

# GRAPHIC POPULATIONS

(Modified for ADEED)

This Alaska Department of Fish and Game lesson has been selected for Yukon Flats School District use by a team of education specialists at the University of Alaska Fairbanks Geophysical Institute.

This lesson was taken from the *Wildlife for the Future* notebook (2001). Page numbering is not consecutive as material has been obtained from different sections of the publication. Please disregard the "Complementary Activities" section, since it requires material from the publication that has not been included with this lesson.

The lesson addresses the following Alaska Grade Level Expectations:

## **Science**

[9] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating. \*Same concept at a higher level

[9] SC3.3 The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by identifying dynamic factors (e.g., carrying capacity, limiting factors, biodiversity, and productivity) that affect population size.

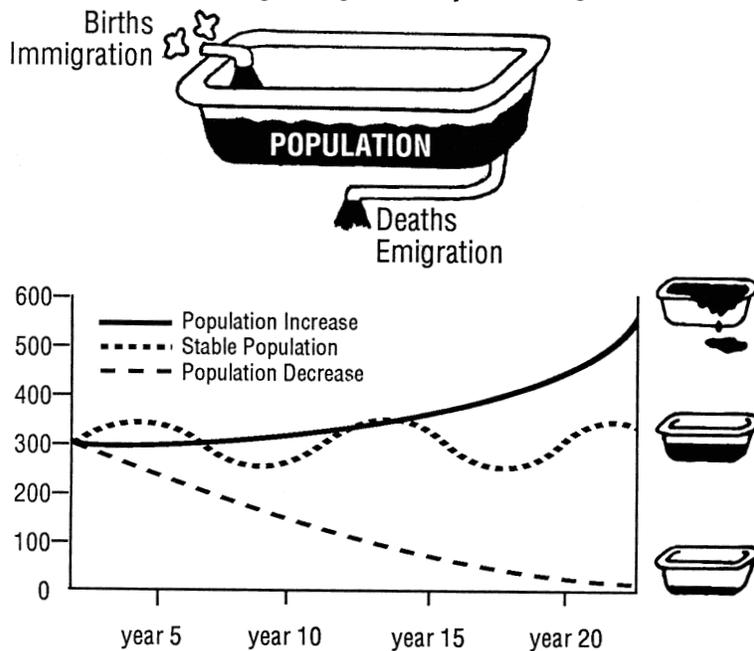
## **Added Materials**

*Alaska Ecology Cards*

# Graphic Populations

## 7 EXTENSIONS

### Carrying Capacity



## Section 2 WILDLIFE ACTIVITIES

**Grade level:** 6 - 8

**State Standards:** M A-4

**Subjects:** Science, math, language arts

**Skills:** Analysis, communication, graphing, inference, prediction, reading, synthesis

**Duration:** 2-3 periods

**Group size:** 4-8

**Setting:** Indoors

**Vocabulary:** Conservation, extinction, graph, population decline, population recovery, stable population

### Objectives:

1. Students will compare population trends.
2. Students will determine factors that may cause population declines or increases.
3. Students will discover ways that human actions have contributed to or reversed population declines.

### Teaching Strategy:

Students compare graphs for several wildlife populations.

#### Complementary Activities:

"Population Explosions" and "How Many Bears Can Live in this Forest?" in this section. "Science, Technology, Society, and Wildlife" and "Exploring Wildlife Issues" in Section 4.

### Materials:

Copies from INSIGHTS Section 2 of *Steller Sea Lion*, *Northern Pintail*, *California Condor*, and *Western Arctic Caribou Herd* — "Wildlife Facts," "What Happened," and "Population Graphs." Graph paper.

OPTIONAL: computer graphing program, overhead projector, overhead graph paper.

### Background:

See INSIGHTS Section 2, *Biodiversity and Populations – Alaska's Dynamic Wildlife*. Also INSIGHTS Section 3, *When Populations Decline* and INSIGHTS Section 4, *Wildlife Conservation is Up to Us!*

### Procedure:

1. Draw a hypothetical **population** graph on the board or on overhead graph paper to show how a population can grow, stabilize, and **decline**. Discuss the relationship of births and deaths in a population that is growing, **stable**, or declining.
2. Brainstorm the causes of wildlife declines (see INSIGHTS Section 3 for more information). Categorize the causes of declines under two separate headings, "human-related factors" and "other environmental factors."
3. Use jigsaw grouping (see description included with this activity). Divide the class into the lettered groups and



pass out the “Wildlife Population” Fact Sheets (*from INSIGHTS Section 2*). Pass out graph paper if you want the groups to graph the data. If not, pass out the corresponding “Population Graphs” at the same time.

4. Encourage students to read the fact sheets, extract the data, and make graphs.

5. Review the graphs to determine the trend of the population (*increasing, declining, or stable*).

6. Students should discuss what factors might have caused the trends in their population. **If a population is declining**, students may predict when their wildlife population would drop to zero (*extinction would occur*) assuming that all factors causing the decline continue.

7. Discuss how human effort through **conservation** management can change a downward trend. *The Cackling Canada goose of the Yukon-Kuskokwim Delta is an example of effective conservation management in Alaska <www.r7.fws.gov>*

8. **If the population is increasing**, discuss how many animals in a population may be too many for the **habitat** to support – if the animals exceed the **carrying capacity** of the habitat.

9. Ask students to predict what will happen if the population grows too large. Discuss how human effort through hunting and other conservation management can contain this population explosion. *The Canada goose population in the Anchorage Bowl is an example <www.r7.fws.gov>*

10. Distribute the “What Happened?” handouts that match each group’s wildlife population fact sheet. Ask the groups to make a list of the factors that affected the population trends for their animals. Each student will need a copy of the group’s results.

7. After letter groups complete their work, students meet in numbered groups to share the graphs and lists from the lettered groups. Discuss the questions asked about what scientists need to know.

(For example, answers to Sea Lion Population questions: Scientists would need to know whether the populations being counted represented the entire species or if other populations still survived after some populations dropped to zero. They would also need to know the life history, where young are born and raised, and any migratory movements.)

8. For each graph, make a list of human actions that contributed to population declines and a list of human actions that helped reverse population declines. If the population has increased, list what human actions have contributed to the increase and determine if the increase is healthy or cause for concern.

### Evaluation:

1. Ask students the relationship between the number of births and the number of deaths in a population at the following points on a population graph:

- (a) Upward graph (*number of births exceeds the number of deaths*)
- (b) Straight line graph (*number of births equals the number of deaths*)
- (c) Downward graph (*number of deaths exceeds the number of births*)

2. Students research wildlife management success stories in Alaska (*Aleutian Canada geese, sea otters, mallards, bowhead whales, muskox, trumpeter swans, or arctic nesting geese*) or elsewhere in the world. List the ways population declines were reversed.

3. Each group presents a skit or play of what they have learned. Perform for the class and end with at least three recommendations how humans can help declining species.

### EXTENSIONS:

A. **Computer graphing.** Use a computer program that generates graphs based on population data or present graphs and conclusions to another class through a computer network.

B. **Research and write about other populations.** Research and develop population story examples and “What Happened?” sheets for other Alaskan animals.



Chose a variety of animals that are: (a) healthy, (b) threatened or endangered animals and (c) rapidly increasing.

C. **Discuss wildlife news stories.** Students bring in and discuss news articles on animal populations and how they are changing.

D. **Guest wildlife manager.** Invite wildlife managers to the classroom to discuss population graphs. If the biologist is unable to come to class, ask for sample population graphs of animals in your area, or animals of particular interest to your students.

E. **Guest Native elder.** Invite knowledgeable long-term residents and Native elders to describe changes in local wildlife populations that they have observed over their lifetime. Discuss possible human influences on the changes in local populations.

F. **Graph other animal populations.** Obtain scientific data about local animal populations. Graph the data to see if they are declining, increasing, or stable. Predict what action wildlife managers might take after getting the data.

G. **Peregrine falcon case study.** Study the "Population Graph" of American peregrine falcons from the Upper Yukon River (*in* INSIGHTS Section 2). In the late 1960s, populations of the American peregrine falcon populations had declined throughout the United States and the bird was recommended for listing on the federal Endangered Species List.

- *Raptor Kit*. Available on loan from ADF&G in Fairbanks and Douglas or ARLIS in Anchorage. Other Raptor kits are being developed by the Pratt Museum and the Alaska Raptor Rehabilitation Center. For further information check *Guide to Educational Science Kits in Alaska* <[www.col-ed.org/ak/kitwebpage.html](http://www.col-ed.org/ak/kitwebpage.html)>
- Between 1968 and 1977, the number of pairs of peregrines that nested each year in the upper Yukon River changed very little. Female falcons were laying the same number of eggs that they did before the

population declined. Why didn't the population grow? (*All young birds were not surviving and being added to the population.*) What was the trend of the population after 1977? (*rapid increase*).

- To develop scientific questioning skills, ask students to think of reasons why the peregrine population may have increased.
- (*Scientists learned that the cause of death of young birds was thin eggshells. When the adults sat on the eggs, the eggs were crushed and didn't hatch. Scientists later learned that pesticides such as DDT caused the thinning of eggshells. Adult birds ingested DDT when they ate smaller birds that had fed on crops sprayed with DDT.*)

In 1972, the United States banned the use of DDT and similar pesticides. It took time for the population to recover, however, because the pesticide is slow to break down in the environment to the point where it is no longer toxic to peregrines and other birds.)

- (*To demonstrate the effect of accumulating toxic substances at the top of a food chain, do the Project WILD activity "Deadly Links." See Teacher Resources.*)

### Curriculum Connections:

(See appendix for full citations)

#### Books:

*California Condor* (Silverstein)

*Endangered Animals: 140 Species in Full Color* (Kest)

*The Peregrine Falcon – Endangered No More* (Priebe)

#### Media:

*Steller Sea Lions* (Video) (ADF&G)

#### Websites:

Alaska Biological Science Center  
<[www.absc.usgs.gov](http://www.absc.usgs.gov)>

*Alaska Science Forum* <[www.gi.alaska.edu/ScienceForum](http://www.gi.alaska.edu/ScienceForum)>



*California Condor* <[www.dfg.ca.gov/hcpb/condor.html](http://www.dfg.ca.gov/hcpb/condor.html)> (California Department of Fish and Game, Habitat Conservation Planning Branch)

Ducks Unlimited <[www.ducks.org](http://www.ducks.org)> For information on the Pintail Duck.

*Endangered Species* <[endangered.fws.gov](http://endangered.fws.gov)> (US Fish and Wildlife Service)

*Steller Sea Lions* <[www.fakr.noaa.gov/protectedresources/stellers.htm](http://www.fakr.noaa.gov/protectedresources/stellers.htm)> (National Marine Fisheries Service)

*Tundra Peregrine Falcons in the North Yukon* <[www.taiga.net/coop/indics/peregrin.html](http://www.taiga.net/coop/indics/peregrin.html)>

US Fish and Wildlife Service Alaska region <[www.r7.fws.gov](http://www.r7.fws.gov)>.

US Fish and Wildlife Service Alaska region, Arctic National Wildlife Refuge <[www.r7.fws.gov/nwr/arctic](http://www.r7.fws.gov/nwr/arctic)> For information on the Western Arctic Caribou herd.

Wildcam: Steller Sea Lion, Chiswell Island <[www.nationalgeographic.com/stellercam](http://www.nationalgeographic.com/stellercam)> Live video camera on Chiswell Island, Alaska.

**Teacher Resources:**  
(See appendix)

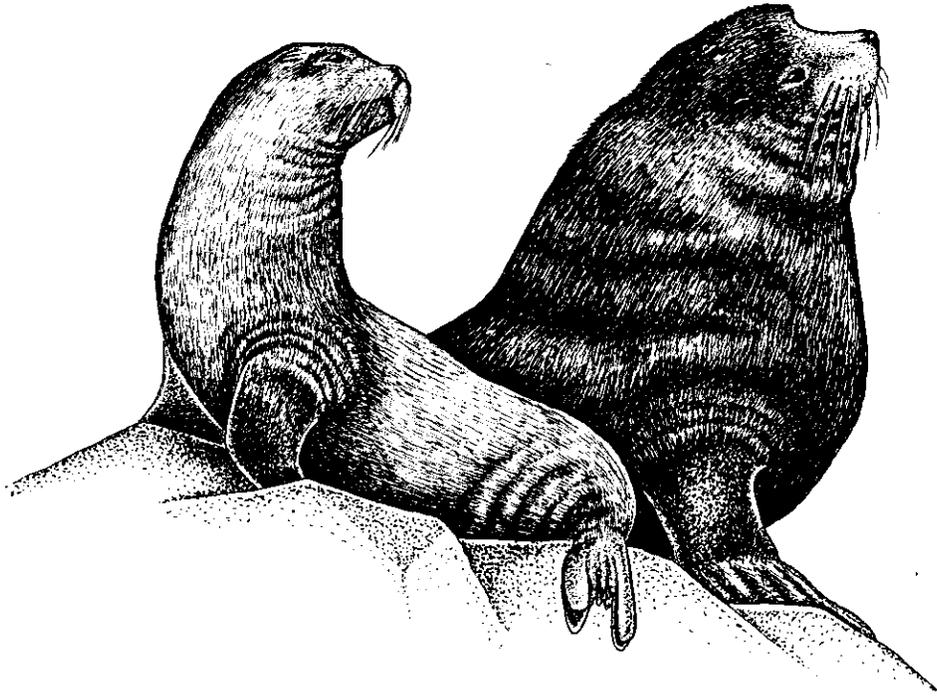
## Jigsaw groupings

Each student meets with 2 groups: **first**, with other students assigned the same **letter** to gather information; second, with other students assigned the same **number** to share the information.

<i>Class Size</i>	<i>W-group</i>	<i>X-group</i>	<i>Y-group</i>	<i>Z-group</i>	
	W-1	X-1	Y-1	Z-1	Ones
	W-2	X-2	Y-2	Z-2	Twos
	W-3	X-3	Y-3	Z-3	Threes
16 students	W-4	X-4	Y-4	Z-4	Fours
20 students	W-5	X-5	Y-5	Z-5	Fives
24 students	W-6	X-6	Y-6	Z-6	Sixes
28 students	W-7	X-7	Y-7	Z-7	Sevens
32 students	W-8	X-8	Y-8	Z-8	Eights



## Steller Sea Lion



Steller sea lions are marine mammals that live in Alaska's coastal waters from Southeast to the Bering Strait. In 1958, scientists counted 140,000 sea lions in the area between the western Aleutian Islands and the Kenai Peninsula. In just over 30 years, the population fell to 27,754!

