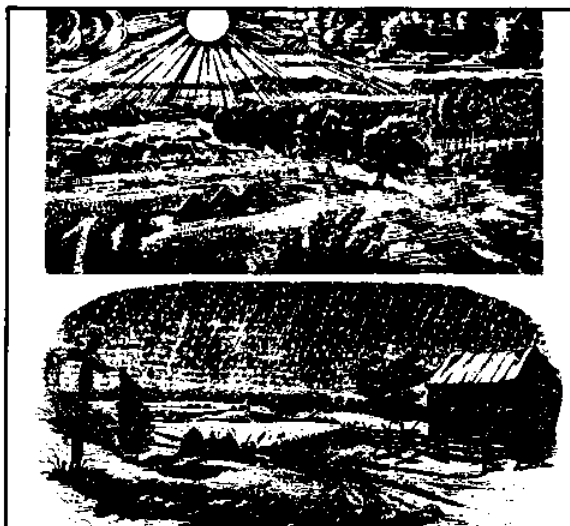
UNIT SIX: Weather. Alaska's temperature has been recorded as low as -80°F at Prospect Creek and as high as 98°F near Fairbanks. Because of the extraordinary diversity and, often, harshness of the climate, it affects all facets of people's lives including the way they eat, dress, and build their houses, and understanding how the weather works becomes highly important.

Weather determines community water supplies. With too little rain, there's not enough water to drink or wash with or use for industry. With too much rain, there are floods and overflows of sewage from treatment plants. Acid rain, which results from pollutants thousands of miles away, affects fish, wildlife and people alike. Snow, with its insulating qualities, protects animals of the north.

Weather dramatically affects life in Alaska. Pilots, boat captains and passengers are always watching the weather. All long-time travelers in Alaska have been "weathered in" or "weathered out" of destinations many times. The storms, fog, waves, wind and freezing temperatures are legendary here. Anyone who spends time outdoors in Alaska should know some weather basics.

Activity 1

Weather Forecasting



Background:

The lore and legends of peoples around the world are filled with tips for forecasting the weather. In the face of weather, we are usually quite helpless. So many of our needs and the things we do depend on weather: the amount of energy required to heat our homes; travel; outdoor work and chores; recreation; hunting and fishing; even our moods.

The study of weather is called "meteorology" (from the Greek *meteoron*, meaning "phenomenon"). Interest is spurred by everyone's desire to look into the future, to be able to glance at the sky and tell what the weather today or tomorrow will be. "Climate" is generalized weather, or the weather at a given place over a period of time. Climate is affected by the same conditions that affect weather--latitude, prevailing winds, ocean currents, mountains, nearness to the sea, and so on. Weather averages, totals and extremes combine to give an overall picture of climate.

Today's sophisticated weather forecasting makes use of satellite imagery and computerized data from all over the world. Yet as every weather predictor knows, weather forecasting remains far from an exact science. No substitute exists for local weather knowledge. It is most importantly a matter of safety, as storms can be much worse than predicted or can sweep through an area before a forecast can be updated.

Vocabulary:

- weather
- climate
- meteorology
- millibars
- isobars
- occluded
- barometer
- cirrocumulus
- cirrostratus
- altocumulus
- altostratus
- stratocumulus
- stratus
- nimbostratus
- cumulus
- cumulonimbus

Materials:

- pencils
- paper
- worksheets:
 - ...Weather Lore (6A)
 - ...What's Your Climate? (6B)
 - ...Classifying Clouds (6C)
 - ...Track that Storm! (6D)

Procedure:

1. Ask students how weather affects the community. Mention any local or regionally related weather disasters. What worldwide weather-related catastrophes are your students familiar with? (hurricanes, floods, typhoons, mud slides, tornadoes, blizzards)
2. Distribute the worksheet Weather Lore so students can make their own weather guides. (Answers: Predicts fair weather: 1b, 3a, 4a, 7a, 8a, 12; Predicts rain or storm 1a, 2a, 3b, 4b, 5, 7b, 8b, 9, 10, 11, 13, 14, 15b; Predicts Clearing 2b, 6, 15a) After students have a chance to categorize the sayings, discuss them further. The first saying has been recognized for more than 2,000 years. It can be found in the Bible (Matthew 16:2-3). Here's an illustration of the second saying:

The second saying is clear if you understand that windward means "toward the direction from which the wind is blowing" and leeward means "situated away from the wind."

The third saying can be explained by the fact that swallows (and bats, too) are in-flight feeders on insects. At times of high pressure (good weather), insects are carried high by air currents. At low pressure, insects are carried downwardly by cool air and their wings are heavy with moisture. The fourth, fifth, eighth, ninth and eleventh sayings are also true because of air pressure. Smoke rises in times of high pressure; sounds carry farther and so do smells; and birds perch more. And at low tide, rain is more likely. The sixth and seventh sayings point out that early morning rain and dew--just like a good morning fog--will often clear off before noon. The eighth saying points out that when the wind is veering

(moving clockwise from E to SE to S), the weather is sure to clear. When the wind starts backing (going counter-clockwise from W to S, SE, N & NE), a storm is coming.

Saying number 10 is somewhat self-explanatory. Number 14 indicates cirrostratus clouds, which let the outline of the sun and moon through, and is a good rain forecaster. Number 15 refers to the fact that if a storm quickly develops, it will pass by rapidly. But if a storm takes a long time in brewing, it will probably stay a long time!

3. Now assign students the task of finding out weather lore in their own community. Ask students to interview local residents and find out old sayings and tricks to forecast the weather, as well as the direction that storms usually come from in each season.
4. Explain that climate is the accumulation of daily weather patterns. Pass out the worksheet What's Your Climate?
5. Distribute the worksheet Classifying Clouds. (Answers: 1. d; 2. h; 3. c; 4. j; 5. a; 6. f; 7. e; 8. b; 9. i; 10. g) Information for this activity was taken from the Golden Nature Guide Weather, as well as Hillcourt's and Sloane's books. Students may be interested in these additional ditties about some of the clouds:

Cirrus

Hen's scarts and filly tails
Make tall ships carry low
sails.

Cirrocumulus

Mackerel sky, mackerel sky -
Not long wet, not long dry.

Cirrostratus

When sun or moon is in its
house
Likely there will be rain
without.

AltoCumulus

Wooly sheep in a dappled sky
Will bring you rain drops by
and by.

Stratus

When hill or mountain has a
cap
Within six hours we'll have a
drap.

Cumulus

When wooly fleeces spread the
heavenly way,
No rain, be sure, will mar
the summer day.

Cumulonimbus

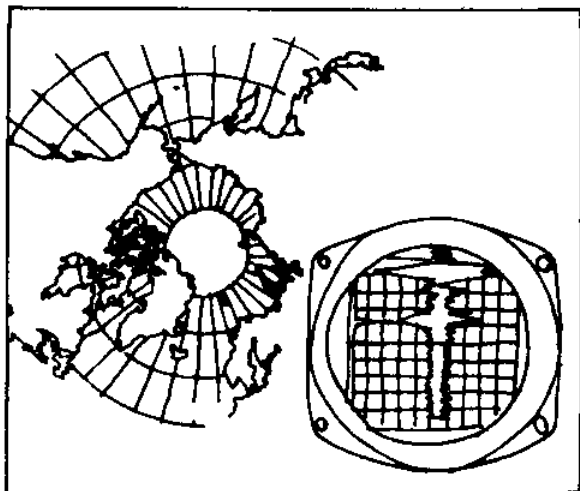
When the clouds appear like
rocks and towers
The earth's refreshed by
frequent shower.
Or a sunshiny shower won't
last half an hour.

6. Now distribute the worksheet Track that Storm! (Answers: Here it comes: 1. NE; 2. warm, cold; 3. 972 millibars, 980 millibars; 4. SE, 45 knots, heavy rain. There it goes: 1. About 600 nautical miles; 2. occluded, stationary; 3. 1032 millibars, 1018 millibars, 20 knots, partly clouded.)

7. Finish up this activity with a weather prediction contest. Have each student predict the weather for the next day!

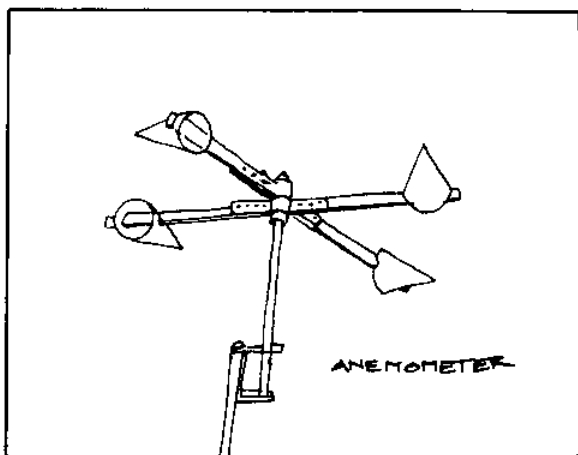


Activity 2 Measuring the Weather



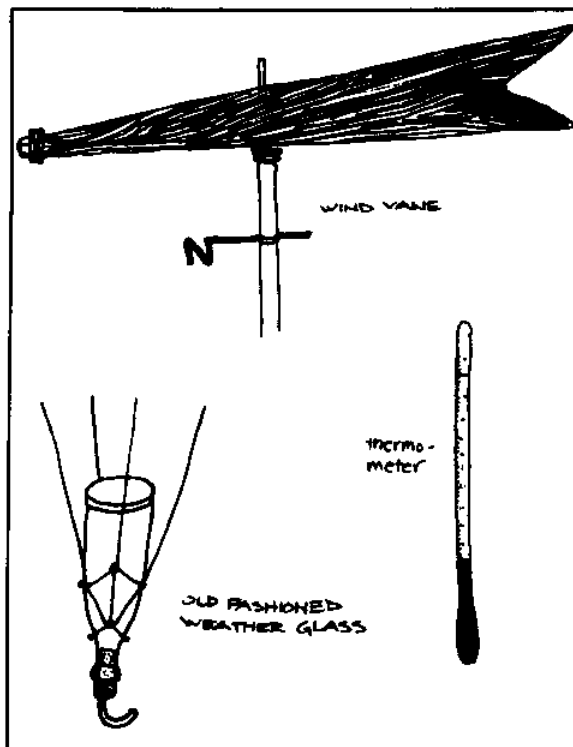
Background:

Six basic instruments are used by both professional and amateur meteorologists: 1) anemometer, 2) wind vane, 3) barometer, 4) thermometer, 5) rain gauge, and 6) hygrometer. The anemometer measures wind velocity. Weather bureaus often give wind speeds in knots (nautical miles per hour). In 1806, before the anemometer was invented, British Admiral Sir Francis Beaufort developed a scale of wind force based on the observations and descriptions of sailors. The wind vane indicates wind direction.

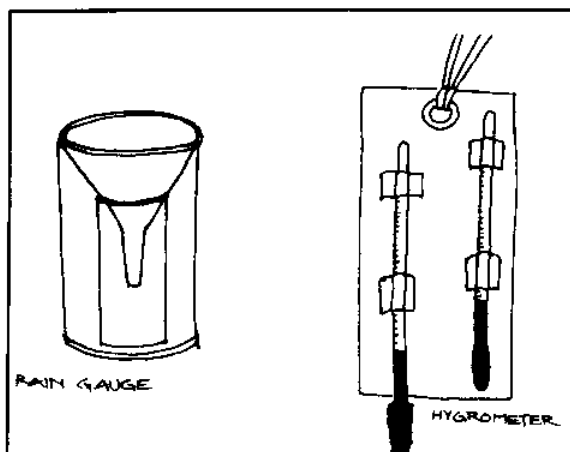


The barometer indicates air pressure. Old-fashioned weather glasses used water to indicate barometric pressure. Modern barometers are read in inches or centimeters of mercury. The average air pressure at sea level is about 30 inches. At higher altitudes, average air pressures are lower, so readings are corrected to sea level before comparing different places on a weather map. On U.S. weather maps, all pressures are converted from inches to millibars (1000 millibars = 29.53 inches of mercury on the barometer or about 18 pounds of air pressure). Falling air pressure generally indicates bad weather and rising air pressure signifies fair weather.

The thermometer measures air temperature. Mercury or colored alcohol are sealed in a glass tube with a bulb at the bottom. The liquid rises and falls with changes in air temperature.



Rain gauges measure the amount of precipitation. A typical gauge consists of a container to hold the rain, a funnel to slow down evaporation, and a small calibrated jar to measure the rainfall. Snow depth is often just measured with a ruler or meter stick, carefully choosing an area where the snow is not drifted or wind-blown.



Hygrometers measure humidity. The relative humidity is the ratio of the amount of water vapor that is present in the air to the amount of water vapor that could be in the air at that particular temperature. Two common types of hygrometers are wet- and dry-bulb hygrometers and hair hygrometers. The wet- and dry-bulb hygrometers utilize two thermometers--one whose bulb is kept wet, and another that is kept dry. The temperature difference between these two thermometers is read to determine humidity. If the difference is large, humidity is low; if the difference is small, humidity is high because the amount of cooling is directly dependent on the water vapor pressure in the air. The hair hygrometer works on the principle that human hair responds to the amount of humidity by stretching or shrinking. When humidity is high, the hair stretches, and it shrinks when humidity is low.

Vocabulary:

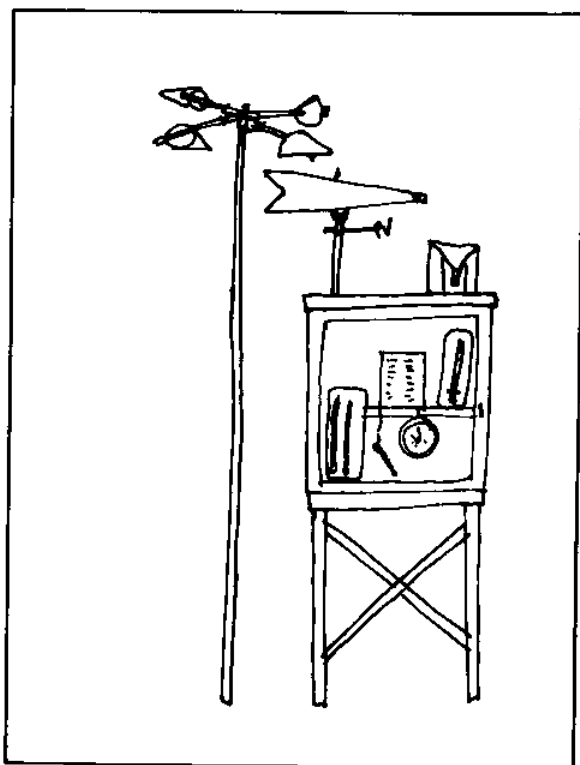
- anemometer
- wind vane
- barometer (review)
- rain gauge
- hygrometer
- calibrate
- precipitation

Materials:

- ¼" plywood
- large metal washers
- two broomsticks
- coat hanger wire
- pliers
- large headless nail
- screw
- drill
- wood dowels
- 4 paper cups
- heavy duty tape
- saw
- felt-tip markers
- pop bottle
- cork
- V-shaped glass tubing
- heavy string
- funnel
- large juice can
- glass jar with straight sides
- 3 thermometers
- shoe lace
- cardboard
- worksheets:
 - ...Make Your Own Weather Instruments (6E)
 - ...Keeping Watch on the Weather (6F)

Procedure:

1. Challenge students to make their own weather station. Pass out the worksheet Make Your Own Weather Instruments. Students and their parents might help you come up with the supplies. Plan a spot on the school grounds to put up your instruments (illus.).



Activity 3 Acid Rain and Air Pollution



Background:

Many Alaskans seem to assume that because we live way off in the wilds, there is no problem with air pollution. Yet Fairbanks and Anchorage have some of the worst air pollution in the nation. In addition, Alaska is affected by industrial waste from other areas of the world. Oil- and coal-fired power plants, smelters, automobiles and other polluters in Japan, China, Siberia and Europe are all potential causes for acid rain in Alaska. In Bethel, preliminary precipitation and pond studies by students there have shown pH readings as high as 4 (quite acidic!)

What does all this have to do with weather? Scientists are worried that heavy industrialization and increased particulates in the air will change weather patterns. If the climate warmed up just a few degrees, the polar ice packs would begin to melt, flooding coastal cities.

2. Once the instruments are made, begin recording daily weather. Try to do it at the same time every day. Use the worksheet Keeping Watch on the Weather. Also, record the highlights of each day's weather on the school calendar, drawing pictures of sun, snow, wind or rain.
3. Graph your results. First graph each measurement individually. Then try graphing several together. Can the class infer any relationships between the different measurements? Has their weather forecasting ability improved?
4. Also have students figure weekly and monthly averages and the amount of change from one day to the next! What conclusions can they draw from their studies?

If students all over Alaska began collecting data on particulates and precipitation, we might have a better idea of air pollution in Alaska and the potential for climatic variations. Because of vast distances, scientists have not been able to cover the whole state, so your students could make a welcome contribution to scientific knowledge! (Mike Stickick, Bethel Kilbuck Elementary suggested this activity.)

Vocabulary:

- acidity
- alkalinity
- pH scale
- particulates
- greenhouse effect

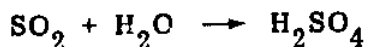
Materials:

- index cards
- new plastic bags (small)
- pH paper (range 2-5, 4-7 and 6-9)
- vaseline
- petri dishes (or blocks of wood or tile painted white)
- worksheet:
...Buy Bikinis... or Haul Out Your Parkas? (6G)

Procedure:

1. Ask students how they think weather is related to air pollution. Then pass out the worksheet Buy Bikinis... or Haul Out Your Parkas? (Answers: 1. carbon dioxide from burning wood and coal could create a "greenhouse effect"; particulates in the air could block out the sun and cool things off; 2. carbon dioxide; 3. (illus.); 4. permafrost would melt, less ice pack, less snow, more bare ground, increase in arctic shipping and fishing, summers cooler and wetter, farming increase, flooding of coastal areas; 5. 10,000 years; 6. the earth's axis could tilt away from the sun; 7a. violent storms of electrical gases; 7b. increase our temperature)
2. Have students check the community for air pollution. Particulates (small particles) are the easiest to see, but the least harmful of the air pollutants. Nonetheless, they will give students an idea of local air pollution. Students should prepare test samples by smearing vaseline on petri dishes (or white tiles or blocks of wood painted white so the particulates can be easily seen). Then set these samples out in various spots in the community where animals or young children cannot get into them. Check them 24 hours later. Label the sample locations and have the students design a way to compare them.
3. Have students check for acid rain or snow. Explain that the pH scale is an indicator of how acid or basic a substance is. The scale goes from 0-14. Low numbers are acidic and high numbers are basic. Seven is neutral. Have students test common substances with a high quality pH paper. The pH paper comes in a variety of ranges. So if you're using a pH paper with a range of 4-7, then for anything that comes out 4, you should also check on a larger range paper, i.e., 2-5. All rain is slightly acidic (pH 5.6) but industrial practices--for example, the burning of coal in factories or power plants--can make the precipitation highly acidic.

Burning coal releases SO_2 (sulfur dioxide) into the air, along with other waste products. When SO_2 combines with H_2O (water)--rain or snow--it forms H_2SO_4 (sulphuric acid).

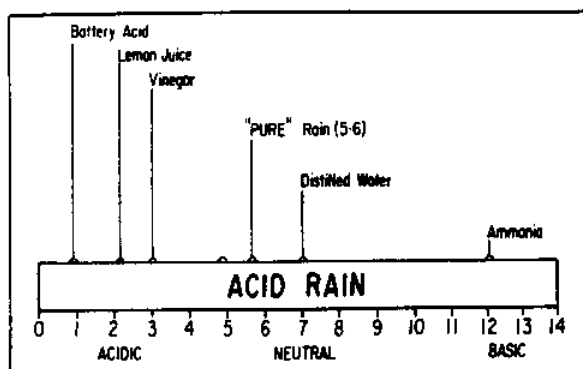


In a similar way, nitrogen oxides, which are principally generated from car exhausts, can form nitric and nitrous acids when combined with water. These acids can have grave consequences on fish, wildlife and vegetation, not to mention people. And these pollutants can travel thousands of miles with the air currents. Acidity also occurs naturally. Both volcanoes and thunderstorms release oxides into the air that can combine with the water molecules.

Ask students what would happen as a result of increased acid rain. (The fish in lakes and streams would die. Wildlife would be affected when they tried to drink the water. Vegetation might die. And here in Alaska, once the vegetation was gone, the permafrost would start to melt. In addition, many areas in Alaska, such as in the Interior, are keenly susceptible to acid rain and snow, as the soils don't have much natural "buffering" ability; i.e., the soils have not derived from limestone, which is basic).

To check for acid precipitation, give each student a new plastic bag and have them stand outside for 15 minutes in the rain or snow, holding

the bags open. As a control, have some students pour a little bit of distilled water in a bag outdoors. Test the samples with pH paper immediately. Tape the paper on an index card and mark its reading and location and note the weather, including percentage of cloud cover (25, 50, 75 or 100), air temperature, and a general description. Try the experiment if possible during a thunderstorm, as University of Alaska scientists have found readings as low as 3.0 under storm conditions.



The pH scale.

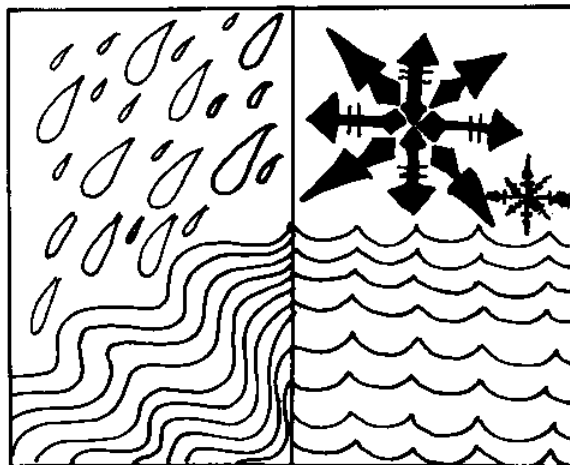
The pH scale is also logarithmic, which means that a change of one unit on the scale means a ten-fold change in how acidic or alkaline a solution is. Battery acid at pH 1 is only one unit down the scale from lemon juice (pH 2), but is ten times more acidic. It is 100 times more acidic than vinegar, which has a pH value of 3.

Students might also want to test other local water spots, then mark the results of their study on a community map. Write up a class report of your results. Are there any sources of SO_2 (sulfur dioxide) in your community, such as coal power plants?

Are there places where old car or boat batteries are dumped that could be increasing acidity levels? Include this information. Discuss the results with area biologists and village officials. Send one copy to Acid Rain Project, Alaska Cooperative Fishery Research Unit, University of Alaska, Fairbanks 99701. Also send in a sample of your leftover, unused Ph paper to be tested for its buffering capacity. All those who send in reports will receive a yearly update on the progress of this statewide project. Be sure to send results of rain that's normal or basic, too! It's important to have all results to correctly gauge what's happening statewide.

Activity 4

Water in Your Community



Background:

Water comes in many forms--rain, snow, sleet, hail--and it remains as streams, rivers, lakes, marsh, muskegs and underground water supplies. Water may seem abundant, but only a limited amount exists. We will never have more water on earth than we have right now. The great majority of water on the planet is salt water. Fresh water is especially precious because we need it for life.

Fresh water can be changed to salt water at an overly fast rate through poor watershed management. As wetlands are filled in and covered over, rain washes downstream to salt water faster because there is no chance for water to soak into the ground. Floods and soil erosion are also more likely, and once fresh water reaches salt water, it only evaporates and changes back to fresh water through the hydrologic cycle at a set rate. Thus, we could ultimately end up with more salt water in proportion to fresh water.

Additionally, groundwater that is tapped for residential, agricultural

and industrial uses replaces itself very slowly. Shallow groundwater may have a renewal rate of approximately 300 years; deep ground water (more than 3,000 feet) may renew itself in about 4,600 years. As groundwater dries up, ponds and marshes dry up and plant species die out. The remaining groundwater may also become contaminated by saltwater intrusion or by pollution, rendering it unfit to drink.

Most of the world's fresh water is used for irrigation, but personal water conservation can make a difference. In Alaska, it often seems as if we have more water than we could ever want. But even rainy coastal communities have been known to run low on water because collection and storage facilities are limited.

Vocabulary:

- hydrologic cycle
- ground water
- waste water treatment
- conservation
- precipitation
- evaporation
- condensation

Materials:

- chalkboard and chalk
- cups
- water
- graph paper
- pencils
- worksheet:
...Water and I (6H)

Procedure:

1. Give each student a cup of water. Tell them that one of their ancestors from Europe, Asia, Africa, or Alaska might have drunk this same water thousands of years ago. Ask

students how this could happen.

2. Now begin drawing a picture of the hydrologic cycle on the board, with help from the class. All water ultimately comes from rain (or snow) in what is called "precipitation." This water accumulates in streams, rivers and lakes, or is stored in underground reservoirs or various wetlands before beginning its journey to the sea. The sun continually evaporates the water over land and sea, transporting it upwards where it eventually condenses and forms clouds ready to rain or snow again. The water that we have now is all we'll ever have. That's why our ancestors may have drunk the same water that we are drinking today. Of course, as it goes through the hydrologic cycle, it's filtered and purified. So drink up!
3. How much water do your students use every day? Pass out the worksheet Water and I. Discuss question 2 as a class. Let students come up with their own methods for measuring individual water use. Here are some figures that may help students with hard-to-measure items: toilet flushing, 5-7 gallons; showers, 5-15 gallons/minute; baths use 25-30 gallons; dishwater, 5 gallons/load; clothes washer, 25-30 gallons/load; bathroom faucet, 2-5 gallons/minute.