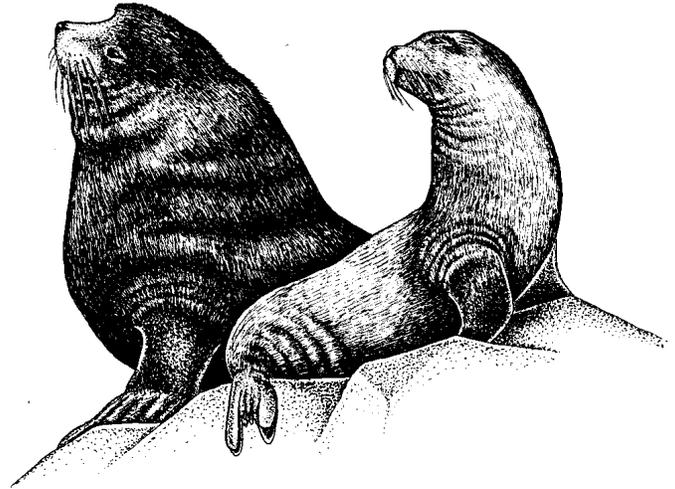
**WHERE TO CENSUS?** Sea lions are difficult to count accurately much of the year because they spend so much time in and under water and scatter widely. In spring and summer, however, the sea lions gather on **rookery** beaches and rocks where they rest, mate, and raise pups. Non-breeding sea lions gather on nearby **haulouts**.

**FLYING RESEARCHERS.** Scientists count the sea lion population by flying over the haulouts and rookeries in June when the pups are born. The scientists fly along the coast and count each haulout area separately. While they never see all of the sea lions because some are in the water, scientists can check the population **trend** from the number of sea lions they see. When the groups are too large to count quickly, scientists take photographs and count the animals later using the photos.

**DOWNWARD SLIDE.** Let's look at the current population trends of Stellar sea lions in the same area that originally had 140,000. In 1990, the population was 22,754. In 1991, it was 21,737 and for 1992 it fell to 20,629. Studies were then set at two year intervals. In 1994, the population was down to 18,713 and in 1996 there were 17,900 Steller sea lions in that area. In 1998, the population count was 16,315 and in 2000, it was 15,228.

**Graph challenge:** Graph the population trend. *What percentage of the population have we lost between 1958 and 2000? When would this population of sea lions drop to zero if the trend continued? What questions do biologists need to answer to help the population return to safer levels.*

## What Happened? Steller Sea Lion



Since 1958, about 90% of the Steller sea lion population from Kiska to the Kenai Peninsula has disappeared. The population is continuing to decline. Biologists do not know the *precise* cause of decline, but believe food is a factor.

Alaska Natives traditionally hunted sea lions for subsistence (food, clothing, boat coverings, art, tools, etc.). A subsistence harvest continues under provisions of the Marine Mammal Protection Act. Subsistence harvests are not considered to be a major factor in the population decline. Sea lion pups were harvested commercially for their fur until this law was passed in 1972.

Scientists are trying to find out why young sea lions are not surviving to adulthood. Biologists suspect there is a shortage of food. Commercial fishermen harvest some of the same types of fish that sea lions eat. Fishermen also have shot and killed sea lions in the past because the sea lions feed on fish caught in their nets and hooks. Scientists have detected major changes in prey available for Steller sea lions in the Northern Pacific Ocean. The ocean has been warmer for the past 25 years.

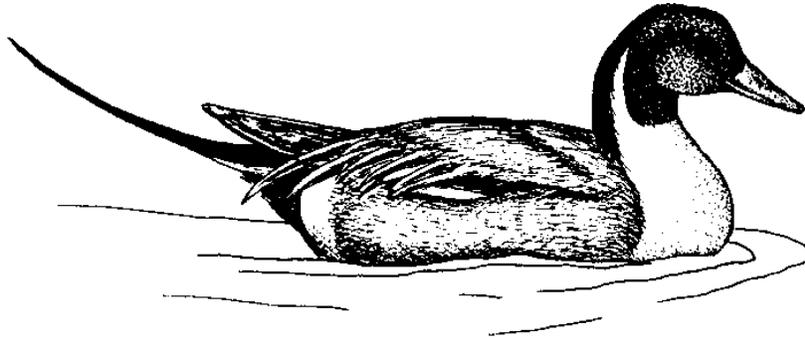
Killer whales prey on sea lions, but scientists have no data showing an increase in killer whale populations. Sea lions also may be threatened by disturbance from development along the coastline (increased boat traffic and water pollution, for example). Also, diseases have not been ruled out as a contributing factor to the decline.

Steller sea lion populations were listed as threatened in 1989. In 1996, the western stock (north of Cordova) were moved to the endangered list. With the exception of subsistence harvest, people are prohibited from shooting sea lions, or disturbing rookeries and haulout areas occupied by sea lions. People cannot come within three miles of these areas. In 1999, the western stock was only 40,000.

Scientists have attached radio transmitters to sea lions to find out where they feed. The signal from the radio is transmitted to a satellite and then sent to a computer. This allows scientists to plot sea lions' movements. When scientists find feeding areas, they attempt to reduce any activities that would disturb feeding sea lions. Scientists are also trying to learn more about the marine ecosystem that supports sea lion populations to pinpoint cause of food shortages. (*For additional information on Steller Sea Lions, check out the video, Steller Sea Lions In Jeopardy from your school library.*)



## Northern Pintail



The northern pintail is one of the most abundant ducks nesting in Alaska. In 1955, national biologists estimated that 9.2 million pintails nested on the North American continent. They nest in many places, but Alaska and the prairie grasslands of north-central North America are the two most important breeding areas for the pintails.

**FLYING RESEARCHERS.** Wildlife biologists fly over nesting areas and count pintails at the beginning of summer. The biologists return later in summer to count the number of ducklings. This gives them a measure of how successful the nesting ducks are each year.

**ESTIMATED POPULATIONS.** In 1960 wildlife biologists estimated 5.2 million pintails on the breeding grounds. In 1965, they estimated 3.8 million. In 1970, the pintail duck population rose to 6.2 million.

In 1975, biologists counted an estimated 6.0 million pintails. In 1980, 4.5 million; in 1985, 2.3 million; in 1990, 2.1 million; in 1995, 2.4 million. In 1999, biologists counted 2.5 million pintails.

**Graph challenge:** Graph the population trend. When did the pintail population get into trouble? Why? What is the trend in recent years? Is *this population decreasing, stable, or increasing?*

## What Happened? Northern Pintail



Overall, pintail populations in the United States remain low. In 1999, the population was estimated at 2.5 million – down 6.7 million in 39 years. Wildlife managers believe many pintails from nesting areas in the “prairie potholes” (*midwestern states and Canadian provinces*) fly to Alaska because their normal habitat is currently unsuitable for nesting. After their long trip, the ducks do not nest or breed successfully.

**LOSS OF NEST SITES.** One reason for declining pintail numbers is the loss of nesting habitat south of Alaska. This loss follows (1) drought and (2) conversion of land to agriculture. In the Midwest, 10 years of drought dried up many small wetlands used by pintails for nesting. When the wetlands are dry, farmers often plow and plant them. Other wetlands are filled for homes or for industrial development, taking away wetland habitat permanently.

**LOSS OF WINTER WETLANDS.** More than half the continent’s pintail population winters in California where wetlands have been reduced drastically. Only 10 percent of California’s original wetlands remain. Many acres have been filled for homes, towns, roads, and industries. Water that would flow into these wetlands has been diverted for city water supplies and farming.

**HELP FOR PINTAILS.** Rice fields are being restored. They provide food and resting areas for pintails in winter. Other restoration projects have returned important wetland areas for pintails and other migrating waterfowl (*ducks and geese*).

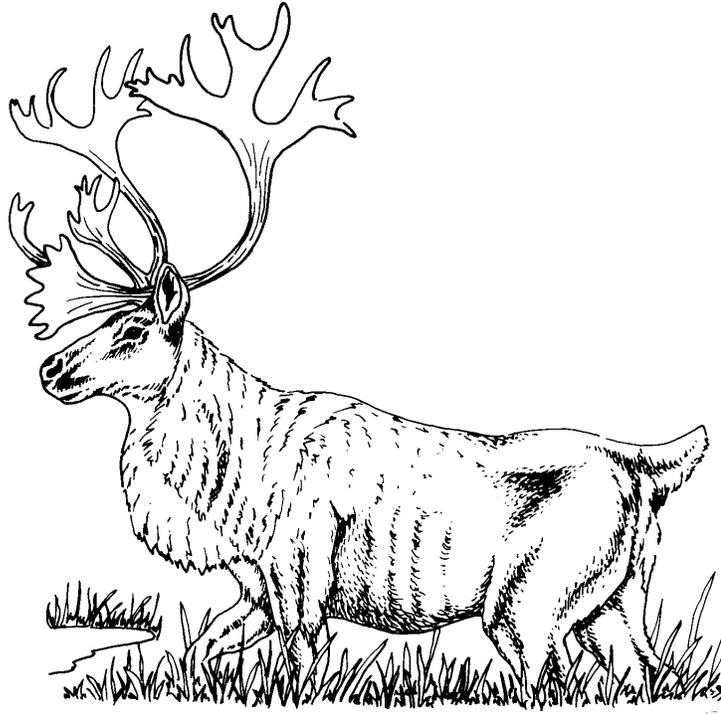
**PESTICIDE PROBLEM.** Pesticides and other toxic substances used on some of the farms pollute runoff water that drains into California wetlands. The future balance between human development and pintail conservation is still unclear. Wildlife managers are watching pintail populations closely.

**HUNTERS’ MONEY HELPS PINTAILS.** The number of pintails taken by hunters is regulated. Hunters buy hunting licenses and “duck stamps” in order to hunt ducks. The money they pay is then used to study duck populations and to protect wetland habitat.

For more information on pintail restoration, see <[www.ducks.org](http://www.ducks.org)> (Ducks Unlimited), <[www.r7.fws.gov](http://www.r7.fws.gov)> (US Fish and Wildlife Service), or <[www.state.ak.us/adfg](http://www.state.ak.us/adfg)> (Alaska Department of Fish and Game).



## Western Arctic Caribou Herd



Caribou in Alaska separate themselves geographically into more than 30 herds. The Western Arctic herd is the largest herd that stays in Alaska all year. These animals migrate over 140,000 square miles that includes many communities where people traditionally hunt caribou.

**GATHER AFTER CALVING.** While the caribou scatter over a very large area for much of the year, the herd migrates toward one calving area where the cows give birth to their calves in late June or early July.

**PHOTOGRAPHING THE CENSUS.** Wildlife biologists take advantage of this gathering to photograph the herd from the air and count the animals later using the photos. This technique is called photocensusing.

**POPULATION COUNTS.** Wildlife managers and the people who live in the herd's territory became very concerned when photocensus counts dropped from 243,000 caribou in 1970 to 75,000 caribou in 1976. Historical estimates of the size of the herd were 240,000 caribou in 1950, and 280,000 caribou in 1965.

**Graph challenge:** Graph the population trend. *What do you predict will happen to the Western Arctic Caribou Herd population based on this data?*



## What Happened? Western Arctic Caribou Herd

Additional photo-censuses in 1978, 1980, 1982, 1986, and 1988 resulted in the following population counts: 107,000 caribou, 138,000 caribou, 172,000 caribou, 229,000 caribou, and 343,000 caribou. In 1990 the herd numbered about 416,000 animals. By 1993 there were 450,000 caribou and in 1996 reached a peak count of 463,000. Biologists counted 430,000 in 1999.

**EMERGENCY ACTIONS.** When the herd declined in the 1970s, the Alaska Board of Game reduced the harvest of caribou. Wildlife managers asked hunters to take fewer caribou so the population could recover. They also removed some of the caribou's natural predators, wolves and bears.

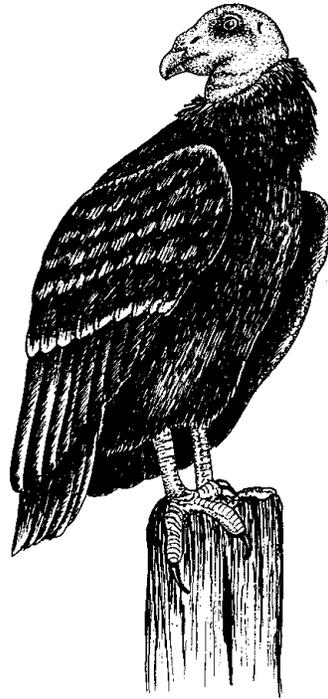
**HEALTHY HERD.** Now that the Western Arctic herd is healthy, hunting regulations are more liberal. Even with large numbers of bears and wolves, predators will not have a significant effect on this herd, given its large size. This herd is a very important source of food and cultural identity for the local communities. As with predation, hunting is having little effect on the current size of this herd.

**HI-TECH RESEARCH.** Wildlife managers census the population every three years. Some caribou have been radio collared and some have been fitted with collars that beam information to satellites. That technology lets biologists follow the movements of the herd and collect data such as the number of calves born every year and the number of adults dying.

**WINTER WATCH.** Such remote data collection is particularly helpful in monitoring the herds movements during the dark, stormy winter months. Wildlife managers also study the body condition of the animals, how many calves survive the winter, and test for the presence of disease. The Western Arctic herd currently appears stable.



# California Condor



The California condor is one of the ancient animals. It survived from the Ice Age when many animals were very large.

**ANCIENT SCAVENGER.** The condors is a scavenger that eats dead animals. The condor itself is large so it has a big appetite and must eat a lot in order to survive. Condors probably scavenged on woolly mammoths as the mammoths became extinct 11,000 years ago.

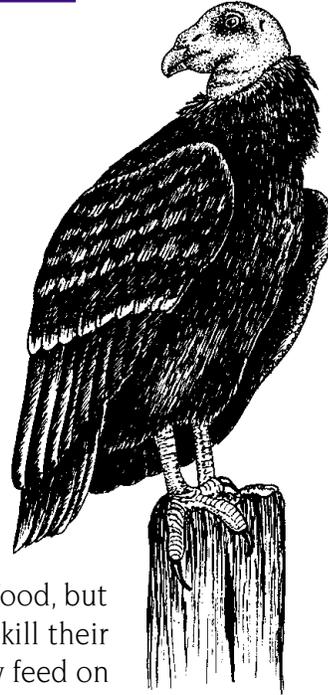
**HABITAT SHRINKS.** California condors ranged widely until the early 1900s when their habitat shrank to the mountainous and rugged terrain of California and Baja California.