Conservation is very important because we have all the fresh water we'll ever have. The sun can only evaporate water at a certain rate, and

then return it as rain or snow at a certain rate. So if we use it up and send it down to the sea too fast, we will continually have less and less fresh water, and more and more salt water. Groundwater replenishes itself slowly, taking hundreds and even thousands of years. In addition, it takes energy to pump water out of the ground, and also takes lots of energy to heat water.

4. Graph individual results from the worksheet. Compare water use by students who have running water with those who don't. Imagine hauling the 70 gallons of water a day used by each member of the average American family!
5. Investigate your local water sources. Where does your community get its water? Are there any communities upriver or downriver that share your water? Does your community have a water treatment or sewage treatment plant? Students may want to visit these sites to learn more about local water quality and future plans for the community. Students may discover the need for a local water education program. Design one and carry it out.

Unit Seven

A Review of Sea Week's Past

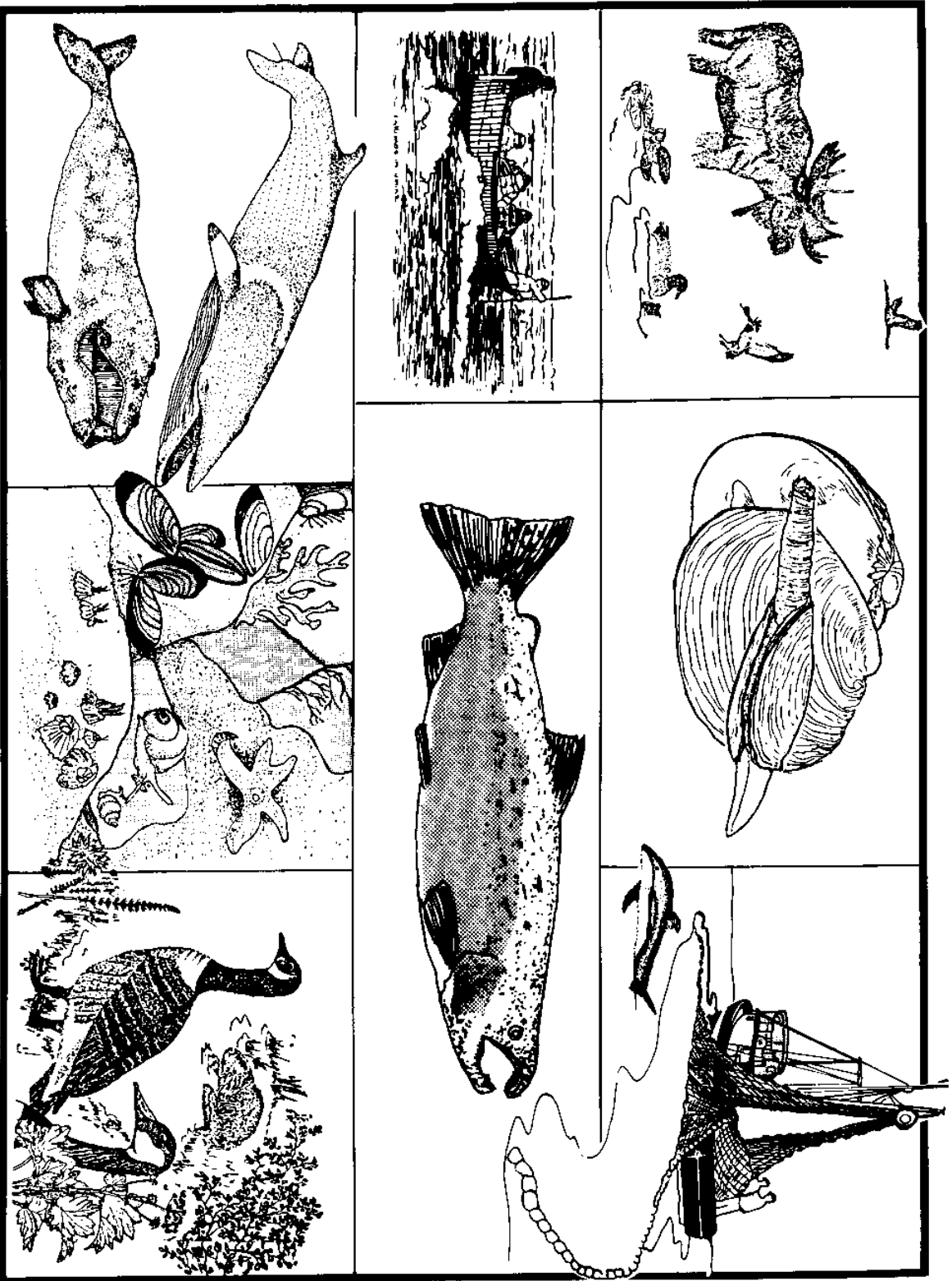
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Objectives:

To help students:

- Set up learning centers on marine and freshwater topics (Activity 1).
- Complete worksheets on aquatic habitats, invertebrates, seaweed, intertidal zonation, birds, fish, fisheries, mammals, glaciers and sea ice, Native uses of the seas and rivers, and safety and survival (Activity 2).
- Design a Sea Week instructional session for one or more of the younger classes (Activity 3).

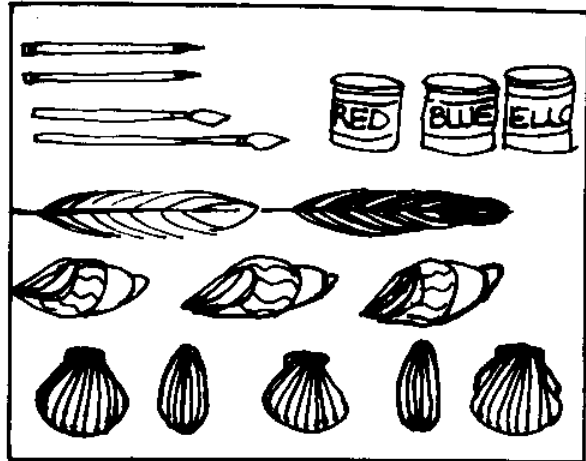


UNIT SEVEN: A Review of Sea Week's Past. From upper left clockwise--moose and ducks in a pond; clams; a fishing trawler and salmon; geese and a beaver in a marsh; starfish, snail, seaweed and barnacles on the shore; a right whale and a minke whale; and Eskimos in an umiak illustrate the diversity of subject matter that was covered in previous Sea Week volumes.

In the lower grades, students have had a chance to cover a wide variety of marine and freshwater subjects through Sea Week activities. This year, they have the opportunity to pull all that background information together, applying it to local issues.

One of the best ways to be sure that students really understand all they have learned is to have them instruct other people; hence, the activities in this unit turn your students into teachers!

Activity 1 Learning Centers



Materials:

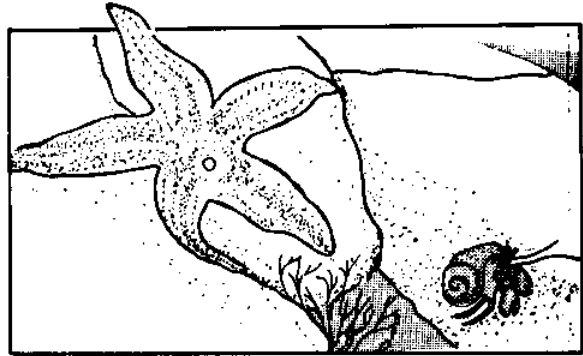
- Sea Week curriculum guides (Volumes I-VII)
- props and artifacts
- pencils
- paper
- art supplies
- ditto machine or copier
- reference and children's books
- worksheet:
...Ocean Word Images (7A)

Procedure:

1. Explain to students that this is their chance to be teachers. Divide the class into small groups and assign them space to set up learning centers around the room. For each center, they should have:
 - a puzzle
 - a prop or artifact that other students can touch or use, such as net-mending needles, bones, shells, seaweed, bird feathers
 - a book to read
 - worksheet(s)

records, tapes, film-strips, photos or pictures

Students may get their information from reference books, community residents, or the Sea Week Curriculum Guides. Here are suggested topics and where to find them in the guides:



<u>Topics</u>	<u>Sea Week Curriculum Guides</u>
Ocean	All volumes
Ponds, Streams and Rivers	All volumes
Wetlands	All volumes
Marine Invertebrates (except mollusks)	I, II, IV
Mollusks	I, III
Seaweed	I, IV
Freshwater Invertebrates	II, III
Birds	I, V
Fish and Fisheries	II, VI
Marine Mammals	I, II, IV, VII
Freshwater Mammals	II, IV
Glaciers and Sea Ice	IV
Native Uses of the Seas and Rivers	IV
Safety and Survival	All volumes

Smaller classes may want to combine several of these topics.

Challenge the class to be creative in figuring how to pass information they know on to the rest of the class. Remind students to ditto or copy puzzles and worksheets at their learning centers, so that each class member can have one. Encourage them to include math problems, vocabulary and spelling words in their centers, as well as to look for poems. For example, the following is one on shells:

SEE WHAT A LOVELY SHELL

*See what a lovely shell,
Small and pure as a pearl,
Lying close to my foot,
Frail, but a work divine,
Made so fairily well
With delicate spire and whorl,
How exquisitely minute,
A miracle of design!*

*What is it? a learned man
Could give it a clumsy name.
Let him name it who can,
The beauty would be the same.*

*The tiny cell is forlorn,
Void of the little living will
That made it stir on the shore.
Did he stand at the diamond door
Of his house in a rainbow frill?
Did he push, when he was
uncurl'd,
A golden foot or a fairy horn
Thro' his dim water-world?*

*Slight, to be crush'd with a tap
Of my finger-nail on the sand,
Small, but a work divine,
Frail, but a force to withstand,*

*Year upon year, the shock
Of cataract seas that snap
The three-decker's oaken spine
Athwart the ledges of rock,
Here on the Breton stand!*

--Alfred Lord Tennyson

2. Use the Ocean Word Images worksheet to get students started thinking about puzzles they can design. Ruth Berman, designer of these puzzles (with help from her students), is a long-time California marine educator. (Answers: 1. sea gull; 2. sand dollar; 3. octopus; 4. sea horse; 5. starfish; 6. plankton; 7. clam up; 8. school of fish; 9. surface; 10. man overboard; 11. tidal wave; 12. sea bed; 13. dolphin; 14. fish-eye view; 15. man-eating fish; 16. swordfish; 17. surface tension; 18. jellyfish.)
3. Once the centers are complete, have each student go through all of them. Other classes or parents may want to tour and try out your learning centers, too! Think up a sea-going name for your collection of learning centers, and make badges or certificates for everyone who finishes.

Activity 2

Review Worksheets



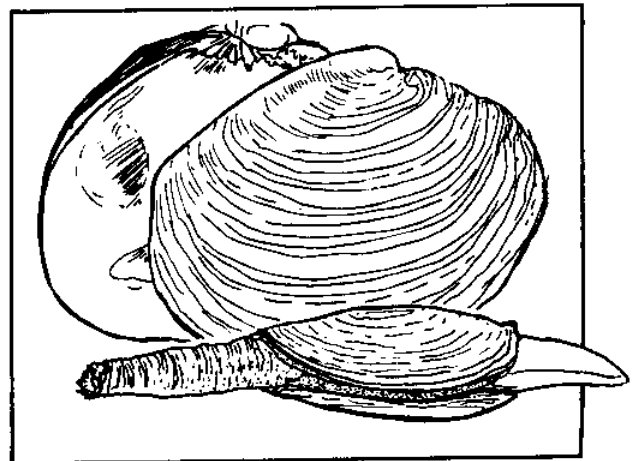
Materials:

- Sea Week curriculum guides
- reference books
- worksheets:
 - ... Aquatic Habitats (7B)
 - ... Marine Invertebrates (7C)
 - ... Mollusks (7D)
 - ... Seaweeds (7E)
 - ... Intertidal Zonation (7F)
 - ... Freshwater Invertebrates (7G)
 - ... Birds (7H)
 - ... Birds in the Field (7I)
 - ... Fish (7J)
 - ... Fisheries (7K)
 - ... Marine Mammals (7L)
 - ... Freshwater Mammals (7M)
 - ... Glaciers and Sea Ice (7N)
 - ... Native Uses of the Seas and Rivers (7O)
 - ... Safety and Survival (7P)

Procedure:

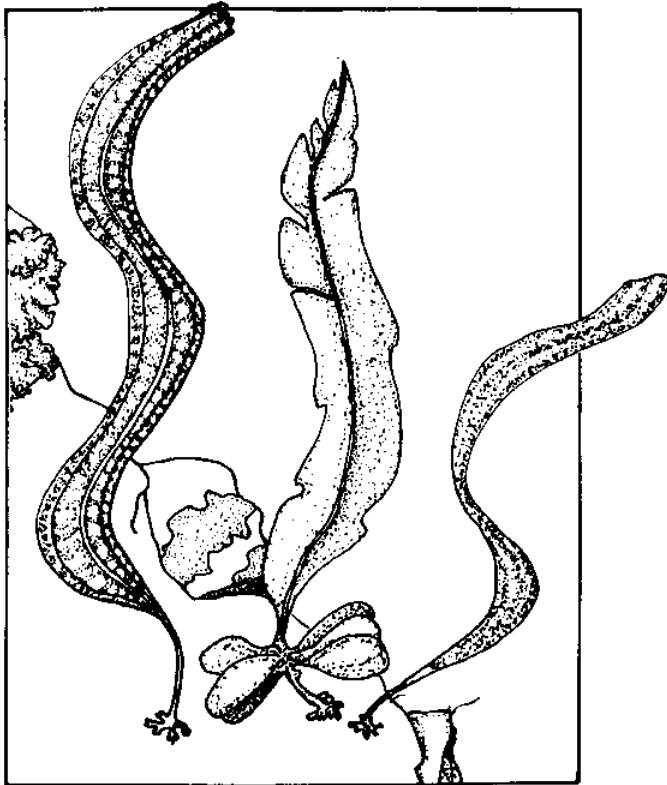
1. Pass out the worksheets. Encourage students to use the Sea Week curriculum guides and reference books to find the answers. The previous activity lists the location of these different topics in the Sea Week curriculum guides. In any case, here are the answers for your information:

Aquatic Habitats - magic number is 15; A. 7; B. 3; C. 5; D. 2; E. 4; F. 9; G. 6; H. 8; I. 1; 10. Seas, rivers and wetlands provide fish and wildlife habitat; human food; jobs; recreation; and are a source of beauty and inspiration. Oceans and rivers are especially important for transportation; wetlands are crucial for ground water recharge and flood control, and help also to buffer storms.



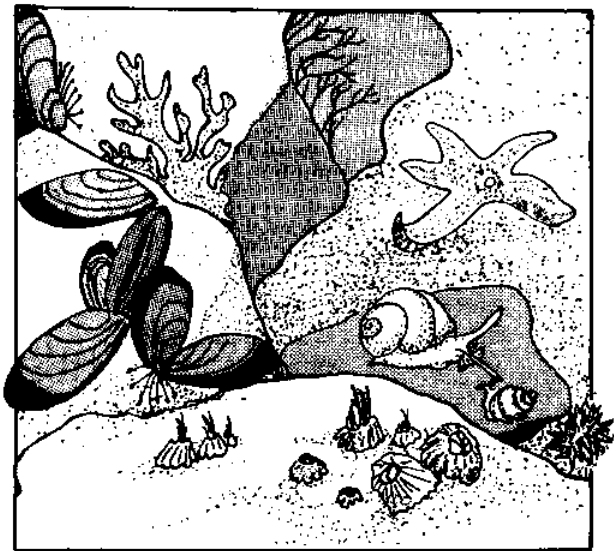
Marine Invertebrates - 1D, sea star; 2H, limpets; 3E, barnacles; 4G, sea anemone; 5A, mussels; 6C, sea urchin; 7I, snail; 8F, sea cucumber; 9B, razor clam; 10J, octopus.

Mollusks - mollusks, mollusks; 1a. univalves; 1b&c. limpets, snails; 1d. snails; 1e. limpets; 2a. univalves; 2b. bivalves; 2c&d. clams, cockles; 2e. foot; 2f. siphons; 3a. chitons; 3b. chitons; 4a&b. octopi and squid; 4c. octopi; 4d. squid; 4e. mollusks



Seaweeds - 1. green, brown, red; 2. algae; 3a. blade; 3b. float; 3c. stipe; 3d. holdfast; 3e. flower; 3f. stem; 3g. leaf; 3h. root; 4. look similar, have chlorophyll to make food, are usually stationary. Some seaweeds in warmer climates float--but they don't locomote; 5. are flexible and cannot remain vertical if they are not supported by water; they lack flowers; their blades are comparable to leaves, but are sometimes found at the top rather than along the sides or bottom; the holdfast functions primarily for hanging on, rather than supplying nutrients as roots do; seaweeds sometimes have floats; seaweeds live in salt water; 6. spring and summer because conditions are most favorable for growing then, with plenty of light and warmth

Intertidal Zonation - 1a-e. exposure to air, summertime warmth and dryness, wintertime freezing temperatures, predators from the land and sea, hanging on in surf and storms; 2a-b. black lichen, blue-green algae, periwinkle; 3a-f. Fucus, mussels, barnacles, amphipods, sea stars, cucumbers; 4a-e. sea stars, anemones, juvenile king crabs, larger snails, sea urchins

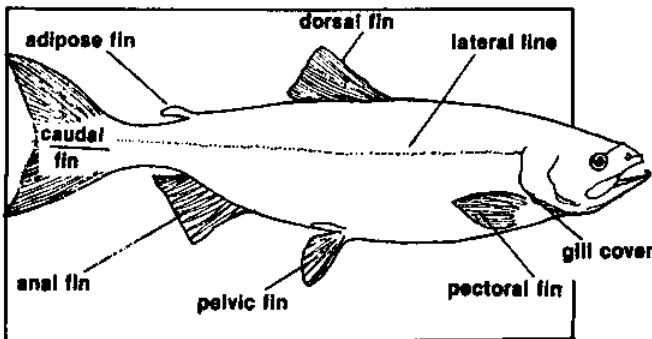


Freshwater Invertebrates - many possible answers

Birds - 1-6. swimming birds; waders; birds of prey; gull-like birds; grouse and ptarmigan; perching birds; 7. the abundance of food, cover, water, open space and in general the lack of human disturbance; 8. pollution might harm or kill birds by oiling their feathers or causing disease; overhunting might lower bird populations; increased human activity might change patterns of distribution, but the greatest threat is loss of habitat through building, dumping and filling on wetlands.

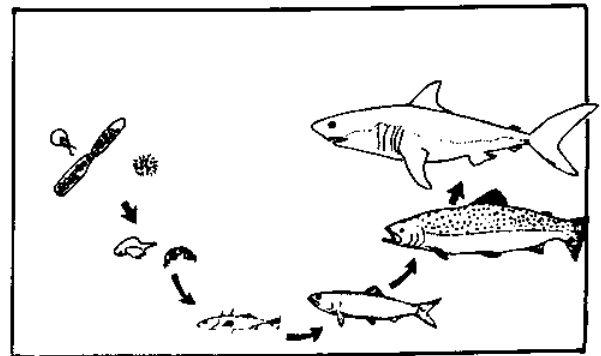


Birds in the Field - a. Canada goose; b. pintail duck; c. bald eagle; d. red-breasted merganser; e. tundra swan (whistling); f. black-legged kittiwake; g. semipalmated plover; h. great horned owl; i. black oystercatcher; j. mallard; k. oldsquaw; l. great blue heron; m. bufflehead; n. tufted puffin; o. snipe; p. Arctic tern; q. surf scoter; r. willow ptarmigan; s. raven; t. common eider



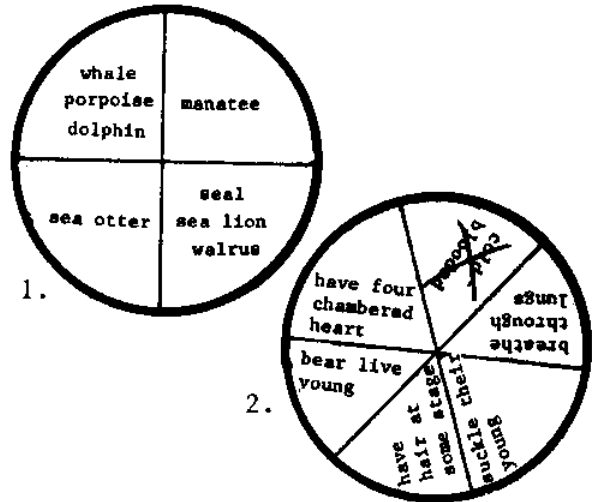
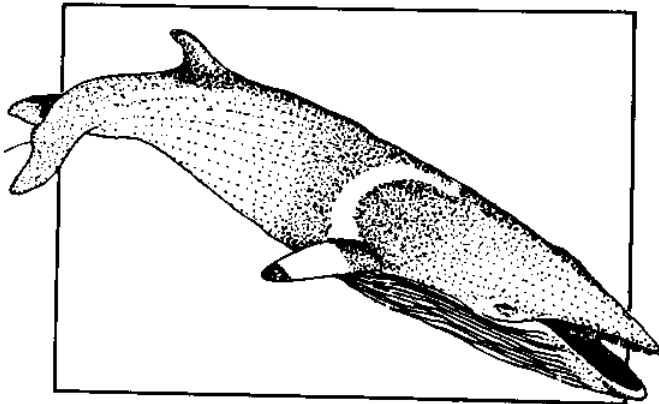
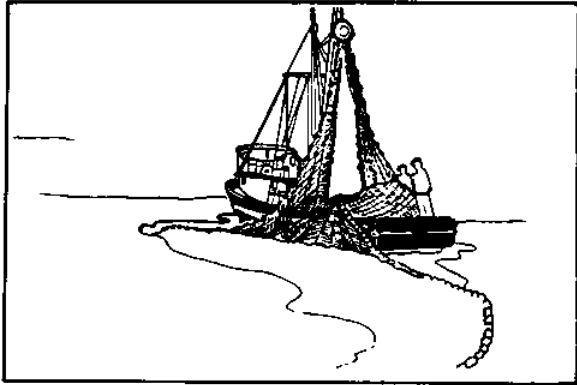
Fish - 1. (illus above); 2. chum or dog; silver or coho; king or chinook; red or sockeye; pink or humpy; 3. egg, alevin, fry, smolt, adult salmon; 4. Wetlands are important salmon spawning and rearing habitat. The wetlands soak up rainwater and snow melt and release it gradually, assuring even

flow. Additionally, insects and debris along streambanks and edges of ponds supply food for young salmon. Wetland plants supply nutrients that filter into the water system. Estuary wetlands at the mouths of rivers and streams are important rearing areas for salmon. Plankton and wetland plants grow extremely well due to the mixing of shallow, warm salt water and fresh water with additional nutrients washed down through the stream and river system; 5. many possible answers; 6. because they can hide so well; 7a-d. changing colors to fit their background, blending in with the bottom because they are flat and dark on top, blending in with the water's surface because they are white below, burying themselves in the sand; 8. (illus below)



Fisheries - 1a-c. jigging, hook and line, spearing whitefish, trapping blackfish, trapping salmon (Annette Island); 2a. crabbing, Dungeness crab; 2b. trolling, salmon (kings and cohos); 2c. set gillnetting, salmon; 2d. purse seining, salmon (mainly pinks) or herring; 2e. long-lining, halibut; 2f. drift gillnetting--salmon or her-

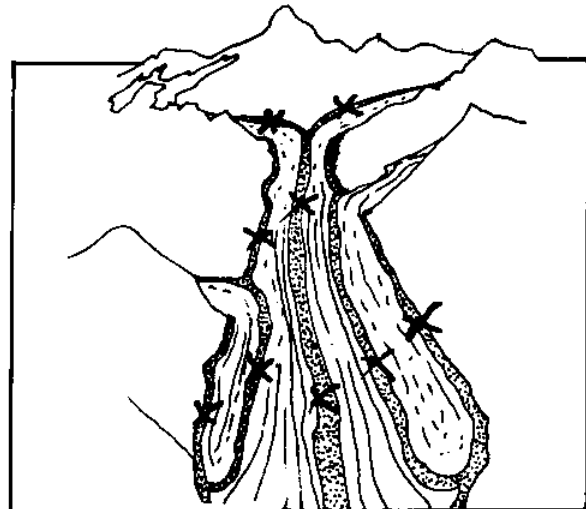
ring; 3a-e. protect wetland spawning and rearing habitat and productive coastal waters, avoid pollution and overfishing through education and regulations.