**POPULATION SHRINKS.** The rugged habitat that protected the condors created challenges when biologists tried to count them. When they finally succeeded, the news wasn't good. In 1940 they estimated there were 65 wild condors. In 1963 they counted 40 condors. In 1978, 30 condors: in 1982, 23 condors: in 1984, 16 condors: and in 1986 there were 3 condors.

**Graph challenge:** Graph the population trend. *Predict when this species would become extinct.*

## What Happened? California Condor

The California condor's habitat became smaller and smaller as towns, farms, industries, and other human habitat grew. The number of dead, large animals – the condors' favorite food – decreased. A few condors were able to survive in California near large ranches because they could feed on dead sheep, cattle, and deer.



**HUMAN FEAR IS MISTAKEN.** Humans never hunted condors for food, but many condors were killed because people were afraid they might kill their livestock. Condors do not kill animals; they are **scavengers** – they feed on animals once they are dead.

**CONDORS DIE.** To protect livestock from predators such as coyotes and wolves, people put poisons in the bodies of dead livestock. That killed condors that fed on the carcasses. Scientists also contributed to the population decline. They killed some condors to put in museum displays.

**SLOW GROWTH OF FAMILIES.** As with many large animals, it takes several years before a condor is old enough to nest. Adult condors do not nest every year. This means that a small condor population would take many years to grow and recover.

**STATE & NATIONAL PROTECTION.** In 1953 condors were given special protection under California law. In 1967 they were placed on the first national list of animals likely to go **extinct**. Condors are still on the Endangered Species List.

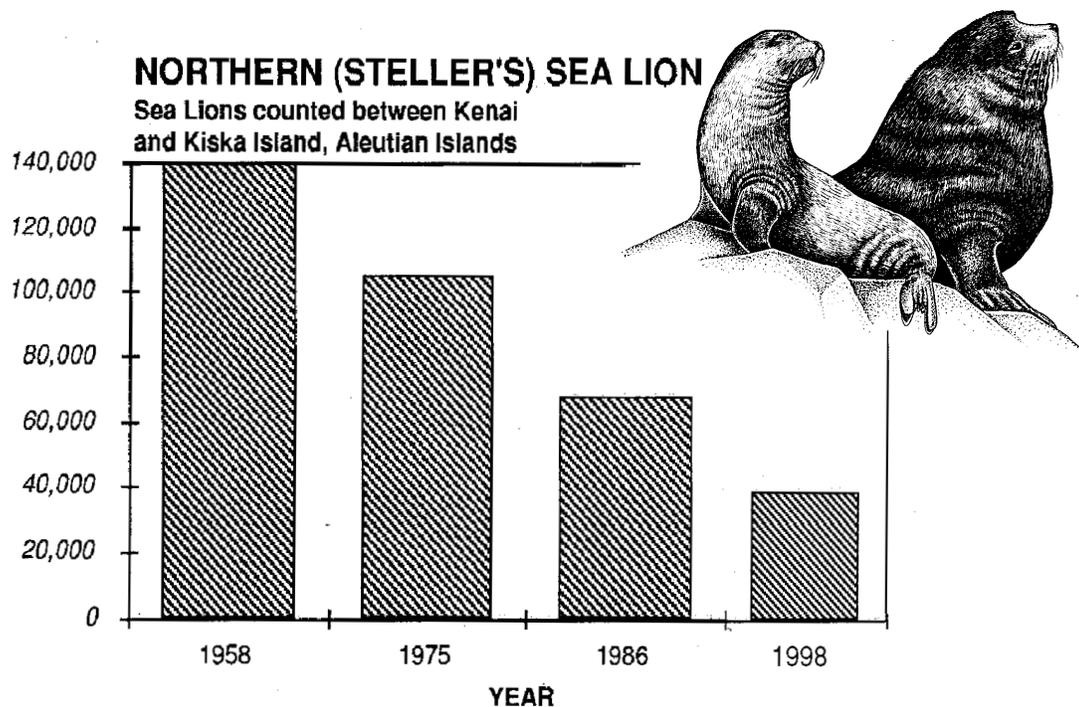
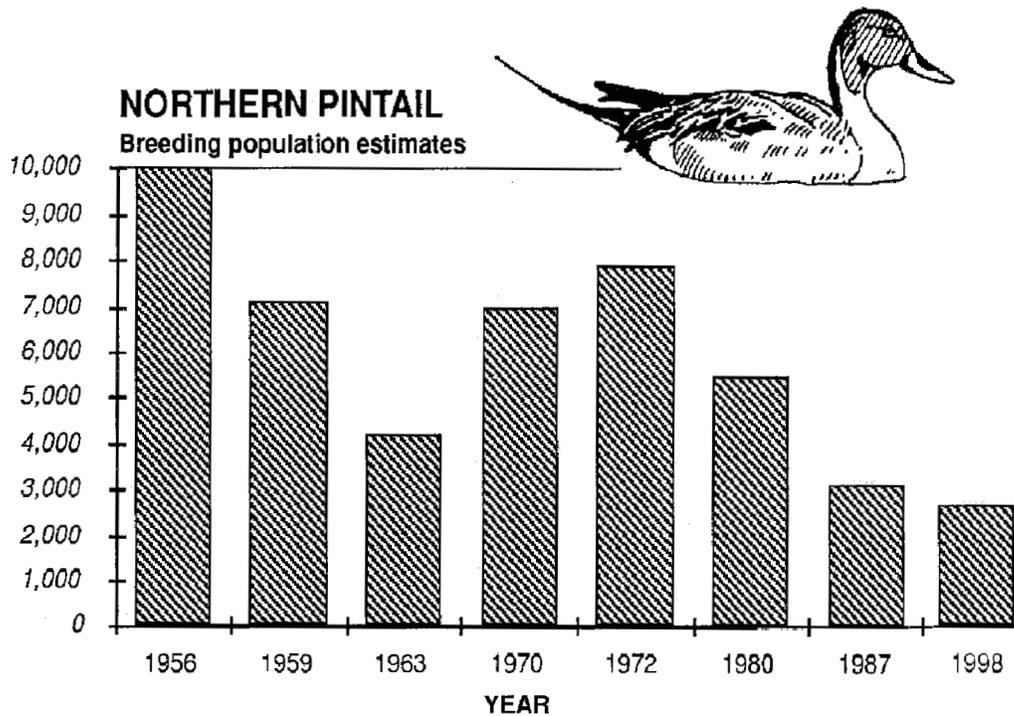
**POPULATION SAVED IN ZOOS.** The population of California condors living in their natural habitat dropped to 0 in 1987. Fortunately, the species has been saved from extinction – so far. People captured the last 3 condors and put them in zoos with the 21 captured earlier. Under a special program, they helped them survive and raise their young.

**SOME BACK IN THE WILD.** In January 1992, enough condor chicks had been raised that two young birds were released to the wild. The total population of captive and released birds in January 1992 was 54. In 2000, the total population was up to 169. The majority remain in captivity, but 36 are living in the wild.

For current information, see <[www.dfg.ca.gov/hcpb/condor.html](http://www.dfg.ca.gov/hcpb/condor.html)> (California Department of Fish and Game).

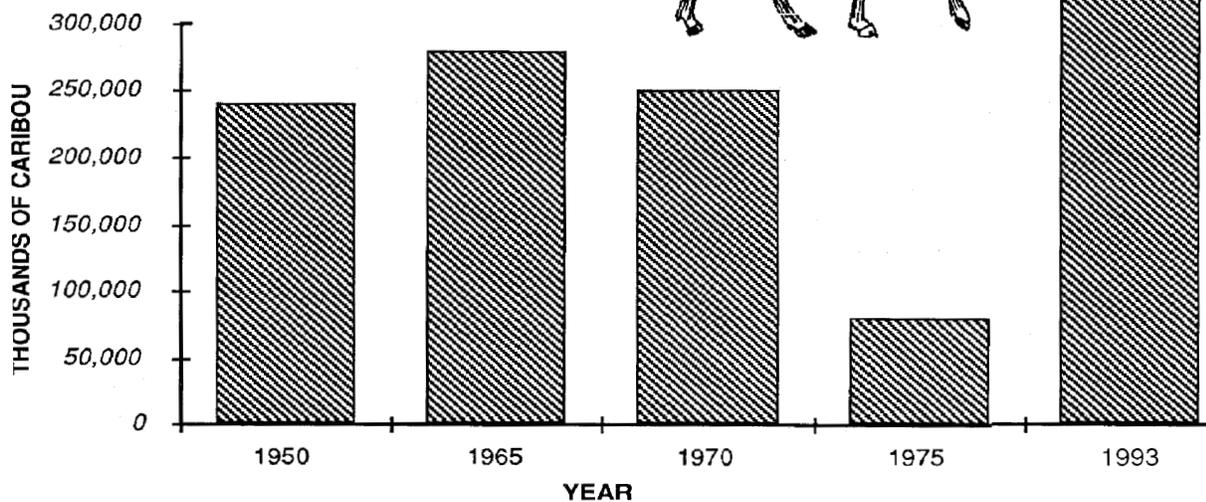
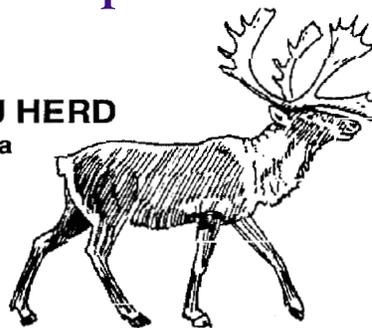


# Population Graphs

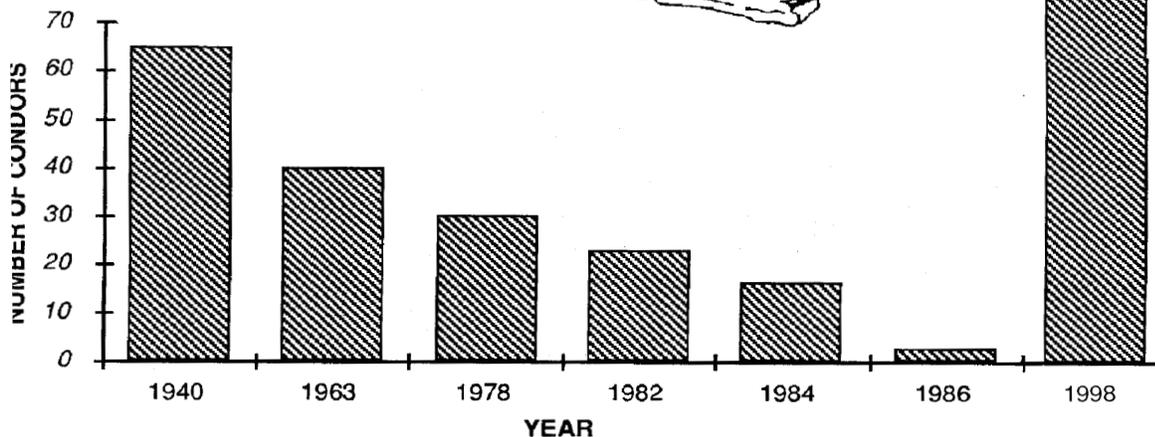
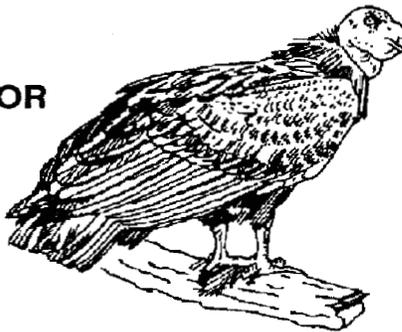


# Population Graphs

**WESTERN ARCTIC CARIBOU HERD**  
Population estimates in northwest Alaska



**CALIFORNIA CONDOR**  
Birds counted in the wild

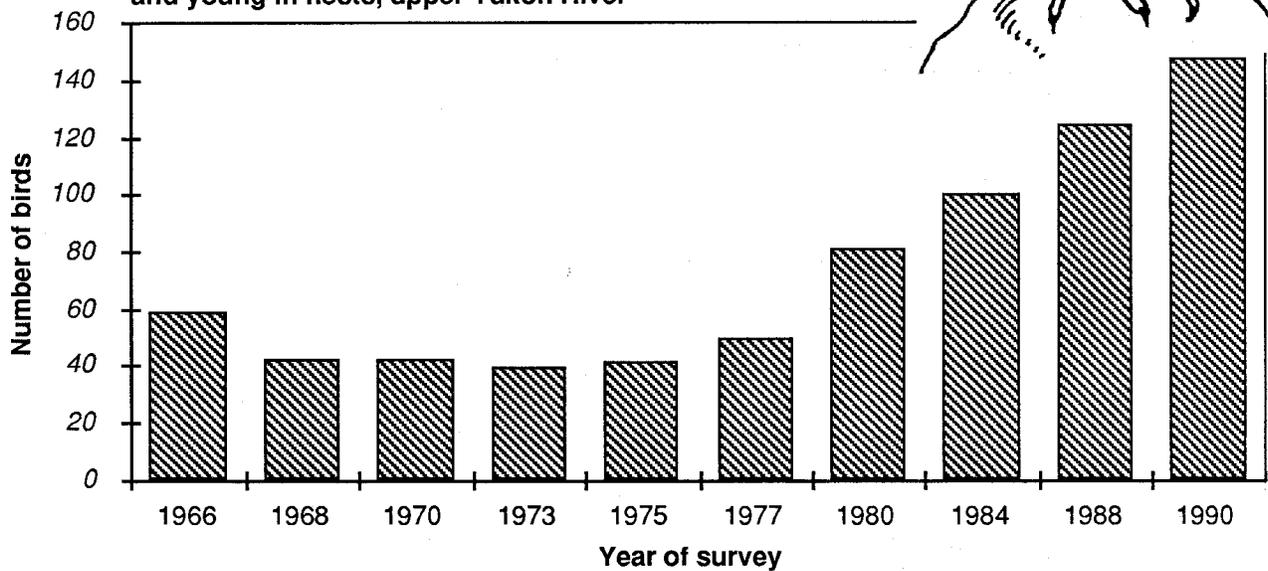


# Population Graphs



## AMERICAN PERIGRINE FALCON

Counts of nesting pairs, unpaired adults, and young in nests, upper Yukon River



# Biodiversity & Populations – Alaska’s Dynamic Wildlife



**Biodiversity (biological diversity)** is a measure of the variety and number of different organisms and ecosystems – locally, regionally, and globally.

A **species** is a population of organisms that are alike and that are able to breed and produce fertile offspring under natural conditions.