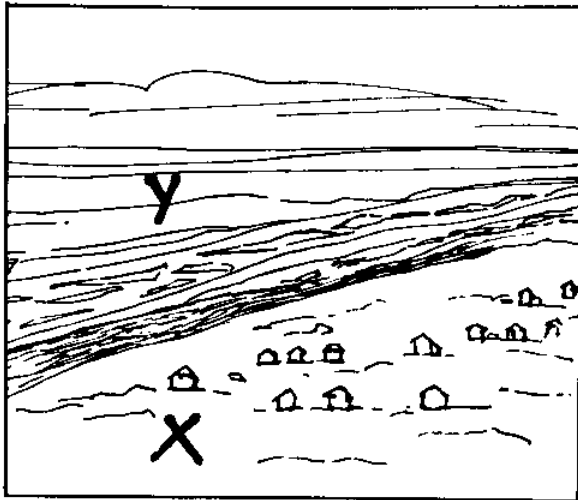


Freshwater Mammals - The following are the four groups: a (beaver track), b (beaver-chewed stump), i (beaver lodge), k (beaver); c (muskrat), d (muskrat house), j (muskrat track); e (river otter), h (river otter slide and tracks), l (river otter track); f (mink track), g (mink)

Glaciers and Sea Ice - 1. ice; 2. snow; 3. rocks; 4. silt; 5. motion; 6. leads; 7. black; 8. gray; 9. blue; 10. glacier carved, u-shaped valley, such as the one on the right; 11. (illus. below);

Marine Mammals - 1. (see illus.); 2. (see illus.); 3. true; 4. true; 5. false; 6. false; 7. false; 8. false; 9. false; 10. false; 11, 12. be able to swim, develop denser body hairs or a fat layer, adapt to marine foods; 13. echolocation is the interpretation of self-produced sound waves bouncing off objects on the ocean floor. It is used to spot fish and other prey and to gauge distance and direction. 14. Many possible answers.

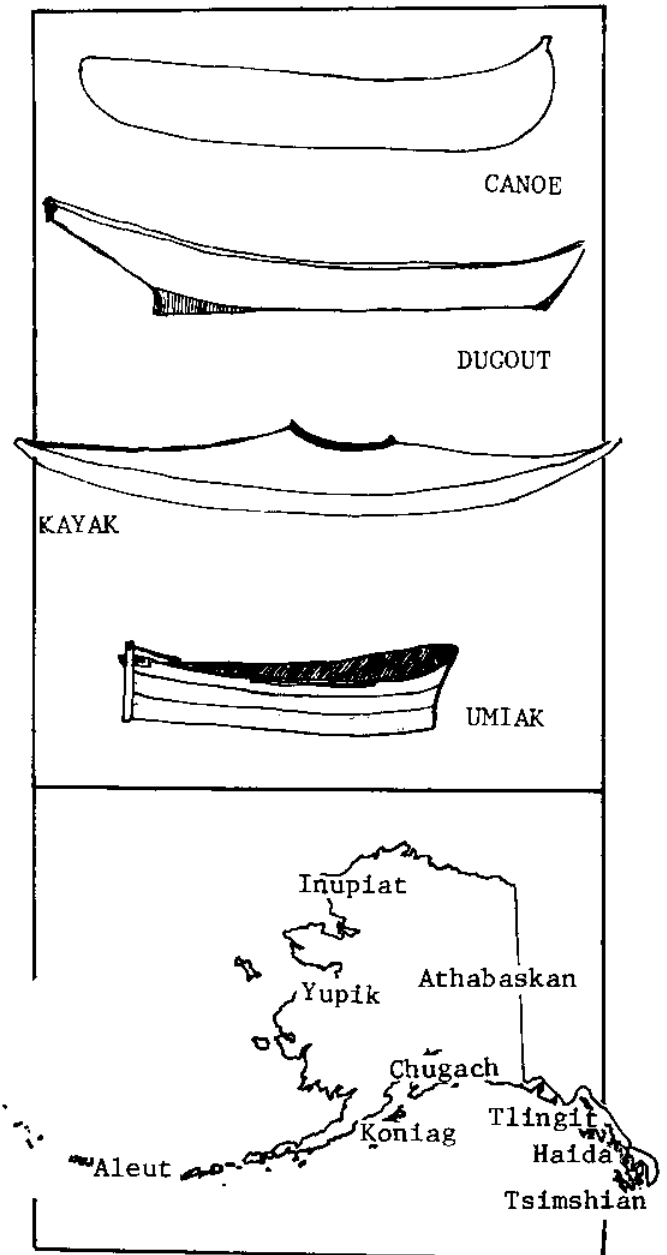




12. (see illus.); 13. onshore;
 14. abundant; 15. flexible;
 16. Glacial ice and sea ice are similar in that both are types of ice; both are constantly moving and dangerous; both glacial ice and old sea ice are brittle and blue and melt to form fresh water. They are different in that sea ice floats over a large body of water while glaciers move over land and have rivers running over them; glaciers form from snow, and sea ice forms from freezing salt water; young sea ice is flexible and salty; glaciers grind rocks up into glacial flour; glaciers change land formations.

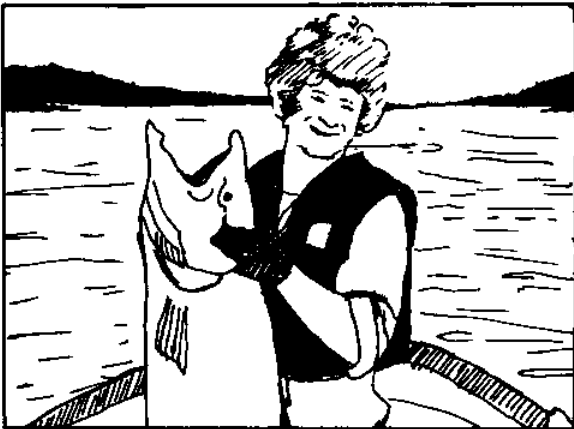
glaciers grind up rocks into glacial flour; glaciers change land formations.

Native Uses of the Seas and Rivers - 1. (see illus.); 10a. dugout used in southeast Alaska; 10. umiak used in northern and northwestern Alaska; 11. kayak used in northern, western and south-central coastal Alaska; 12. canoe used in central or interior Alaska



Safety and Survival - 1a. PFD (life jacket or survival suit); 1b. life ring and line; 1c. anchor and line; 1d. survival kit, which includes lighters, sleeping bag, foam pad, tarp, line, hook and line, snare, tape, heavy cord, knife, water, and food (see Unit Eight, Activity 4);

1e. bailer; 1f. compass; 1g. motor with gas tank and line and spare motor, prop, tools; 1h. light; 1i. oars; 1j. first aid kit; 1k. sailing plans, i.e., tell someone where you're going and when you're coming back; 2. students should mention sending one person for help and beginning artificial respiration immediately! They should describe artificial respiration in detail; 3. events should approximately follow this order (discuss as a class) - h, i, f, k, j, c, a, b, n, g, l, d, m, e; 4. refer to Unit 8, Activity 4. Pick items from coffee can survival kit (Unit 8, Activity 4) that could be carried in your pocket, and discuss as a class. Should definitely include knife and lighter.



2. Discuss the worksheets as a class. You may want to do additional review on subjects with which students have the most difficulty.

Activity 3 Sharing What You Know



Materials:

- paper
- pencils

Procedure:

1. Ask students if they would like to design a Sea Week program for younger students. Explain that the best way to tell if you really understand something is to try to teach someone else. Brainstorm some different options. First you will have to figure out who your audience will be and what will appeal to them, and then decide on a topic or topics. Your class could:

- give short talks to the younger children
- take the younger children on a field trip
- present a play or skit
- read stories
- show slides or films
- help the younger children make something such as little boats, puppets, or mobiles
- cook seafood for them to taste

- make up games or puzzles
- set up exhibits

2. Now have students write outlines of what they want to say, and prepare any necessary displays or props.
3. Discuss teaching techniques and have students practice with each other. Ask students when they have learned the most, and ask them to discuss the qualities of their favorite teachers. Be sure to mention that if students ask the younger children questions instead of telling them everything, the children will have to think a little more and will also remember more. If asked questions by the younger children that they can't answer, students should say that they don't know, but will be glad to look up the answers.
4. Remind students to be gentle with the younger ones, as well as to set an example of good behavior.

Unit Eight

Sea Week Camp

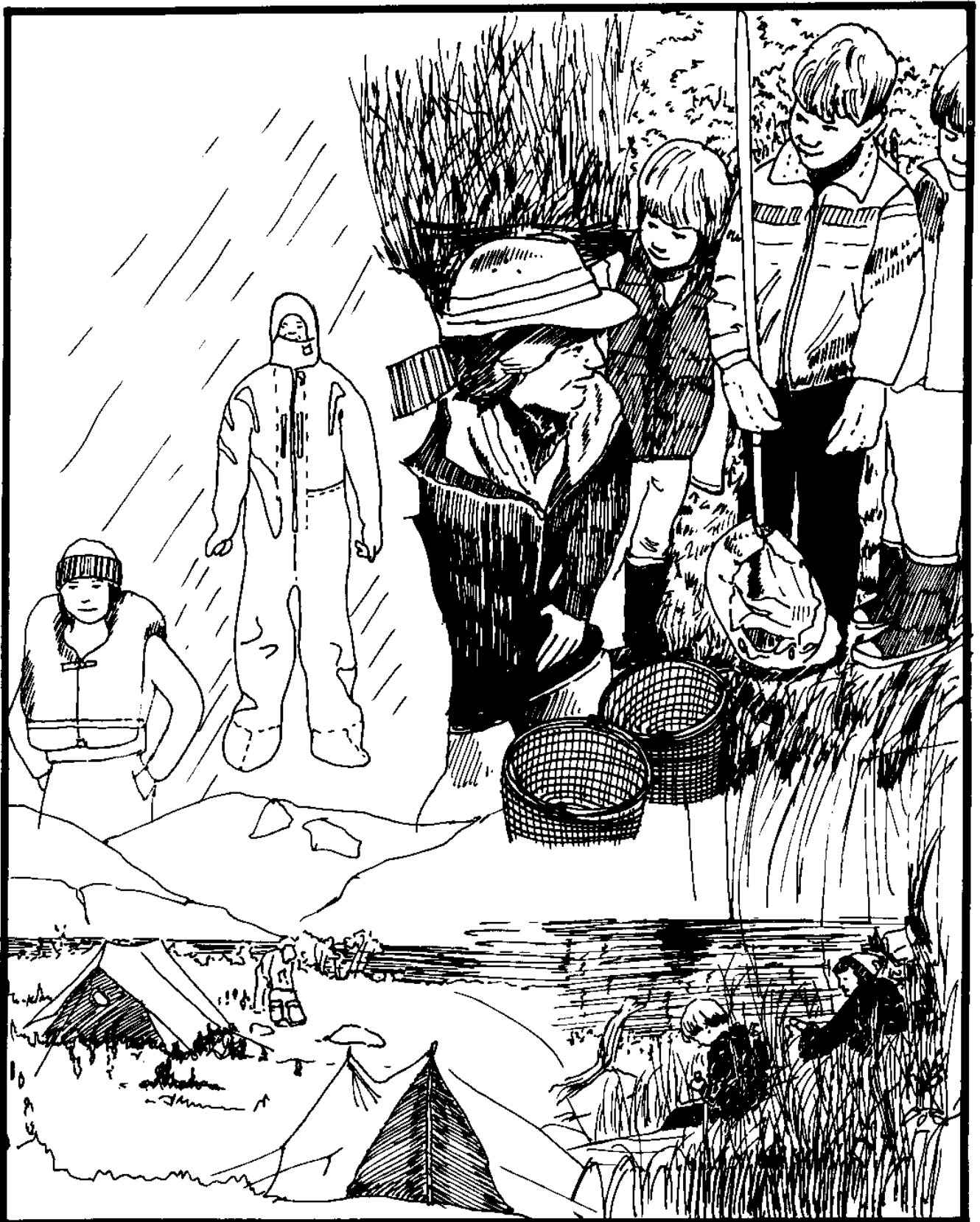
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Objectives:

To help students:

- Plan food and gear for an educational experience outdoors (Activity 1).
- Measure plant and animal life on sample plots within a study area (Activity 2).
- Chart and graph these measurements (Activity 2).
- Estimate total numbers of plants and animals in the study area (Activity 2).
- Compute and graph research on the importance of wearing a PFD (personal flotation device) (Activity 3).
- Draw cartoons about water safety (Activity 3).
- Practice first aid (Activity 3).
- Learn to treat earthquake victims by staging a mock disaster (Activity 3).
- Read about beach survival (Activity 4).
- Make coffee can and pocket survival kits (Activity 4).
- Write survival guides for their own community (Activity 4).
- Participate in a simulation game about future development on their camping site (Activity 5).



UNIT EIGHT: Sea Week Camp is usually the highlight of the Sea Week experience. Pictured above are a tent camp and students wearing flotation devices, capturing pond creatures, and examining objects on the seashore.

A three to five-day Sea Week camp can easily be the highlight of a student's school year or entire school career! Each community has exciting places to explore, and the opportunity for learning and living with classmates, teachers, parents and community resource people is a never-to-be-forgotten experience. Students often make tremendous strides socially as they work and play together as a team at Sea Week camp.

Activity 1 Planning Your Camp



Background:

Sea Week camp can be as elaborate or as simple as you want to make it. Involving students and community resource people (including parents) in the planning and implementation will add to the camp's success. But be careful, as too many group decisions can be difficult for everyone.

The most important item to plan for is safety. Make sure all participants are warmly dressed, are wearing PFD's (life jackets), and know what to do if someone becomes separated from the group.

Have good food and plenty of it. Quality food really helps the morale and is important for growing youngsters. Students can make it through a lot of poor weather conditions as long as they have enough good food to eat and are dressed properly for the weather. Don't let a little rain or snow stop you!

"The only problem we ever had was when the kids had too much 'free' time," explains veteran schoolteacher Kay Pearson of Ketchikan, who has been taking students outdoors for years.

So make sure there is plenty for students to do: classes, arts and crafts, organized games, chores.

Have your program well-planned, but be flexible, too. If the hooligan or salmon are running unexpectedly, make that a learning opportunity. If the boat to pick you up is late, sing songs or play games to build students' sense of community. Sea Week camp can demonstrate that learning is fun for everyone. It can be the start of an enjoyable lifetime adventure for parents, students and teachers alike.

Materials:

- food
- cooking utensils
- resource people (including parents)
- shelter
- transportation
- field guides
- safety and survival gear

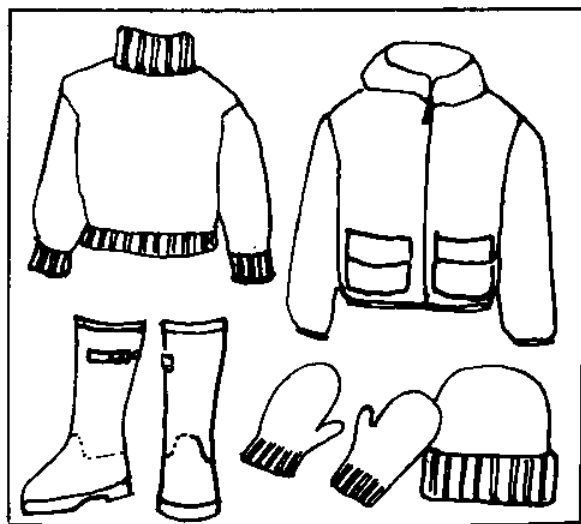
Procedure:

1. Obtain administrative approval. You may want to prepare a special presentation outlining your educational goals and objectives, safety considerations, resource people, lodging and transportation possibilities.
2. Organize a group of parents and other resource people to help plan the program and assist with logistics. Perhaps each person can figure out one aspect of the trip and report back to you. It is amazing the number of talented people in every Alaska community! (Refer back to the human resources list in your Community Inventory, Unit One, Activity 1.)

3. Decide on a location. Do you have access to a hunting camp or lodge where students can dry out their gear if necessary? Are there some small buildings where they can lay out their sleeping bags? Do some parents have tents that can be borrowed? What place has the most exciting habitat to explore? (beach? river? wetland?) Are there community events that students could be involved in? (muskrat or duck hunting? whaling? salmon or herring fishing? the spring bird migration? low tide exploration? fish camp?)
4. Work on transportation. Are there state or federal agencies close by? (U.S. Coast Guard? Forest Service? Fish and Game? Fish and Wildlife Protection?) Are there local charter operations that might be able to take students to the camp? Sometimes agency insurance will cover the students, particularly if students are signed up as volunteers to do an onsite project or survey. Would parents provide transportation if the school paid for the fuel?
5. Safety. Radio contact is important. Students need to review first aid procedures. Pack one or more first aid kits. Have students make survival kits. Discuss what to do if someone gets lost. If possible, every student should wear a whistle at all times. Life jackets should be worn during boat travel. Bear protection should be considered. Spare motors, tool kits, parts and oars

should be included if you're traveling by small boat. Sleeping bags, warm clothes, food and tarps should be spread out among all the boats (or other transportation), so that if anything happens to one boat, students will have adequate survival gear.

6. Students can help with planning the food. Stress good nutrition. You may want to have parents do the cooking, so that students can attend all classes. Have students wash their own individual dishes and assign a K.P. (kitchen patrol) crew to do the pots and pans. Plan for lots of food at mealtimes and nutritious snacks (apple slices, stuffed celery, dried fish, peanut butter and crackers) mid-morning, mid-afternoon, and at bedtime. Take extra dried food in case you are weathered in.



7. Warm clothing and rain gear are critical. The program should go on even in rain or snow. Students should have rubber boots or mukluks and several changes of clothes.

Stress the importance of wearing wool clothes, dressing in layers and bringing warm hats. You may want to have all participants bring their bag of clothes (wrapped in plastic garbage sacks to keep them dry) the week before, so you can check everything over.

8. Each school has different policies for raising money. Will the school cover camp costs, or will students need to raise money with bake sales and carnivals? If each parent is asked to contribute, perhaps a scholarship fund can be set up to cover those who cannot afford it.
9. Students should be well prepared scholastically, by going over some of the previous units in this book. Be sure they cover some of the topics from earlier Sea Week volumes (see Unit Seven this volume). You might want to involve students in planning special educational games or puzzles for camp. Have them review safety and first aid (Activity 3 of this unit) and make up survival kits (Activity 4 in this unit). They should start journals if they haven't already (Unit 1, Activity 2). If the trip will be physically difficult, you may want to give tests of skill and/or required miles to cover ahead of time. It might be good to have students write down individual explanations of what they expect to learn as a result of their camping experience.

10. Below is a sample program for a three-day campon the coast. As long as you are planning for one night, you might as well go for two, as it usually takes some time for students to get used to everything. Three days is a good length of time for the first year, and the following years you can expand to as many as five days.

The actual travel to the camp area can incorporate the educational treasure hunt "I Spy," or a map-reading exercise, to set the proper learning atmosphere. Your program should depend on the resource people that you can bring along, as well as on your local history and culture. Start brainstorming on who is available in your community.

SAMPLE SEA WEEK CAMP PROGRAM

Monday

8:00-10:00 Travel (treasure hunt on way)
 10:00-11:00 Settling in/snack
 11:00-12:00 EARTHQUAKE (first aid simulation game, see Activity 2 this unit)
 12:00- 1:00 Lunch
 1:00- 3:30 Classes - divide into groups
 Birds and Wetlands (pond field trip): Group 1
 Fish and Fisheries (stream survey field trip): Group 2
 Marine Mammals (beach walk, creative writing): Group 3
 3:30- 4:30 Snack/beach games
 4:00- 5:30 Classes - divide into groups
 Net Crafts (making belts with knots): Groups 1 & 2
 Beach Collage (making plaques or mobiles): Group 3
 5:30- 6:30 Dinner
 7:00- 8:00 LOCAL HISTORY (lecture/map work)
 8:00- 9:00 Sing-a-long and snack
 9:00-10:00 ASTRONOMY

Tuesday

7:00- 8:00 Breakfast
 8:00- 9:15 INTERTIDAL LIFE EXPLORATION - low tide
 9:15- 9:30 Snack
 9:30-12:00 Classes - divide into groups
 Marine Mammals (beach walk, creative writing): Group 1
 Birds and Wetlands (pond life field trip): Group 2
 Fish and Fisheries (stream survey field trip): Group 3
 12:00- 1:00 Lunch

- 1:00- 3:30 *Classes - divide into groups*
 Fish and Fisheries (stream survey field trip):
 Group 1
 Marine Mammals (beach walk, creative writing):
 Group 2
 Birds and Wetlands (pond life field trip): Group 3
- 3:30- 4:30 *Snack/beach challenge course*
- 4:30- 5:30 *Classes - divide into groups*
 Beach Collage (making plaques or mobiles): Groups 1
 & 2
 Net Crafts (making belts with knots): Group 3
- 5:30- 6:30 *Dinner*
- 7:00- 8:30 *Sea skits (students make up and then present)*
- 8:30-10:00 *Sing-a-long and snack*

Wednesday

- 7:00- 8:00 *Breakfast*
- 8:00- 9:15 *INTERTIDAL SAMPLING (low tide, see Activity 2 this unit)*
- 9:15- 9:30 *Snack*
- 9:30-12:00 *Classes - divide into groups with each group doing a*
 similar study
 Coastal Habitat (habitat mapping, forest study,
 field trip)
- 12:00- 1:00 *Lunch*
- 1:00- 3:00 *COASTAL PLANNING SIMULATION GAME (students debate*
 what should happen to their camping site, see
 Activity 5 this unit)
- 3:00- 5:00 *Snack/travel/sing-a-long - evaluation*

Units in this Sea Week volume or the previous volumes may be best covered or reviewed in a field setting such as your camp. For instance, ideas for fish and fisheries and netcraft can be found in Volume VI; birds and wetlands Volume V; marine mammals this volume. Weather (this volume) might be another good addition to your program. Coastal habitat can be explored and mapped. If you have trees in your area, check the logging, fisheries and wildlife unit in this volume for ideas.

The school's physical education instructor may be able to help design beach games and a beach challenge course that fits in with the educational theme; i.e., crab, octopus, seal walk relays; running down a whale's throat (through a cardboard box); swinging over a salmon stream (on a rope); riding a porpoise (on a swing); climbing up into a life raft.

The art instructor or a local artist may be able to help in planning art projects such as beach collages or mobiles.

For astronomy and local history, you'll need to rely on local resources.

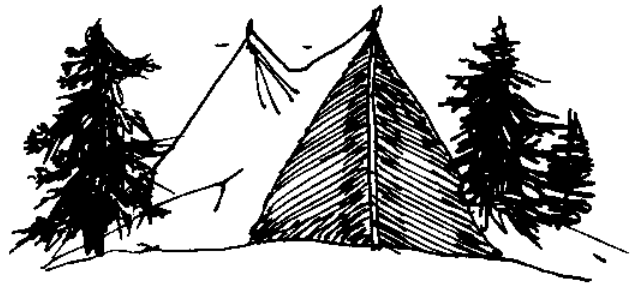
Sea and river songs are included in the various Sea Week volumes and in the Sea Week Sourcebook.

Try to break students up in smaller groups whenever possible, so that everyone has a chance to see and talk with the resource people. Involve students in measuring and recording data and writing a class report on their results. Activity 2 of this unit explains how to do the intertidal transect mentioned in the sample program.

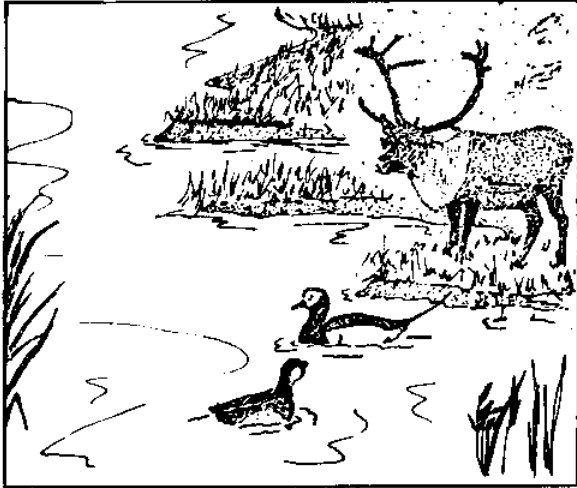
11. Have students develop rules for their camp (including safety procedures). Ideally, the rules will be easier to obey if students participate in making them up! Be sure to stress conservation.
12. Emphasize that this is an educational venture. It's also a chance for everyone to live, learn and work together. Have everyone draw names for secret pals--someone they will do something nice for every day.
13. Have a training session for parents and other participating resource people. Explain the program, giving them tips for working with students in this age group, and if possible, visit a site similar to where you will be camping. Go over field trip leadership techniques and answer questions.

Consider using older students for counselors and small-group leaders. They will probably get more out of the trip than anyone else. It's a tremendous learning experience for them to be looked up to, not only as models of good behavior, but as an educational resource.

14. Alert local media (radio, tv, newspapers) about your trip. Be sure to take a camera and plenty of film to record happenings. A slide show would be a great memento for this year's students, as well as a good introduction for next year's students, teachers, parents and resource people.
15. When the great day arrives to leave for camp, be rested so that you can also enjoy the adventure and excitement.
16. Plan to take full advantage of the Sea Week camp after it's over. Have students: write stories and reports on their adventures; research some of their finds; compute trip costs; make thank you gifts for those who helped; create great works of art inspired by Sea Week camp experiences.
17. Plan a parents night to show slides, journals, charts, art projects, songs, gifts.



Activity 2 Scientific Sampling



Background:

Do you ever wonder when you hear a large figure such as the total of ducks in North America, trees in the National Forest, or people who watch a certain television program, how such high numbers can possibly be counted?

Often this is accomplished by a process called sampling--taking an exact count in a small area and then multiplying to obtain an estimate for the total area.