- Importance of **Biodiversity**
- Human Benefits
- Diversity Intact in Alaska
- Alert for Changes
- Fact Sheets*
  - Microhabitats & Biodiversity Collection & Field Trip Sites
- Dynamics of **Population Change**
- Carrying Capacity of Habitats
- Limiting Factors
- Population Cycles
- Tracking Wildlife Populations
- How It’s Done
  
- Student Fact Sheets*
  - Population Explosions
  - Predator – Prey
  - Hermit Crab Challenge
  - Carrying Capacity
  - What’s on a Bear’s Menu?

## WHY IS BIODIVERSITY IMPORTANT?

Biodiversity is a measurement of concern in the 21st century. All living things exist in biotic communities – **ecosystems** – with a complex web of roles. Each species has adapted to fill specific **niches** (detritivores, producers, consumers, for example).

Biodiversity allows ecosystems to respond with flexibility to damage or change.

- The more numerous the detritivores are in an ecosystem, the better that job will continue to be done if one or more species are weakened or removed.
- If a forest is attacked by spruce bark-beetles, that forest will be radically changed if only one kind of tree – spruce – grew there.
- If the only wetland in town is removed, no wetland species can survive there.

Biological diversity is an important measurement in understanding how human activities can influence the future of wildlife and our Earth.

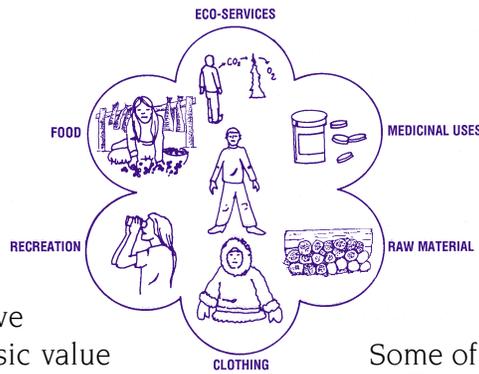
## HUMANS BENEFIT FROM BIODIVERSITY

Humans benefit directly from the multitude of living things that we use for food, shelter, clothing, medicines, and raw materials for other products. The moose meat that stocks the freezer, the spruce trees that provide wood for homes, and the plants gathered for teas, soaps, or herbal medicines are examples of direct uses of living things in Alaska.

INDIRECT. We also benefit indirectly from living things. Insects pollinate food crops or control pest species in warmer climates where a majority of our fruits, vegetables, and grains are grown. Many Alaskans enjoy recreational activities that involve a variety of living things, such as bird watching, nature study, hunting, fishing, and gardening.



INTANGIBLE. Some benefits are intangible. Each type of living thing is a unique element of the world. While many people value other living things because of their utility, some people believe that all species have intrinsic value even if there is not an existing or potential human use.



few Alaska species of plants, mammals, fish, birds and invertebrates are on the endangered or threatened species list: <[www.r7.fws.gov](http://www.r7.fws.gov)> or *Endangered Species* <[endangered.fws.gov](http://endangered.fws.gov)> (US Fish & Wildlife Service).

Some of our species incorporate diversity in their survival. Black bears eat different foods throughout the spring, summer and fall. By eating what becomes available, their population does not react as severely to one change (loss of one prey species, for example) in their habitat. (See student activity “How Many Bears Can Live in this Forest?”)

EARLY WARNING SYSTEM. Changes in the distribution and abundance of wildlife populations may indicate more widespread changes in environmental conditions. For example, changes in lichen species may show that levels of harmful air pollutants have increased in an area. These changes may be an “early warning” of environmental changes that could be affecting human health.

**How many species ... a sampling**

	ALASKA	WORLD
Amphibians 	6	+4,200
Birds 	452	+9,000
Fishes 	430	+18,800
Mammals 	108	+4,000
Plants 	+1,500	+248,000
Reptiles	0	+8,300

ECO-SERVICES. Forests convert carbon dioxide, minerals, and sunlight into food for themselves and release **oxygen** that humans and animals breathe. Bacteria and fungi recycle minerals and energy as they break down dead things for their food and clean up the planet. Marshes and bogs filter out **pollutants** from the water passing through them. Forests can prevent flooding by slowing rainwater runoff. They also help maintain the **water cycle** by returning water to the atmosphere by transpiration.

## ALERT FOR CHANGES IN BIODIVERSITY

Today, changes in biodiversity are attracting more attention from scientists and the public because the global rate of species extinction is rapidly increasing. People want scientists to keep track of changes in wildlife **populations** to alert us before a species is in danger and Earth’s biodiversity is diminished.

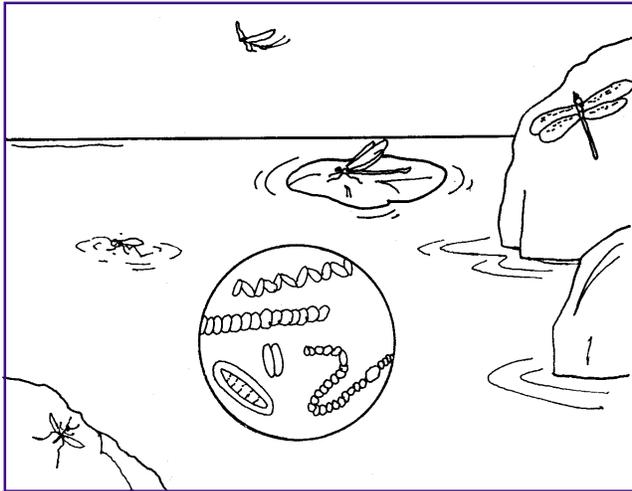
## DIVERSITY LOW, BUT INTACT IN ALASKA

The roster of Alaska’s wildlife is small in comparison with the number of species in the world (see table “How many species ... a sampling”). Our state’s biodiversity is noteworthy because it is remarkably intact. Less than a handful of known species have gone extinct in historical times (see INSIGHTS Section 3). Relatively

Appreciating the importance and value of all species is also the key to developing attitudes of respect, responsibility, stewardship, and action for the environment.



MICROHABITATS & BIODIVERSITY



If you look closely at the environment, you will notice that differences exist even on a small scale. These small “mini-environments” are called **microhabitats**. Within each microhabitat, there are living things adapted to minute variations in conditions.

In a pond, for example, fish and many plants live below the surface of the water while the water strider and other insects are adapted for life on the surface. Some insects are even adapted for life on the underside of the surface of the water.

On land, some insects live inside the bark of a tree while others are found among the lichens on top of the bark. Some plants live on the tops of tussocks in the tundra while others thrive in the wetter troughs between the tussocks.

Questions to be Answered

**Wildlife managers** try to predict and monitor changes in species diversity after forest fires, beetle outbreaks, drought or floods, human development, or as one animal high on the food chain becomes more abundant or scarce. Questions that scientists ask and try to answer include the following.

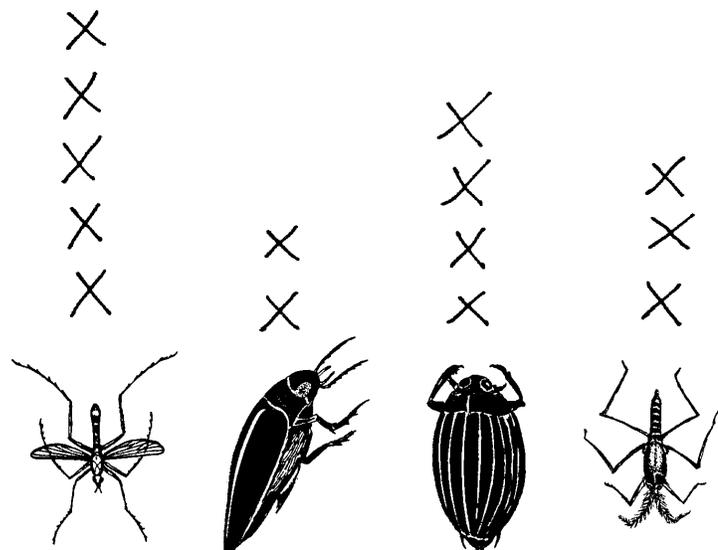
- How do changes in a plant community (forest, wetland, tundra, etc.) affect wildlife that depend on that community for some or all of their habitat needs?
- Who eats whom?
- What other species may be impacted because of the web of connections of living things in an ecosystem?
- How many individual animals might be affected if the habitat is lost?
- How significant will the loss of individuals be to the continuance and abundance of the population?
- Will elimination of one population or species from an area result in the loss of other populations or species?
- What is the **carrying capacity** for a population? (*How much habitat is needed to support a population?*)
- How can impacts to wildlife be balanced against **human needs** and desires that lead to land use changes?

How Scientists Measure Biodiversity

When scientists describe or measure the amount of **biodiversity** in a particular place, they do two things:

- (1) identify and count the number of different **species**
- (2) count the number of individuals of each species.

Scientists often compare small areas in order to draw conclusions about the biodiversity of a larger area.



## WILDLIFE FACTS

### IDEAS FOR COLLECTION & FIELD TRIP SITES



#### After break-up (spring, summer, fall):

- Ponds, streams, wetlands, intertidal areas
- Vegetated area of your school grounds
- Forest with several successional stages in close proximity
- Aquarium - classroom or public facility
- Classroom terrarium
- Dig a hole under grass or other area with organic layer
- Garden or flowerbed
- Lawn
- Pile of leaves
- Decomposing tree stump, log, or snag
- Rock outcrop
- Top of a pingo or cottongrass tussock
- Wet trough of tundra polygons (permafrost areas)

#### After freeze-up or snowfall (winter):

- Snow-free areas under large trees - in the leaf litter
- On and under tree bark (*insects, lichens, moss*)
- Under the snow where snow is deep enough to insulate the area and keep temperatures above freezing (*check for unfrozen plants or small animal tunnels*)
- On the surface of the snow after a thaw
- Also ask local naturalists and Native elders in your community to help you find living things during different seasons of the year.



# Wildlife Populations

A **population** is all the individuals of a single species that live and multiply or raise their young in a specific area.

## DYNAMICS OF POPULATION CHANGE

Maintenance of **biodiversity** means maintaining the populations of our diverse wildlife and their habitats. How does one measure when a species is trouble? What are natural up and down population trends?

Animal populations change over time. Animals die because of predation, starvation, hunting, disease, accidents, extreme weather challenges, old age, and loss of habitat. Populations lose animals because they **emigrate** (*move away*), or gain from others **immigrating** into the area.

### **Bottom Line is Habitat**

Ultimately, every population is shaped by the amount of available **habitat** (*food, water, shelter, and space*). Often, the key is the availability of one necessity that is in shortest supply.

- When drought dries small ponds (*shelter*), nesting and brood rearing sites for ducks are limited. This results in fewer ducklings being born and even fewer young ducks surviving to fly south.
- A shortage of prey (*food*) such as lemmings in a tundra area may trigger an emigration of snowy owls that prey on the lemmings. This phenomenon occurred periodically on the Arctic Coastal Plain of Alaska. Between 1986 and 1991, biologists estimated that the snowy owl population varied from zero to approximately 4,000 owls in response to changing populations of lemmings.

The relationship between predator and prey species is important to understanding population dynamics of wildlife. Although predators are often the major factor limiting growth of a prey population, prey populations (as illustrated by the lemmings) can also

limit the size of predator populations (the snowy owls) if the prey are the only source of food available.

### **Humans Influence Habitat**

Humans and our activities affect the dynamics of wildlife populations. Our actions can alter or wipe out habitat. Lawns and ballfields in Anchorage provide feeding areas for Canada geese which rarely nested in the city historically. The clearing of land to develop roads and the construction of buildings for homes and industry decreases available habitat for other wildlife. Timber harvests and mining can change or remove food and shelter and change the temperature or clarity of water.

## CARRYING CAPACITY OF HABITATS

Every population has a maximum size it can reach before the species exceeds the available habitat. This maximum number is the **carrying capacity** of an area. It is a “ceiling” for the population.

POPULATION EXPLOSIONS. Numbers may briefly soar past the ceiling under favorable conditions (mild winters, abundant food) causing a population explosion. Inevitably, deaths drop numbers below the carrying capacity when individuals cannot find resources needed to survive.

POPULATION CRASHES. Populations of **herbivores** (plant-eating animals) such as deer and caribou may crash precipitously if they exceed carrying capacity. This is because they can damage or kill their plant food sources through heavy browsing or grazing. The heavily-browsed lichens and shrubs can take years to recover. Herbivore populations that have crashed are limited while their food supplies recover. In this situation, the animals actually reduce the carrying capacity of their habitat temporarily.



## Limiting Factors

Something that keeps a population of animals from increasing is called a **limiting factor**. For wildlife it could be a shortage of food, water, shelter, or space. Or it could be diseases, predation, climatic conditions, pollution, hunting, poaching, and accidents that affect either the number of births, the number of deaths, or both.

Limiting factors in a habitat affect its carrying capacity.

- For example, the availability of willow browse is a limiting factor for moose. More moose cows have twins (versus single calves) that survive their first winter in areas where willows are abundant.
- Another limiting factor for moose is snow depth. More moose die during a winter when deep snow covers willow shrubs for a long time.
- The depth of snow also affects the ability of moose to avoid predators. Thus, a winter with deep or long lasting snow will lower the carrying capacity of an area (*and the moose population*) compared to winters when the snow is shallower or less persistent.

A healthy wildlife population fluctuates from year to year as limiting factors and the carrying capacity of the habitat change. Some animal species have a wider range of tolerance – they eat a variety of food and can diversify when one food is in short supply, for example. The populations of these species tend to stabilize at a certain level, while other species' populations fluctuate widely.

## Population Cycles

Certain species display cyclic patterns of growth and decline. Lynx and snowshoe hare populations in Alaska and elsewhere are a classic example of a predator/prey/plant cycle. (*see following "Predator-Prey" Fact Sheet and the activity "Predator-Prey Predicament in Section 2*). Among the larger mammals, moose and wolves also go through peaks and troughs of abundance, with each species' population size dependent on the other.

## TRACKING WILDLIFE POPULATIONS

One of the main jobs of wildlife managers in Alaska is to track the ups and downs of wildlife populations and to determine the causes. They do so because Alaska wildlife is managed on the principle of sustaining human uses of wildlife into the future. Rises or drops can indicate a change in the health of a population, its habitat, and other members of its **food chain**.

**HELPING ACTIONS.** Serious population changes may call for human intervention – changes in harvest regulations, habitat protection, and/or habitat enhancement. Wildlife managers work to maintain healthy populations that permit a variety of human uses of wildlife.