Biological sampling is sometimes done by taking counts in randomly selected plots. Coat hangers pulled into squares are a good device for marking plot boundaries. Counts are taken inside the plots and then used to estimate the number of small animals per acre on a rocky beach, the number of flowers or berries on an acre of tundra, etc. This method will work for anything that is fairly evenly distributed over a large area, and small enough to be found inside coat hanger plots.

Sampling is very useful for gauging changes taking place over a period of time. One may wish to measure changes resulting from natural causes: earthquakes, storm surges, shifting currents, the seasons, etc. Cycles of succession--lakes that eventually fill in to become marshes and later dry land, or meadows that gradually turn into forests--can be best understood by studying changes in animal and plant life over a period of many years.

Or one may study changes caused by human activities: the construction of a boat harbor or subdivision; the building of a road or pipeline; a dredging operation, or an oil spill. Scientists are sometimes asked to investigate an area and develop baseline data before a construction project takes place. If the proposed changes are on a large scale, environmental impact statements are required. To determine the actual effects of the development, data must also be collected during and after completion of the project.

This activity describes random plot sampling and systematic sampling using transects. Your students can use either one or both of these methods to monitor local changes. Standardize your sampling techniques as much as possible, so that classes year after year can collect and compare data. Sample not only your Sea Week camping spot but also a local development site.

Discuss planned development projects with city planners or members of the village council. Ask their advice on what area to study and also on what types of information it would be most helpful to them for your class to study. The data your class collects may be of real use in the

future, so be sure to save your field notes and the report summarizing your findings. (This activity was developed with the aid of Jim and Mary Lou King, Juneau.)

Vocabulary:

- . sampling
- . random plot
- . transect

Materials:

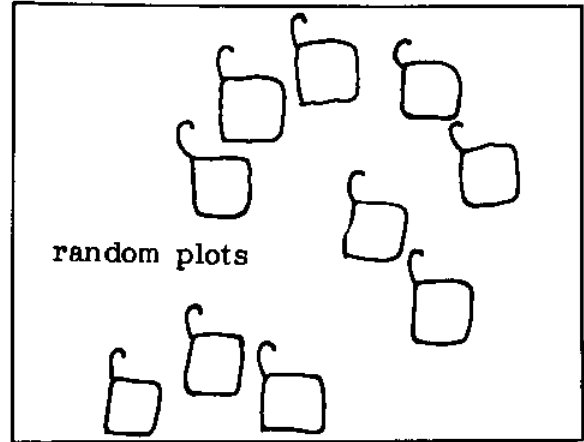
- . one coat hanger for every two students
- . yardstick
- . 100 ft lengths of $\frac{1}{4}$ in. rope or heavy twine (for the transect method)
- . wooden stakes
- . felt-tip markers
- . hammer (or rock)
- . adhesive tape
- . small rulers
- . paper
- . pencils
- . string
- . pocket notebook for each student
- . clipboard
- . field identification guides
- . camera and film (optional)

Procedure:

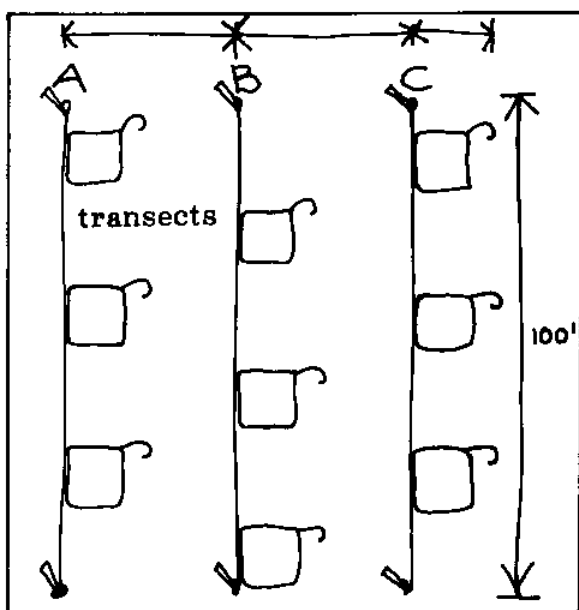
1. Decide on a study site. Ask students to describe how they would find out about the plants and animals living at this site. Plan to try out some of their suggested methods. Then explain the following two sampling techniques. Both require a supply of frames; these can be of any size, so long as the same size is used consistently in any one study. Coat hangers pulled into squares make handy plot frames, but wood or metal frames can also be used.

Random Plot Sampling:

Explain that to make their plots random, each pair of students should stand along an edge of the site, close their eyes and throw their coat hanger inside. After counting and recording all the plants and animals inside the frame, they should close their eyes and throw again, proceeding in the general direction of the opposite side of the study site. Each pair should complete 5-10 plots (whatever is agreed on beforehand).



Systematic Sampling using transects: To make transect lines, stake 100 ft ropes (use nylon-cotton will stretch) across the study site. The ropes should be numbered consecutively and marked off ahead of time with adhesive tape every three feet or at some other regular interval. If your study site has a variety of habitat types (including, for example, tundra, marsh and lake) your transect lines should be laid out to cross all of them. Teams of two students each, using the coat hangers, should take sample measurements along the transect line at the taped intervals.



2. For both types of sampling, at least two of the study site corners should be marked with stakes or by some other means. If transect lines are used, these also should be marked, so that the study can be duplicated in the future.

3. Each team of two students should record its findings in a small pocket notebook. (Notebooks can be made by cutting sheets of scrap paper in quarters, then stapling them together. Punch a hole in one corner and tie a pencil to it with a string.) Students should head their notes with the date, time, location and weather. While sampling, one student of a pair can count while the other records. A separate page of the notebooks should be used for each plot.

Have students write down the names of all species of plants and animals inside or at least more than halfway inside their square.

If students cannot identify something, ask them to draw a picture or write a description of it.

Students should make as accurate a count as possible of each species within the square. If there are too many to count, they can estimate by counting the number within one square inch, then multiplying by the number of square inches in the plot.

If grasses, algae or other plants are not too dense, they can be counted individually. Otherwise, have students measure the surface area, in inches, that each species occupies.

Make a note of inanimate evidence of life found in a plot--seashells, detached seaweed, bird feathers, animal tracks, or droppings.

RECORDER NAME:	
PLOT LOCATION: tran sect A plot 2	
DATE: April 2	TIME: 1:15
WEATHER: cloudy, light wind, low tide	
PLANT/ANIMAL:	NUMBER
barnacle	25
limpet	2

4. To be sure that students understand the procedures, you may want to try sampling in the classroom or on the school playground before you do your field study. Place construction paper plants and animals on the floor or ground. Then have students

mark and measure their study site, sample using random plots or a transect, and summarize data.

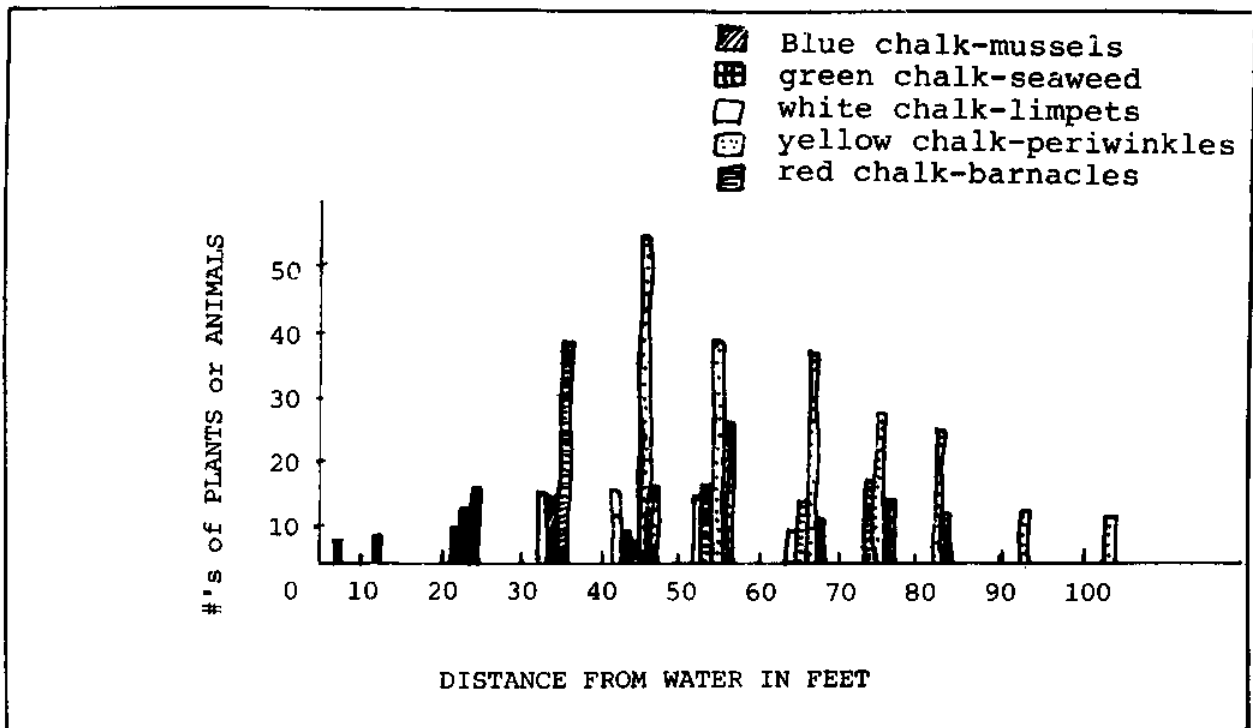
5. When you arrive at the study site have each student estimate how many plants and animals are living there.
6. Assign one team to be reporters. They can photograph or draw the entire operation and interview the biologists at work. Be sure they photograph or draw the whole of the study site and the bench marks at the beginning and end of each transect. If you have two cameras, you might want to put black-and-white film in one and color slide film in the other. Have students write a story about their class findings for your local school or community newspaper or parent newsletter.
7. Another team (more than one team if there is time) should draw a map of the study site showing prominent biological, geographical and geologic features, along with any man-made features. One student can establish scale for the



map by measuring his or her normal stride with the yardstick, then pacing off the size of the study site.

8. After the teams have finished their sampling, hold a summary session. Have each pair tell briefly of its findings. Try to look at the study site as a whole. What are its general characteristics?
9. Back at school, have each team record its findings on a data summary sheet. (A data summary sheet can also be used in the field instead of the field notebooks. If you've been to the study site before and are aware of what you'll find, you can draw up your own sheet ahead of time. Or students can make their own as they go along by writing down each plant or animal the first time they find it.)

BEACH PLOT SAMPLE RECORDING SHEET															
Beach Dimensions: Length _____ Width _____															
Plot Numbers	1	2	3	4	5	6	7	8	9	10	11	12	Total	Aver- Age	Beach Total
ANIMALS															
Sea Anemone															
Worms															
Starfish															
Sea Urchin (STAR)															
Sea Cucumber															
Chiton															
Blue Mussel															
Clam															
Snail															
Limpet (bat)															
Barnacle															
Crab															
Head Flea															
Insect															
Fish															
Other															
TOTAL ANIMALS	x	x	x	x	x	x	x	x	x	x	x	x	x		
PLANTS															
Pink Algae (Sq. inches)															
Red Seaweed															
Brown Seaweed															
Green Seaweed															
Grass															
Other															
TOTAL PLANTS	x	x	x	x	x	x	x	x	x	x	x	x	x		
Student Names	_____														



10. Have the teams make bar graphs of their results, so that they can see graphically how populations of animals and plants vary at your study site.

11. To compute the average number of animals or plants per plot, divide the total number recorded by the number of plots sampled.

To figure the number of animals or plants on the entire study site, use this formula:

$$\frac{\text{total square inches on study site}}{\text{total square inches in plot}} = \text{total plots on study site}$$

$$\text{average on plots sampled} \times \text{total plots} = \text{total creatures on study site}$$

For example, say you found a total of 1500 barnacles in 10 plots. $1500 \div 10$ gives you an average of 150 barnacles per plot.

Figure out the number of square inches in your coat hanger plot (9 x-9 in. coat hangers = 81 sq. in.) and the average number of barnacles per square inch:

$$150 \div 81 = 1.85 \text{ barnacles per sq. in.}$$

Now to estimate the number of barnacles on your study site, figure the number of square inches in your study site. Assuming a site 100 ft x 40 ft;

$$100 \times 40 = 4,000 \text{ sq.ft.}$$

$$4,000 \times 1.85 \text{ (sq. in./sq. ft.)} = 7,400 \text{ sq. in.}$$

and

576,000 x 1.85 = 1,065,600
barnacles in your study site.

These figures may be more meaningful if they are translated into creatures per acre. One acre equals 43,560 sq. ft., or 6,272,640 sq.in. Thus, in the example:

1.85 barnacles/sq. in. x

6,272,640 sq. in./acre =

11,604,384 barnacles per acre.