**PEOPLE CARE.** Many Alaskans and visitors hunt, trap, photograph, or view our wildlife. People who depend on animals become concerned when populations change. Wildlife managers allow harvests of populations (hunting and trapping) when the predicted rate of reproduction is high enough to replace the animals harvested.

**TAILOR PLAN TO SITUATION.** In Alaska, certain populations of geese are high (*Canada geese in Anchorage*) while other populations remain low (*Emperor geese on the Yukon-Kuskokwim Delta*). Management plans for these populations must be designed differently, for different results.

**WORRISOME LOWS AND HIGHS.** Wildlife managers worry that small populations of wildlife may become extinct. If populations are small or have declined to low numbers, people may need to make special efforts to help them increase or recover.

Wildlife managers are also concerned about large populations for the overall health of the population (*avoiding crashes*) and impacts on the health of the ecosystem and human health.



## How Are Populations Counted?

Wildlife managers study *populations of animals* (rather than *individual* animals) to keep track of changes in animal abundance.

- (1) Wildlife biologists must determine population boundaries in order to know which animals are part of the same population before they can study how populations change. They also need to know the best time of year to see and count all the animals.
- (2) Then they need to count the animals within those boundaries, repeating their counts over years to detect changes and trends.

**Determining population boundaries.** The first question - which animals are part of the same population? - involves finding out which animals live and raise their young in the same area year after year. This can be difficult because some Alaska wildlife species move over long distances and gather in groups only briefly. Biologists try to make accurate counts of all animals in a population, but they are not always able to do so.

**Caribou for example.** Herds may spread out over tens of thousands of square miles during winter. Where does one caribou population end and another begin? Fortunately for biologists, caribou herds gather into separate areas after calving. Biologists can **census** (*count each animal*) at this time of year.

**Counting the animals.** Not all wildlife species come together in groups at certain times of year. Many animals are hard to see during a survey. A moose in a dense stand of spruce trees may be impossible to spot even from an airplane. Because it is often difficult to census all animals in a wildlife population, biologists often choose a smaller area within the whole and count that portion of the population (a **sample**).

**From sample to whole.** From that sample, they **estimate** the size of the total population. They multiply the results by the number of same-size areas in the whole habitat. (*For example, if they just counted one-tenth of the habitat, they multiply their census number by 10 to get an estimate of the entire population.*) While this is a simplification of the process wildlife biologists use to determine population, it illustrates the general concept.

Many variances are included in an actual census, sometimes involving complex equations.



## WILDLIFE FACTS

### POPULATION EXPLOSIONS

#### Linear or Exponential Growth?

**EXAMPLE: Students.** If a population were to increase linearly, it would grow at a constant rate. For example, if your class size increased at the linear rate of 2 students per year, at the end of 5 years, there would be 2 times 5, or 10 new students.

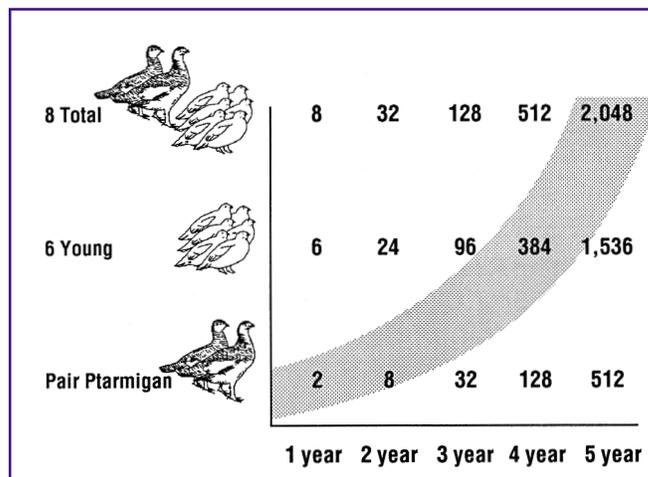
If, however, the number of students in your classroom increased **exponentially**, each year there could be two new students for each existing student. A class of 25 students would add 50 new students the first year. In the second year the 25 original and 50 new students (75 total) would increase by 150 new students. Those 225 students would grow to 675 and then to 2025 by the fifth year. **Exponential growth occurs at an increasing rate through time.**

#### Potential Rates

Most animal populations grow at an exponential rate because each female has the **potential** to give birth to more than one offspring in each generation. Thus, the number of females ultimately determines how fast the population can grow.

**EXAMPLE: Ptarmigan.** A pair could nest and raise 6 chicks in one year. The next year, if half of the chicks were female and all survived, the 3 chicks and the original female would each raise 6 chicks, 3 of which would be female who would, in turn, each raise 6 chicks.

At the end of two years, *assuming no deaths occurred*, the original population of 2 would have grown to 32. After 3 years there would be 128, in 5 years there would be 2,048, and after 9 years this imaginary ptarmigan population would have grown to include over a million birds.



#### Actual Rates

The larger the population is, the faster it grows. The faster it grows, the larger the population becomes. Although all animal populations have the potential to grow at an exponential rate, the actual **growth rate** for each species varies because each has a different pattern of births. The pattern or rate of births is influenced by:

- (1) the time between generations
- (2) the length of gestation (pregnancy)
- (3) the number of young born each time a female gives birth
- (4) the age at which a female first gives birth
- (5) the average reproductive life of females.

- Female red-backed voles produce 4 - 8 young up to 6 times each year and give birth to their first young at 3 - 6 weeks of age. In one year, one female red-backed vole can give birth to 24 - 48 young. That's a lot of voles!
- In contrast, humpback whales produce 1 calf every 2 years and begin breeding at 6 to 12 years old.

#### Factor in Deaths

In reality, animal populations do not grow as rapidly as their reproductive rate would predict because deaths occur. The size of a population at any point is a result of both births and deaths.

For example, a biologist surveys a moose population each winter. The change in the size of the population from one winter to the next is a result of both the number of calves that were born into the population and the number of adults and young that died.



## WILDLIFE FACTS

### PREDATOR-PREY

Predators often limit the population growth of the animals they eat. Prey populations, in turn, limit the size of predator populations if they are the only source of food available. If the prey animals eat plants, then plants also can affect this relationship.

Alaska's best example of a predator-prey-plant relationship is the cycle of lynx and snowshoe hare populations.

#### Snowshoe Hare Explosions

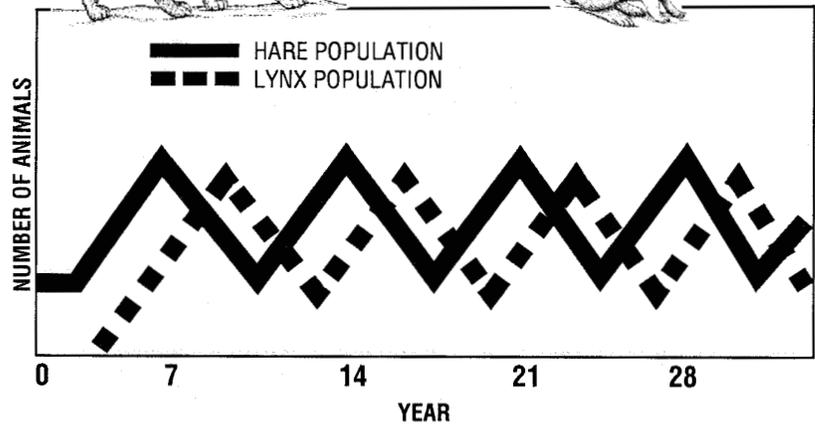
Snowshoe hares prefer early successional stages of forests (*see* Alaska's Forests & Wildlife). They need branches of willow, birch, and aspen at heights they can reach. Hares reproduce "like rabbits!" and multiply rapidly.

As their population increases, they begin to destroy the plants they eat. In defense, gnawed willow and birch produce chemicals that either taste bad or affect the hare's ability to digest food. Without being able to eat their favorite foods and consuming all others, many hares starve. Others may become diseased. Their once-high population drops ("crashes") to a low level within 2 - 3 years.

Without the pressure of browsing hares, the vegetation recovers. But it takes 3 - 5 years before snowshoe hares will have enough food to increase again.

#### Lynx is Right Behind

And what's happening to the lynx? Lynx are uniquely adapted to prey on snowshoe hares, their main food source. As hare numbers increase, more lynx kittens are born and survive. The lynx



population will continue to rise until snowshoe hares crash.

The peak in the lynx population is usually a year behind the peak of snowshoe hares. Lynx can support themselves and their kittens on the still relatively abundant hares for an extra year or two, which adds to the hares' swift decline. Then, as hares become scarce, the lynx population crashes.

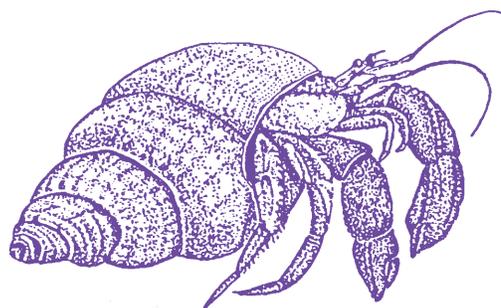
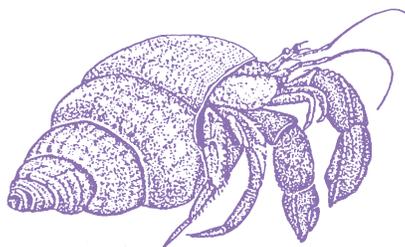
#### Predictable Cycles

The cycle of population explosion and crash in this predator-prey-plant-food chain may take 8 - 14 years but is usually 9 - 11 years. This cyclic pattern, recorded for more than 200 years, occurs across most of northern North America with remarkable regularity.



## WILDLIFE FACTS

### HERMIT CRAB CHALLENGE



Hermit crabs are found in shallow tidepools along parts of Alaska's coastline. Hermit crabs have a highly visible **habitat** need. They use empty snail shells as **shelter** to protect their soft lower bodies. They live in the abandoned shells of snails and rarely leave these "borrowed" homes.

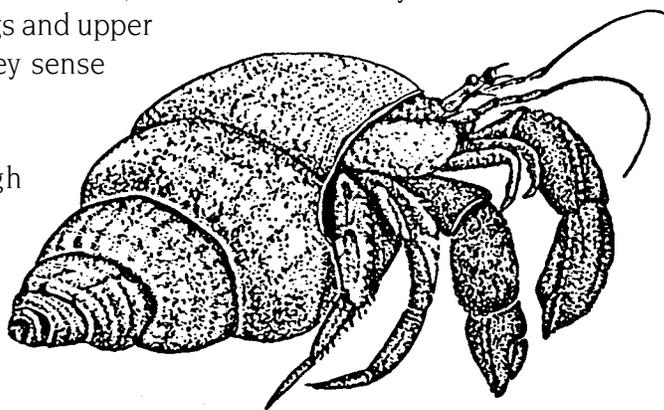
**HABITAT:** If you are able to take an intertidal field trip, you and your students will likely spot hermit crabs in tidepools or shallow, rocky intertidal areas. You can easily observe how hermit crabs use their shells for shelter.

**BEHAVIOR:** Hermit crabs move slowly pulling themselves and their shell around, then quickly withdraw their legs and upper body into the shell if they sense danger.

**ADAPTATIONS:** Through evolution, hermit crabs have become physically

adapted and dependent on the use of the shells. Unlike other crustaceans, which are armored with hard coverings over their entire body, the abdomen of hermit crabs is soft and shaped to fit the coiled and tapering snail shells. A hermit crab without a shell is vulnerable to **predation** or injury and will likely survive only a short time.

**LIFE'S CHALLENGE:** It is critical that hermit crabs find new shells. Like other living things, they grow during their lifetime, and need to find bigger shells periodically. Finding exactly the right size of empty shell may not be easy for growing hermit crabs. If the right size shell is not available, then the crab may die.

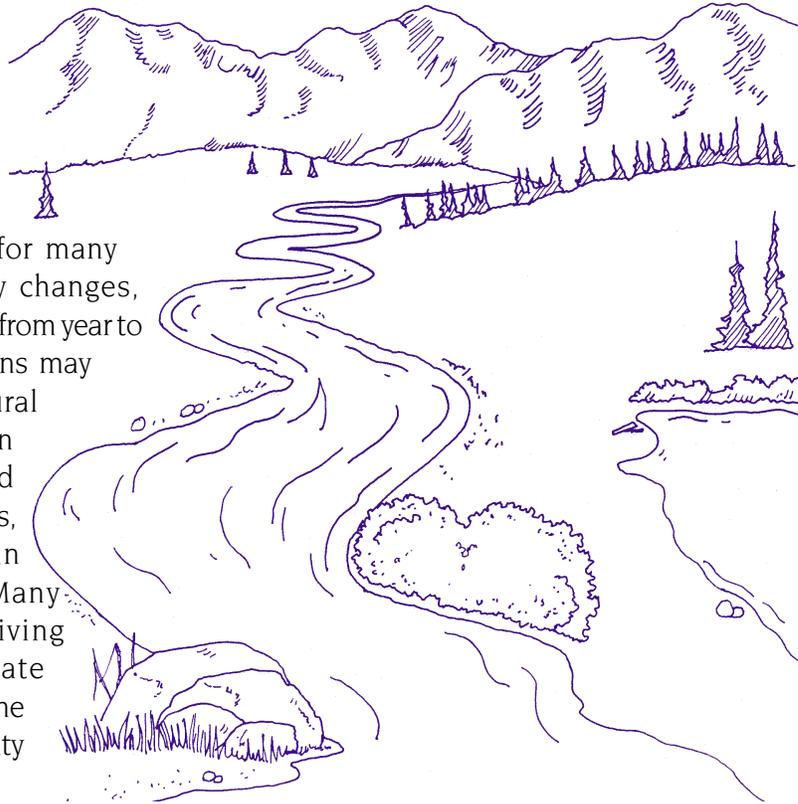


**LIMIT TO SURVIVAL:** The number of suitable shells is a **limiting factor**. It limits the number of crabs that survive in a **population**.



## CARRYING CAPACITY

**Carrying capacity** may be defined as the number of plants or animals of a given species that an area of land or water can support. It is the largest **population** a unit of **habitat** can support on a year-round basis, or during the most critical period for the species.



Carrying capacity for many species constantly changes, both seasonally and from year to year. Yearly variations may be caused by natural disasters, changes in rainfall and temperature patterns, or human interventions. Many populations of living things fluctuate naturally around some level. Carrying capacity affects that level.

other and brown bears. Adult bears run adolescent bears out of the area or occasionally kill them. These young bears must keep moving until they find an area vacated by the death of an adult. If they do not find an area for themselves, eventually they will die.