12. Have students analyze and summarize their data. Ask them:

- What species are most abundant?
- What species are most widely distributed?
- Is there much size range within individual species?
- What species are present but represented only by a few individuals?
- What natural changes are occurring within the study site?
- What accounts for the abundance of life in the sample plots?
- What human changes do you foresee in the future for this area?

• How will the animals and plants change in response to these human changes?

13. Show your results to local officials and SAVE YOUR FIELD NOTES AND SUMMARY REPORT! Emphasize to students that their data will be kept and compared with additional data taken the following year at the same time. (Or if possible, repeat the above sampling scheme in the fall, winter and spring, to measure seasonal change in the study area.) But most important is the fact that in some remote areas of Alaska, your surveys may be the only ones that have ever been made. Your reports might be of real help to scientists.

Additional Activities:

1. Science, Mathematics: Have students measure and record sizes of the largest and smallest plants and animals within the plots.
2. Science, Language Arts, Art: Have students write up questions they have about their findings and about specific plants and animals. Then research the answers to these questions and design an attractive bulletin board display with the results.

Activity 3 Safety and First Aid



Background:

Safety should always be foremost in everyone's mind. Sea Week camp is an excellent opportunity to develop and practice safety consciousness, which ideally becomes a life-long habit. By learning first aid, students may be able to help others as well as themselves.

Vocabulary:

- hypothermia
- resuscitation
- PFD (personal flotation device or life jacket)

Materials:

- various PFDs (life rings, float coat, coveralls, life vest, survival suit)
- thermometers
- first aid books (check the bibliography)
- first aid resource person
- catsup
- blankets
- assorted bandages and first aid supplies
- earthquake victims role cards
- worksheets:
 - ...Putting on your PFD (8A)
 - ...Water Safety Cartoons (8B)

Procedure:

1. Discuss with students the importance of safety around the water. Bring up local examples of water tragedies and how proper safety procedures could have prevented them. Demonstrate different PFDs (personal flotation devices) and have students try them on.

Pass out the worksheet Putting on your PFD. To complete this worksheet, students will need to know the local water temperature, so plan time to use thermometers in the water during or before class.

(Much of the information in this worksheet was obtained from a little pamphlet entitled Hypothermia and Cold Water Survival, by Mustang Industries, which is based on research at the University of Victoria. The pamphlet is available from Mustang Industries, Inc., 3810 Jacombs Road, Richmond, B.C., Canada V6V 1Y6.) Answers: 9a. excellent; 9b. poor; 9c. good; 9d. poor; 9e. fair; 9f. good; 9g. good; 10. Explain that the purchaser of a PFD should look for one that is comfortable to wear and provides maximum protection for the money.

2. Distribute the worksheet Water Safety Cartoons and discuss the different statements. Which ones apply to the Sea Week camping venture? Remind them that safety is no laughing matter, but sometimes cartoons and jokes can help a person remember.

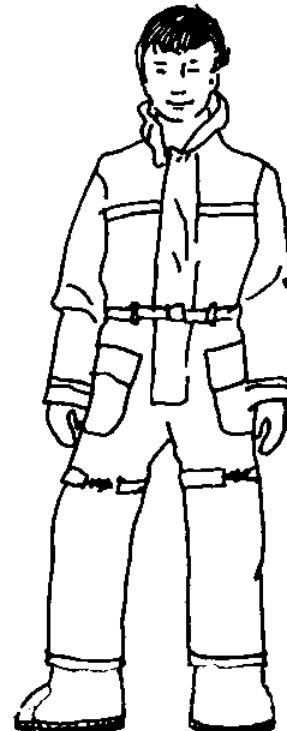
3. If at all possible, give students the chance to learn how to swim and a chance to try out PFDs in the water. Children tend to panic when they are in an unfamiliar environment, and violent movement of arms and legs in an attempt to climb out of the water tends to nullify the stability of a PFD. Children should feel comfortable in their PFDs and know what they're for and how they function in the water.
4. Arrange for someone knowledgeable in first aid techniques source person to come in and work with your class on first aid procedures. Repeatedly go over the four principles of first aid:

Check and Clear the Airway
 Stop the Bleeding
 Protect the Wounds
 Treat for Shock

Be sure students learn the correct procedures for artificial respiration and CPR (cardiopulmonary resuscitation). You may want to order the pamphlets First Aid for the Boatman, Boating Tips for Sportsmen and Cold Water Drowning from the U.S. Coast Guard, Bosteam 17, P.O. Box 2471, Anchorage, Alaska 99510.

5. As a practice of their first aid skills, stage the potential results of an earthquake. Pick eight students as victims (using catsup for blood) and have the other students treat them for injuries with assorted bandages and blankets. Do this activity at camp if you don't think it will give the students nightmares!

Explain that oftentimes on the coast, just before a tsunami hits, the tide will go way, way out. Then there is a roaring as the wave rolls in, so race for higher ground! The rule of thumb is that if the quake lasts longer than 30 seconds or if you cannot stand up when it happens, beware of a tsunami. You may only have five minutes before it hits, if, of course, the epicenter is nearby. If the epicenter is far away, the quake may not feel that strong, but a tsunami still may hit. The Tsunami Warning Center takes 15 minutes to process information about a quake, which it then relays to radio stations. So it is a good idea to turn on your radio anytime you feel an earthquake. Ask students to research stories about the famous earthquake that shook Alaska in 1964.



EARTHQUAKE VICTIMS ROLE CARDS

As you tried to run out of the cabin, a bookcase fell over and broke your arm and sprained your ankle. You are in shock and can't think of what to do next.

You were doing dishes when all the china in the cupboards of your cabin fell out and cut you badly all over your body. Blood is spurting out of a severe gash on your arm. The sight of your own blood has caused you to faint.

You were putting wood in your stove when the quake hit. The stove fell on you and burned your arms and legs badly. Your clothes are smoldering and you run screaming out of the house to get away from everything.

You were fishing near shore when the quake hit. Your boat was wrecked on the rocks and you were thrown out on the beach, near-drowned and unconscious.

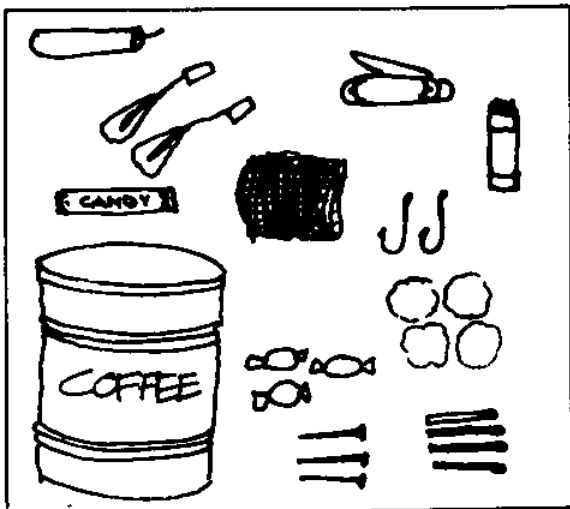
You were chopping wood when the quake hit. The axe hit your knee and split it wide open. Blood is gushing out and you're in shock.

You were up in a tree scouting for wildlife. The quake knocked you out and broke your back when you fell out of the tree.

You were eating fish when the quake struck. The table fell over on you and broke your leg. You also have a bone stuck in your throat. You keep trying to cough it out but it's still stuck.

You were in the shed filling the gas tanks for your boat. All kinds of junk fell on top of you, crushing your leg and pinning you in. Now the fumes are overcoming you.

Activity 4 Survival



Background:

Every Alaskan should know basic survival skills. The best advice is be prepared. Always have survival gear in your boat, plane, snowmachine, dog sled or car. A small booklet called Cold Weather Survival, available from the Alaska Department of Fish and Game, is helpful.

Materials:

(These materials will make a survival kit for each student. Excerpted and adapted from "Coffee Can Survival Kit" by Hank Pennington, University of Alaska. As published in Alaska Tidelines, Volume 11, Number 8, May 1980. Copyright © 1980. Published by the University of Alaska Sea Grant Program. Reprinted by permission.)

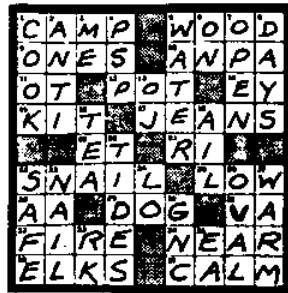
- coffee can
- 6x8-foot sheet of plastic (Fold tightly and place in the coffee can first, as a kind of lining around the sides.)
- three feet of heavy aluminum foil (many uses: cooking; signaling, as with a mirror; fishing lures, etc.)

- two 10-inch zip-lock plastic bags (for carrying water; storing and carrying food.)
- 25 feet nylon parachute cord
- 50 feet nylon twine (small)
- 30 feet fine snare wire (For making snares, net hoops, loop handle for the coffee can)
- 3x5-foot piece of gillnet
- 25 feet of 20 lbs. test fishing line
- fish hooks: 6 #1/0 hooks and 6 #6 hooks
- four large 20d nails
- pocket knife (good quality Scout-type)
- wire saw (small, flexible)
- Disposable propane cigarette lighter
- cotton balls (Good for quick wet wood fire starter.)
- 4" x 3/4" candle
- powdered coffee, tea or fruit drink (to flavor your water and keep fluid consumption high)
- hard candy (high energy food)
- survival food (dry soups, candy bars, etc.)
- waterproof matches (wooden kitchen matches dipped in paraffin)
- gray duct tape to seal the coffee cans shut
- worksheets:
 - ...How to Survive on a Beach (8C)
 - ...Survival Puzzle (8D)
 - ...Beachcombing Trip (8E)

Procedure:

1. Discuss local survival stories. Have students imagine situations in which they might need to use survival skills. Pass out the worksheet How to Survive on a Beach. If your students are from the Interior, have them think about the differences between

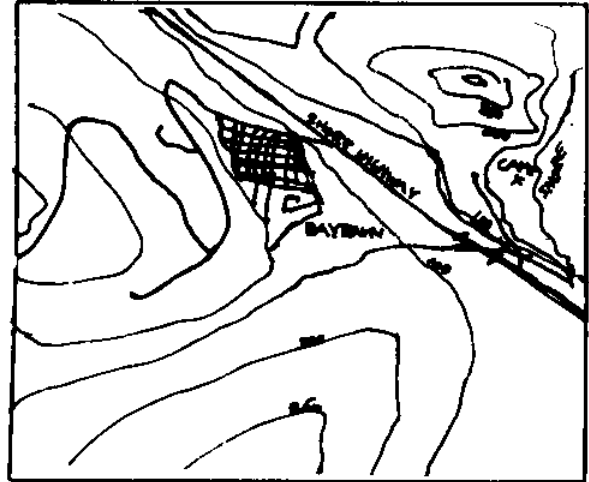
coastal and inland areas as they read the story. They may also want to try problem no. 3 on the review worksheet, Safety and Survival (7P). As a follow-up, have students do the worksheet, Survival Puzzle. (Solution below:)



- Have students make up coffee can survival kits. Use the materials listed above. Students may be able to scrounge items from home to include in their cans. Discuss additional items such as hatchets, first aid kits, sharpening files.
- Have students read the worksheet Beachcombing Trip. Talk about how often accidents happen so fast there is no chance to grab your survival kit or gear. That is why it is important to dress warmly. Often in a survival situation, all you end up with is what is on your back and what is in your pockets. Ask students what they should include, and have them make up their own pocket survival kits.
- Have students write survival guides for their own community. What shelter, warmth, water and food can they expect? Will they be prepared? Have them end their survival guides with a creative story about the time they had to survive.

Activity 5 The Camp's Future

(a simulation game)



Background:

Controversial issues are an important part of the Sea Week Curriculum Series. By having students take a look at their Sea Week campsite, they can perceive and better understand some of the development issues facing Alaska. This game is similar to the coastal zone management game in Unit 1, Activity 2, but it is less structured and more open-ended.

Materials:

- butcher paper
- felt-tip markers
- topographic maps of the area
- construction paper
- scissors

Procedure:

- Bring the group to a spot where they can get an overview of the whole camping site. Ask them to brainstorm different development alternatives (houses, businesses, industry, or keeping it like it is). Discuss the advantages

and disadvantages of development. In small groups, have students come up with specific plans for each development alternative. Butcher paper, felt-tip markers and topographic maps can be used to develop charts for each group's presentation. Instruct each group to prepare a three-minute presentation. Before they get too far along, ask each group to elect a borough commissioner, and have the commissioner meet in their own group.

2. Ask the commissioners to come up with criteria for the plans.
3. After about 15-20 minutes, have the commissioners call a town or village meeting. Each group makes a presentation. Allow a few minutes after each presentation for questions from commissioners and from the audience.
4. Have the commissioners make their decision and present it to the group. Discuss the actual future of your camping site. What will it look like in 10-20 years? What will your community look like? What role will your students play in its development?