A population may be *below* carrying capacity, such as in the spring following a hard winter, or temporarily *above* it. The latter situation inevitably results in a decline of the population by deaths through disease, emigration, and/or lowered reproductive rate until it drops below carrying capacity.

- When **food** supplies are reduced, competition becomes more intense. Some adult bears might temporarily move to seldom-used portions of their home ranges, sometimes many miles away. Most bears, however, must live on what food is available in their area. These individuals may become thin, occasionally starve, or in the case of young bears, be killed or forced from the area by more aggressive adults.

### Black Bear Example

Black bear habitat limits populations especially through the influences of shelter, food supply, and the social tolerances or territoriality of the animal.

- **Shelter** or **cover** is a prime **limiting factor**. Black bears need thick cover to hide from each

Through these “adjustments,” the total bear population remains within the carrying capacity of the habitat.

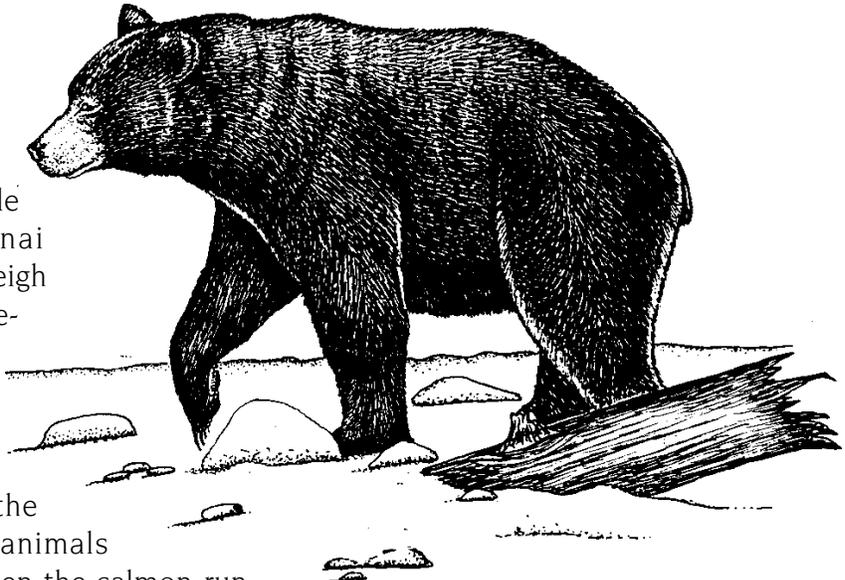
## WILDLIFE FACTS

### WHAT'S ON A BEAR'S MENU?

#### Kenai Café

If you are an average adult male black bear living on the Kenai Wildlife Refuge in Alaska, you weigh 170 pounds, have a 165 square-mile home range, and eat six pounds of food each day.

You are an **omnivore**, eating both plants and animals. In the spring, your diet is a mix of animals (80.3%) and plants (19.7%). When the salmon run, your diet changes to primarily salmon (58%) and other animals (24%) and plants (18%) supplement your needs. You chose from a diverse menu including:



#### Vegetation

- Berries from a variety of plants
- Devil's club
- Horsetail
- Sedge and grass
- Clover
- Leaves
- Mosses
- Flowers

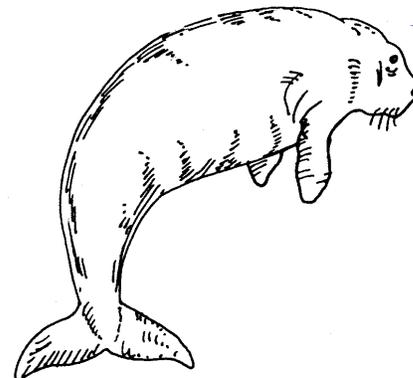
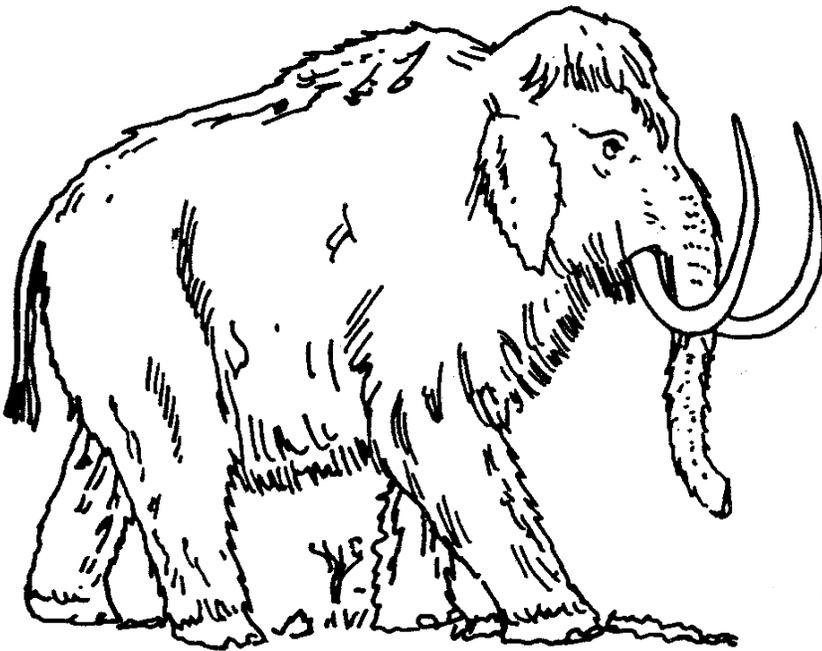
#### Animals

- Moose
- Salmon
- Insects and insect larvae
- Snowshoe Hare
- Birds
- Small mammals



# When Populations Decline – Losing Biodiversity

About 65 million years ago, the North Slope of Alaska resounded to the thud of dinosaurs. About 15,000 years ago woolly mammoths grazed beside glaciers. They are gone now. As the climate changed, the American mastodon, Pleistocene camel and saber-toothed cat were unable to adapt and disappeared.



Life and Death in Change  
Contributions to Diversity  
No Complacency Allowed  
Laws to Protect Wildlife  
*Endangerment Fact Sheets*  
Vocabulary  
Extinct Alaska Species  
Species No Longer in Alaska  
Species Reintroduced to  
Alaska  
Exotic Species Introduced to  
Alaska  
Endangered Alaska Species  
Alaska Species Threatened  
in Lower 48  
Alaska Species of Concern  
Want to Learn More?  
Factors Behind Declines  
*Natural History Fact Sheets*  
Bald Eagle  
Brown (Grizzly) Bear  
Eskimo Curlew  
Great Auk  
Passenger Pigeon  
Spectacled Cormorant  
Steller's Sea Cow  
Woolly Mammoth

## LIFE AND DEATH IN CHANGE

The world we live in is dynamic. Environmental change – with life and death consequences – can come from changes in the **nonliving** elements of our ecosystem (*climate, floods, drought, fires, volcanic eruptions, earthquakes*) and the **living things** (*through competition, predation, disease, and actions of humans*). Or the cause can be a combination of elements.

DINOSAUR DID IT WITHOUT US! Change can lead to **extinction** of some of Earth's life forms. We know that many species have come and gone since the earliest fossil records dating to four billion years ago. Dinosaurs, the most famous example, disappeared when they were unable to adapt to their new environment. The cause of that change is still under debate – but at least we know humans were not to blame!



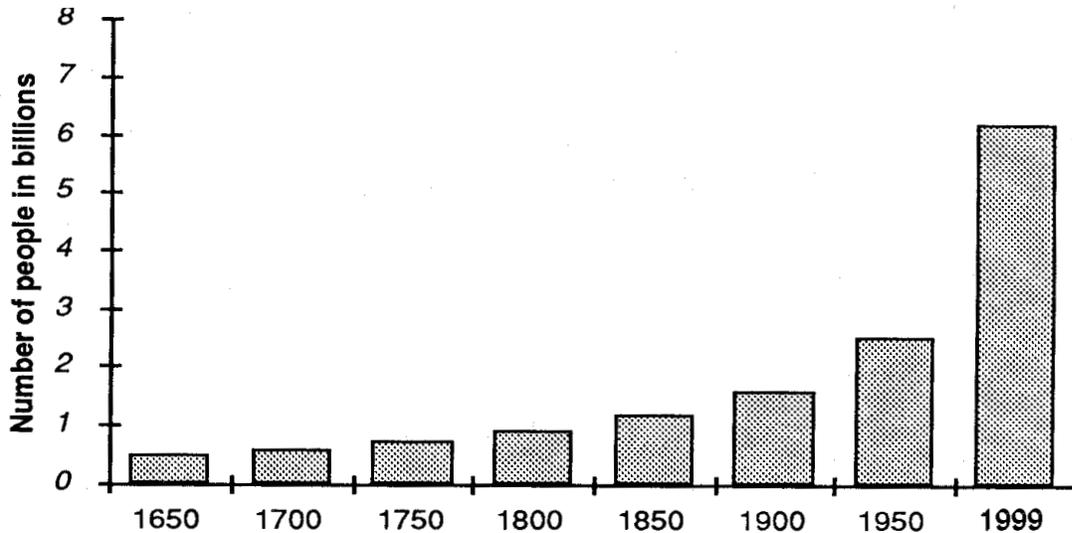
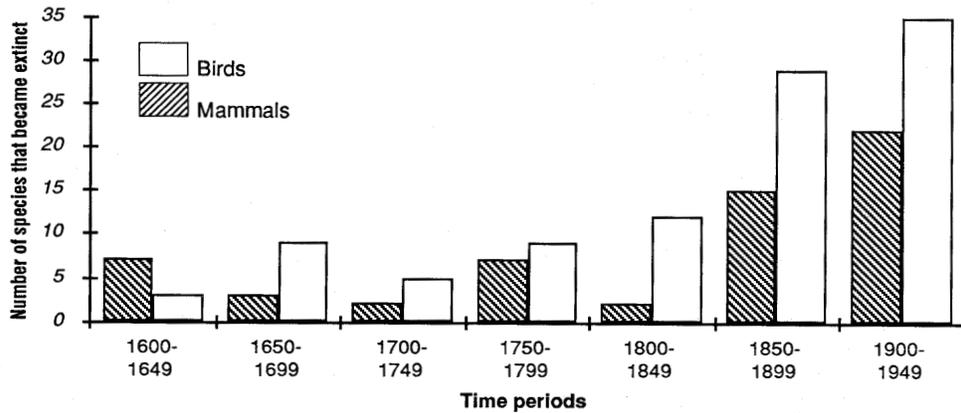
**HUMANS SPEED THE DECLINE.** Recent humans, armed with technological advances and an appetite for resources, have been speeding the decline or extinction of habitats and/ or species around the world. In 2000, the extinction of the first primate, the West African Monkey, was announced.

**LOOKING FOR THE CAUSES.** Sometimes it is a challenge to distinguish between human-caused and natural ecosystem changes such as in the current decline of species in Alaska's Bering Sea. Understanding how our actions have caused loss in biodiversity in the past will help us understand how to prevent future losses and reverse current declines.

### ***Alaska's contributions to diversity***

The biological diversity of Alaska is unique because our ecosystems remain relatively healthy and intact, compared to many other parts of the world. Alaska's low human population, combined with vast tracts of undeveloped land, provide vital habitat to plants and animals that need open spaces free from human development.

**BIG RESPONSIBILITY.** For some kinds of animals, Alaska is the only habitat home they use. Almost all Emperor geese, for example, breed on the Yukon-Kuskokwim Delta and winter in our Aleutian Island chain. For other animals, Alaska is crucial to their survival for migration stop-overs or spring nesting.



OPEN SPACE RESERVOIR. We serve as a stronghold for species no longer found, or in trouble, in the Lower 48 states including bears, wolves, salmon, and lynx. Recent efforts to reintroduce species to their former ranges in the Lower 48 have relied on individual animals from Alaska and Canada. For example, wildlife managers are capturing Alaska lynx for reintroduction in Colorado. The success of these efforts depends on many factors; but without healthy populations in Alaska, reintroduction could not be possible.

### **No Complacency Allowed**

Although we can boast about many healthy populations of fish and wildlife in Alaska, we are also facing an increasing number of species in trouble. Declines in wild residents of the Bering Sea ecosystem in particular remind us that we cannot be complacent.

CHALLENGE TO MONITOR. One of the main tasks of wildlife managers is to conduct population counts to help recognize declines. Our vast and remote landscape allows many of our species to thrive, but at the same time makes it more challenging and expensive to track population ups and downs with needed regularity.

HEALTHY RECORD. To date we have been able to turn around declines in peregrine falcons, geese, and sea otters. No Alaska species is known to have become extinct in the 20th century; and few have been lost since the large-scale extinctions that occurred at the end of the Pleistocene period 10,000 years ago. (See following "Extinct Alaska Species" Fact Sheet.)

## **LAWS PROTECT WILDLIFE**

Some of the first wildlife laws in this nation were written to protect Alaska's resources. In the early 1900s, laws were passed to protect sea otters, fur seals, and migratory birds from over-hunting.

ENDANGERED SPECIES ACT. In 1973, Congress passed the Endangered Species Act to protect populations that are threatened or endangered. Teams of specialists from state and federal agencies and other organizations work together to reverse the population decline, protect habitat, and reduce threats to survival. (See following "Endangered Alaska Species" Fact Sheet.)

ALEUTIAN SUCCESS STORY. As a result of human efforts, some previously declining wildlife populations are now recovering. The Aleutian Canada goose population had dropped to 790 birds in 1975 and was one of the first animals in Alaska to be protected under Endangered Species status. Through extensive management efforts, the population recovered to 7,000 in 1991 when the Aleutian Canada goose was moved from the Endangered listing to threatened status. In 2001, with a population of 37,000, Aleutian Canada goose populations are stable and they are no longer listed.

Today the Aleutian goose population is stable at 25,000. Recovery measures included harvest management (changes in hunting levels), protection of winter resting habitat, and removal of non-native predators (introduced foxes) that preyed on nesting geese and their goslings.

Habitat loss as a result of human activities is now the leading cause of extinction of wildlife populations.



## Vocabulary of Extinction

Wildlife managers use the following definitions to categorize populations.

**Extinct:** (adjective) gone forever. No longer existing on Earth.

**Extinction:** (noun) the process by which a species becomes extinct or the event of becoming extinct.

**Extirpated:** (past participle) no longer existing in an area of former abundance, but still existing elsewhere on Earth. (*Example: muskox from Alaska after 1865*)

**Endangered:** (adjective) in danger of extinction in all or a significant portion of its range (*from U.S. Endangered Species Act of 1973*).

**Threatened:** (adjective) at risk of becoming endangered. A significant risk exists that the species will become endangered in the near future (*from U.S. Endangered Species Act of 1973*).

Note: The federal Endangered Species Act has no specific population numbers or levels that are to be used to determine whether a species or population is threatened versus endangered.

**Introduced:** (adjective) a species that has been moved by humans to an area where it was never known to occur. (*Example: arctic fox to many Aleutian Islands*)

**Reintroduced:** (adjective) a species that has been moved by humans to a place where it originally occurred but has been absent. (*Example: muskox to Alaska in 1930s – see also “Extirpated”*)

**Exotic:** (adjective) a species has been introduced into an area where it never could occur naturally. (*Example: Norway rat, ring-necked pheasant*)

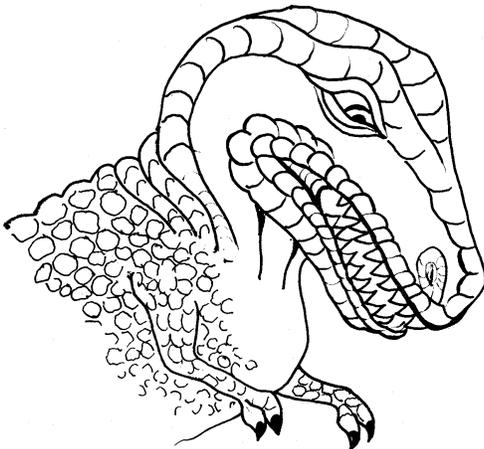
NOTE: *The US Fish & Wildlife Service maintains the threatened and endangered species list. Check <[www.endangered.fws.gov](http://www.endangered.fws.gov)> or contact your local USFWS office.*



# Extinct Alaska Species

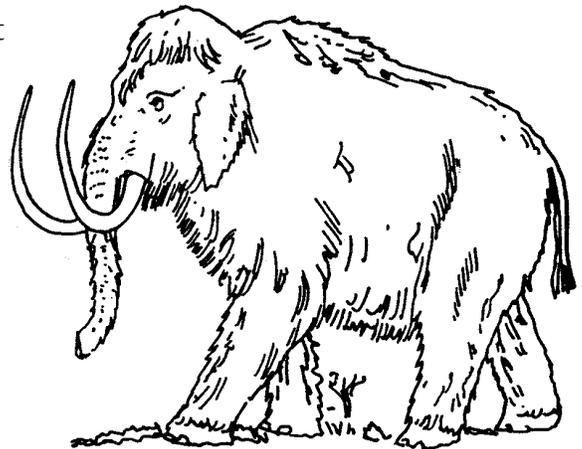
## Age Of Dinosaurs

Albertasaurus  
Tyrannosaurus  
Dromiosaurus  
Edmontasaurus (hadrosaur)  
Pachyrhinosaurs(ceratopsian)  
Troodon  
Plesiosaurs  
Turtle



## Pleistocene/Ice Age

Muskox (2 species)  
Large-horned bison  
Ground sloth  
\*Woolly mammoth  
American mastodon  
Short-faced bear  
Lion-like cat  
Pleistocene camel  
Stag-moose  
Saber-toothed cat



## Human Occupation

\*Steller's sea cow  
\*Spectacled cormorant

(\* see following Natural History Wildlife Facts )

# Species No Longer Present in Alaska

Horse  
Badger  
Taiga antelope  
Yak

These species disappeared during the Pleistocene period.

They entered Alaska via the Bering Land Bridge from Asia. Alaska populations were separated from

populations in what is now the western United States when glaciers and ice sheets reached their maximum extent. They were cut off from Asian populations when the ice sheets receded and ocean levels rose to submerge the land bridge.

These animals were unable to adapt to changing conditions in Alaska, yet they survived in other areas where conditions remained favorable.

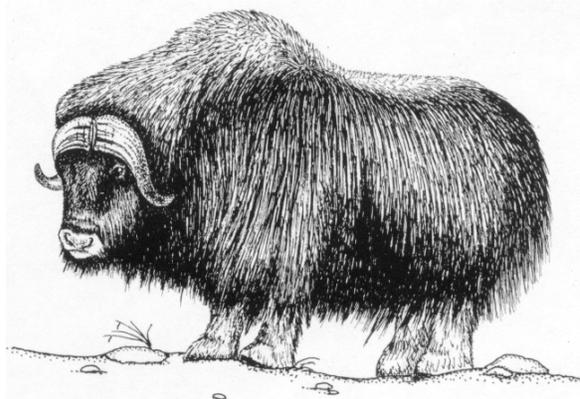
## Species Reintroduced to Alaska

Elk  
Bison  
Muskox

These animals have returned to Alaska as a result of translocations from other areas where they still live in abundance.

- **Elk** did not survive the Pleistocene period in Alaska. Roosevelt elk populations now live on Afognak Island and islands in Southeast Alaska because of reintroduction efforts.
- The steppe **bison** became extinct during the Pleistocene era, but the wood bison survived in Alaska until approximately 500 years ago. The plains bison, moved from Montana in 1928, live in Alaska today.

- Two species of **muskoxen** became extinct during the Pleistocene, but a third species survived until the late 1800s. This species was eliminated from Alaska by over-hunting and other factors. Muskoxen were reintroduced from Greenland in 1930 with a herd of 34 muskox. By 2000 the muskox population had grown to more than 3,400 muskox in Alaska



## Exotic (Non-Native) Species Introduced to Alaska

European rabbit  
Norway rat  
House mouse  
Raccoon  
Rock dove (pigeon)  
Brook trout  
Northern pike

People have accidentally or without thinking introduced a variety of plants, insects, and microscopic organisms that do not belong in Alaska.

Red foxes, while native to some areas of Alaska, were dropped off on many Aleutian Islands where

they had never occurred before. There they preyed on eggs and young birds, **extirpating** Aleutian Canada geese and reducing other nesting birds on many islands.

Release of non-native wildlife into the wild is now regulated under law. Harm can be caused by: direct predation on native species, introduction of diseases and parasites, and competition with native species for food. **Translocations** of native species to areas where they do not occur naturally also can trigger these types of problems. Proposed translocations in Alaska receive careful study.

# Endangered Alaska Species

A few Alaska species and sub-species have declined rapidly and are listed as endangered under the federal Endangered Species Act of 1973.

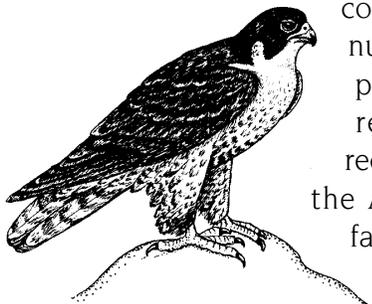
This list changes over time. For a current listing, check [endangered.fws.gov](http://endangered.fws.gov) or call the US Fish & Wildlife Service, Endangered Species office at 907-786-3505 in Anchorage. For a copy of the Endangered Species Act, go to [endangered.fws.gov/esa.html](http://endangered.fws.gov/esa.html)

## Humans Rally to Help

Being named on the Endangered Species List provides protection for the species from additional threats to survival. When species are listed, management agencies must increase efforts for **population** recovery.

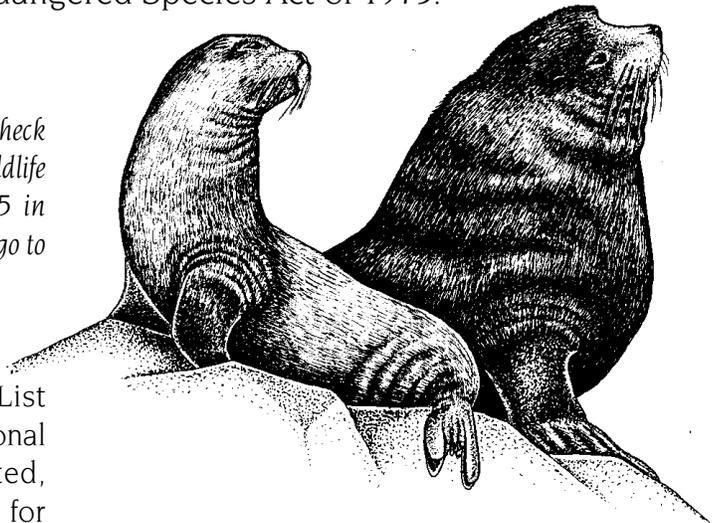
When a species is endangered or threatened, a special **recovery team** of biologists develops a plan return the species to abundance. This **recovery plan** must identify a threshold population number for changes in status to "recovered."

PEREGRINE FALCON RECOVERS. The Arctic peregrine falcon was listed as endangered in Alaska until biologists



counted a certain number of nesting pairs. Then the recovery team recommended that the Arctic peregrine falcon's status be changed to "threatened."

Continued success led to recovery and removal (**delisting**) from the Endangered Species List in 1994.



CONTINUED MONITORING. Biologists will monitor the populations closely to ensure that the population remains stable.

*(The Alaska Raptor Kit is available on loan from the Alaska Department of Fish and Game in Fairbanks and Douglas, and from ARLIS in Anchorage.)*

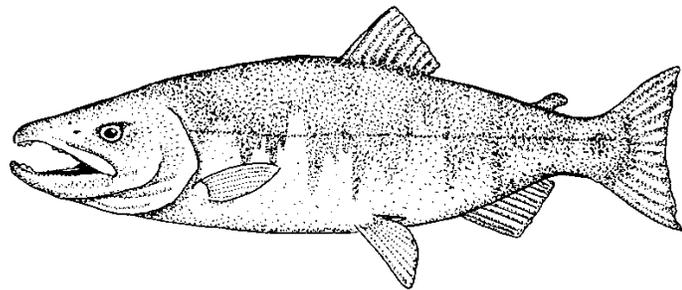
## Habitat May Need Help Too

Endangered species recovery often demands more than just monitoring population numbers. Biologists decide which areas are critical habitat for survival and then take steps to protect these areas from destruction.

The State of Alaska also maintains a list of endangered species considered in danger of extinction by the Alaska Department of Fish and Game. Once a species is placed on the state list, state-owned habitat is protected and people need a special permit to harvest any animals of that species.

## Alaska Species Threatened or Endangered in the Lower 48

Some species have healthy populations in Alaska but are threatened or endangered elsewhere in the Nation.



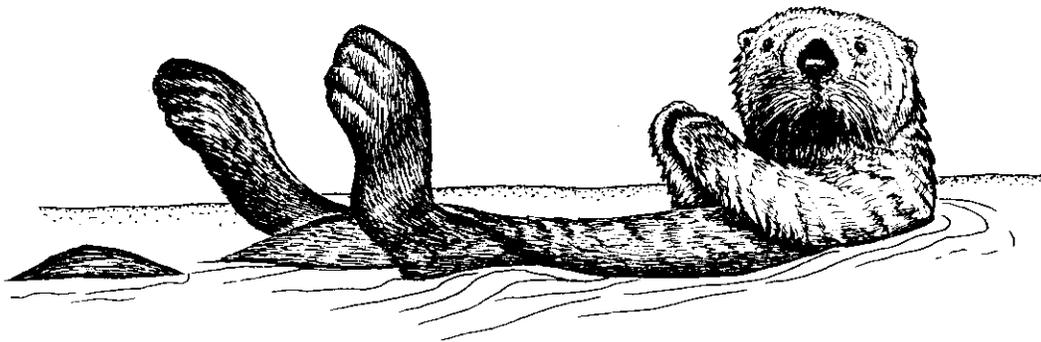
Examples:

Brown/grizzly bear (threatened in Lower 48)

Gray wolf (endangered in Lower 48 and Mexico)

Sea otter (threatened along the Pacific Coast)

Salmon populations (some populations  
endangered in the Pacific Northwest)



## Alaska Species of Concern

Some species native to Alaska are being studied because of declining populations, rarity, restricted distribution, dependence on limited habitat, or sensitivity to environmental disturbance.

**Examples:**

Alexander Archipelago wolf  
 Beluga whale (Cook Inlet population)  
 Black scoter  
 Brant  
 Dusky Canada goose  
 Emperor goose  
 Harbor seal  
 King eider

Kittlitz's murrelet  
 Marbled murrelet  
 Montague tundra vole  
 Northern goshawk (Queen Charlotte Island sub-species)  
 Short-tailed albatross  
 Spectacled eider  
 Steller's eider

## Want to Learn More?

Many **migrant neotropical songbirds** are being studied for listing as threatened or endangered. These songbirds nest in Alaska and spend the winter in the tropical forests of Central and South America (the "Neotropics"). Scientists suspect Alaska songbird populations may be reduced because declines already have been documented for similar songbird species that nest in Northeastern United States and winter in the Neotropics. In these wintering areas, forest

habitats are rapidly being logged, mined, or cleared for agriculture. House and feral predation on songbirds is also effecting their populations. Scientists are gathering more information on these species.

*For updates on songbirds, refer to Journey North <[www.learner.org/jnorth](http://www.learner.org/jnorth)>*

*For annotated Alaska species at risk, refer to the Alaska Natural Heritage Program <[www.uaa.alaska.edu/enri/aknhp\\_web](http://www.uaa.alaska.edu/enri/aknhp_web)>*



## Factors Behind Declines

Animals are more prone to population decline and extinction if they...

**... interfere in some way with human activities.**

At times, some animals kill livestock, eat or ruin crops, or feed on animals that humans like to eat. Animals may threaten our safety or property. If wildlife interfere with human activities, they are often shot or poisoned.

**... are in high demand by humans.**

If a species has a high economic or other use value to people, it could become endangered or extinct unless its harvest is carefully regulated and enforced. *For example, a substance from the Pacific yew tree has been a successful treatment for some forms of cancer and is now in high demand.*

**... migrate.**

Animals that migrate usually depend on several different habitat areas and connecting corridors or greenbelts. If habitat areas are destroyed along the migration route, their population may be more vulnerable.

**... are high on the food chain.**

These animals tend to be larger, with slower reproductive rates, and are more susceptible to over-harvest or habitat loss.

**... have very specific habitat requirements.**

Some animals have adapted to eating only one type of food or living in one type of area. They can become endangered if their food source or habitat area disappears.

**... are sensitive to pollution.**

Many animals have difficulty adapting to changes in their environment. *For example, birds of prey are very sensitive to chemicals introduced into their environment, such as pesticides.*

**... have a low number of offspring and long gestation periods.**

If populations of these species decline, they recover slowly and could become extinct if multiple factors affect them. *Compare the offspring of a northern red-backed vole that has up to 48 young a year to that of a black bear that has two young every other year. If all offspring reproduce at the same rate, the sixth generation of 382,205,952 voles will be produced in six years, whereas the sixth generation of 11 black bears will be produced in 12 years.*

**... are naturally rare.**

Some animals are rare throughout their range, and others have a very limited range. Small populations with limited distributions are particularly vulnerable to environmental changes, habitat destruction, or human-caused problems.

*Adapted from National Wildlife Federation. Endangered Species: Wild and Rare, NatureScope, Washington DC, 1988.*

**For more information on the Endangered Species Act and the status of species, browse <[endangered.fws.gov](http://endangered.fws.gov)> (US Fish & Wildlife Service).**



# Bald Eagle



## The bad news....

Bald eagle populations in the Lower 48 declined due to a combination of factors.

- **Pesticides** accumulated in their bodies, making them sick or thinning their egg shells.
- In many areas water pollution, over-fishing, and destruction of wetlands caused populations of the eagle's primary **prey**, fish, to decline.
- Nest sites became scarce as large old trees were cut for human uses such as lumber, firewood, and to clear the land for development.
- Additionally, many eagles were illegally shot by farmers and ranchers who feared eagles killed their livestock.

**NEST SITES PROTECTED.** Nesting habitat is now protected and artificial nest sites have been built where natural nest sites were limited or lost. Biologists and utility companies are working together even in Alaska to design power lines that will not electrocute eagles if they land on them.

**DDT PESTICIDE BANNED.** The use of pesticides such as DDT are banned. DDT thins eggshells and accumulates in tissues of adults and their prey.

## The good news ....

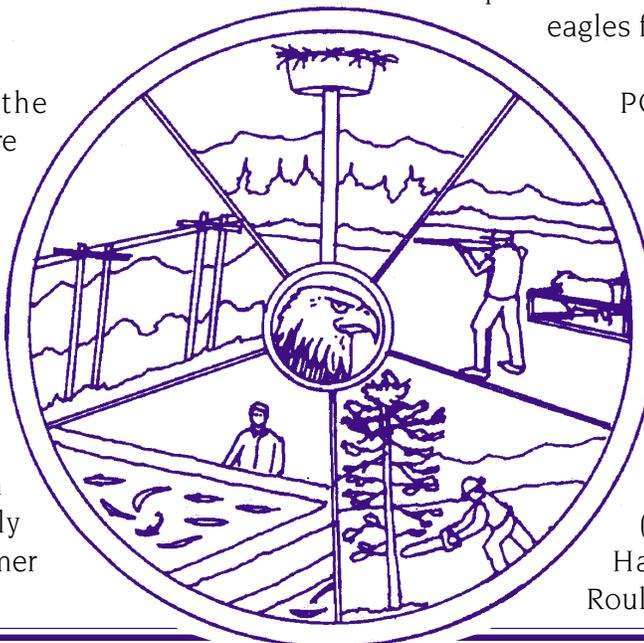
Bald eagle populations in the Lower 48 are recovering and were removed from Endangered Species listing in 1999. Many steps have been taken to ensure the survival of this bird.

**LEAD SHOT BANNED.** Waterfowl hunters are helping by using steel shot when they hunt instead of lead shot. Ducks and geese ate stray pellets of lead shot which poisoned eagles feeding on them.

## What happened?

**FEWER KILLED.** As the public became more aware of the eagle's plight and strict laws were enacted, fewer eagles were killed.

**ALASKA EAGLES BOOST POPULATION.** Biologists captured some eagles from healthy populations in Alaska and successfully moved them to their former Lower 48 habitats.



**POLLUTION CLEAN UP.** Many people are working to clean up polluted rivers and lakes, protect wetlands, and restore fish populations. All these steps have helped provide a healthier environment for the eagles – and for us.

(See activities "Musical Habitats" and "Habitat Roulette" in Section 3)

## Brown (Grizzly) Bear

Brown bears, also known as grizzly bears, once roamed throughout western North America from northern Mexico to the Canadian Arctic, and from the Great Plains west to the Pacific Coast.

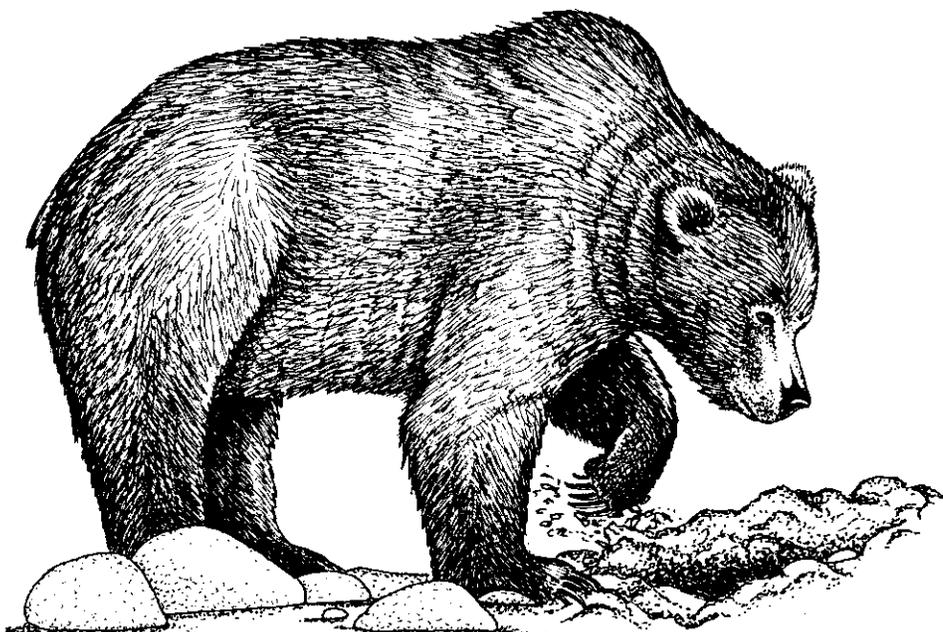
**HABITAT SHRINKS.** Their historically extensive **habitat** has been greatly reduced, lost to expanding human populations. Today the only remaining grizzly bear **populations** in the Lower 48 states are in remote areas of the Rocky Mountains in Idaho, Montana, and a corner of Wyoming.

**SLOW TO REPRODUCE.** Most brown bear populations in the Lower 48 states are small. Only a few cubs are produced each year. An individual female bear (*sow*) does not have cubs until she is between 4 and 9 years old, and even then she can produce only 1 - 3 cubs every 3 - 5 years. If the number of adult females that die each year increases even slightly, small brown bear populations will decline.

**DEATH STALKS THE BEARS.** Brown bear populations in the Lower 48 declined historically as a result of unlimited killing as well as habitat loss. Bears were killed for furs, food, fear, and to protect livestock. Development in brown bear habitat has increased human contact with bears. Human-bear conflicts frequently result in the death of the bear.

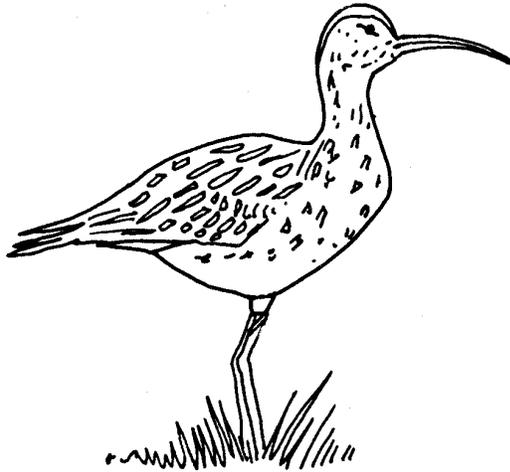
**BEARS NEED SPACE.** Brown bears may travel over large distances during a year. Although the range or space used by a male often overlaps the ranges of more than one female, males and females are together only briefly during the mating season.

(See activity "Habitat Roulette" in Section 3)



# Eskimo Curlew

*Numenius borealis*



## SPECIES STATUS: ENDANGERED

A flock of Eskimo curlews seen in 1860 was estimated to be more than one mile long and nearly one mile wide. There are many reports of single flocks that, upon landing, covered 40 to 50 acres of land. Between 1870 and 1890, the Eskimo curlew population declined sharply. No large flocks have been seen since 1900. In the past 85 years, Eskimo curlews have been reported only a few times in the Canadian Arctic, along the Texas coast, and in Nebraska. The last confirmed sighting in Alaska was in 1886.

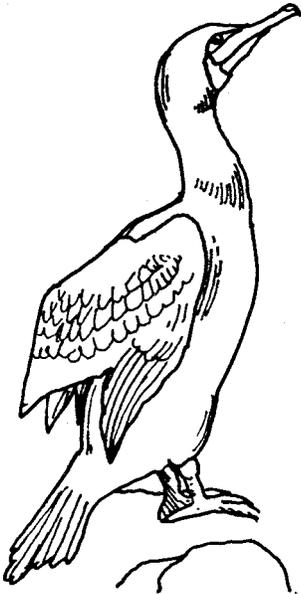
In fall, these arctic nesting birds flew in large flocks east along the coast of the Arctic Ocean to Labrador, then over open ocean for 2,000 miles to the Caribbean, and southward to wintering grounds on the high grassy plains of Argentina and Chile. Each spring, they returned north along a route through the central United States and Canada.

The large flocks and unwary behavior of the curlew made the bird an easy target for hunters. The harvest of curlews was uncontrolled. **Market hunters** along the Atlantic coast killed as many as they could whenever southbound curlews were blown into the coast by storms. As the curlews returned north, market hunters in Texas, Kansas and Nebraska killed curlews by the thousands. Wagonloads of curlews were shipped and sold as food. One record of a hunt indicates that in a single day, market hunters killed more than 7,000 curlews. Unable to withstand this uncontrolled human harvest, the curlew population plummeted.

The Eskimo curlew may be extinct. There have been no verified sightings of the Eskimo curlew for many years.

# Spectacled Cormorant

*Phalacrocrax perspicillatus*



## SPECIES STATUS: EXTINCT

A large, nearly flightless seabird, the spectacled cormorant lived on a few remote islands of the western Aleutian Islands. Scientists believe they were once abundant because Georg Wilhelm Steller reported the birds as existing in “most copious” numbers. Steller was a naturalist who traveled with the 1741 Russian expedition lead by Vitus Bering to determine what land lay east of Siberia.

Steller wrote about this large black bird while shipwrecked on a tiny island near the western end of the Aleutians, later named Bering Island. In midwinter, he and the other stranded sailors killed the slow moving and unwary cormorants for food. Steller wrote, “They weighed 12 - 14 pounds, so that one single bird was sufficient for three starving men.”

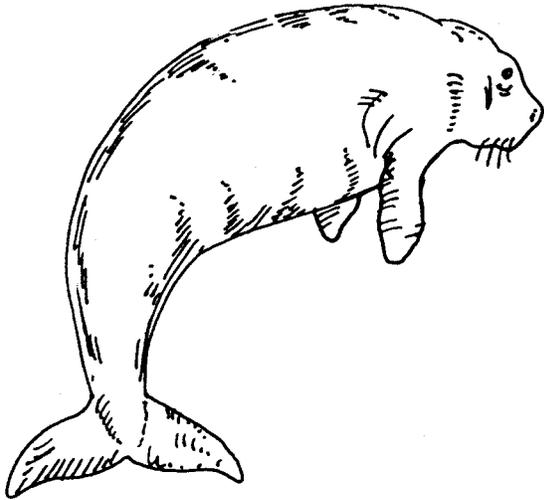
Almost nothing is known about the life of this bird except that it fed on fish, similar to other cormorants. Steller was the only naturalist to see the bird alive. Other scientists learned of the species through Steller’s writings and from specimens brought to museums in 1837.

The population of spectacled cormorants declined quickly as whalers, fur traders, and Aleuts (brought to Bering Island by the Russian-American Company) killed the birds for food and clothing. By 1850, less than 100 years after Steller first saw these seabirds, the spectacled cormorant became extinct. Steller’s records, six specimens, and two skeletons in museums are the only evidence that this species existed.



# Steller's Sea Cow

*Hydrodamalis gigas*



## POPULATION STATUS: EXTINCT

Georg Wilhelm Steller was a naturalist who traveled to Alaska with the Russian expedition lead by Vitus Bering in 1741. He was the first and only Western scientist to see a live Steller's sea cow. Steller sighted this unique marine mammal when Bering's ship, the *St. Peter*, ran aground on a small island near the western end of the Aleutian Islands. A small population of sea cows lived in the waters around this island and a nearby island. These islands were later named Bering and Copper. This area apparently was the only place in the world where Steller's sea cows lived.

Far larger than the largest male walrus, a Steller's sea cow measured up to 25 feet long. A single animal probably weighed up to 8,800 pounds. Steller and the Russians saw sea cows clustered in herds along the shore of the island. "These animals," he wrote, "are busy with nothing but their food. The back and belly are constantly seen outside the water, and they munch along just like land animals with slow, steady movement forward."

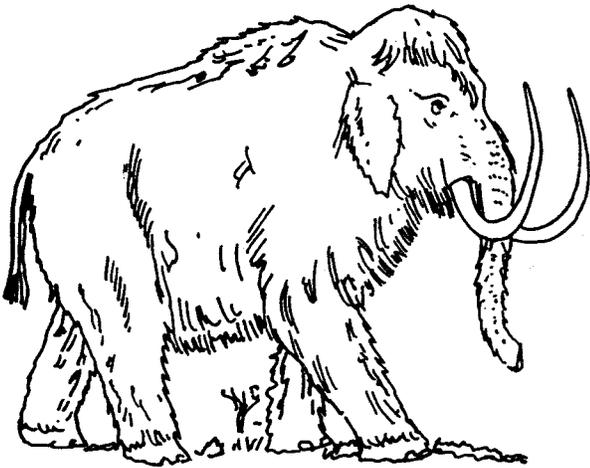
The population of sea cows was small when Steller first described the giant creature. Some scientists think that the entire population included less than 2,000 individuals. The sea cow's habitat was restricted to a small area of the ocean where the temperature of the water was suitable.

The slow-moving animals were an easily hunted source of food for the Russians exploring the Alaska coast. The crew on Steller's ship were the first Russians to hunt and eat the sea cow. By 1768, only 27 years after Steller first sighted them, the entire population had been killed by sailors, seal hunters, and fur traders. The sea cows were killed for food and skins to make boats. This amazing animal, which lived in the Bering Sea just over 200 years ago, now exists as a few intact skeletons and pieces of skin in museums.

# Woolly Mammoth

*Mammuthus primigenius*

**TIME PERIOD: 11,000 - 14, 000 YEARS AGO**



## **SPECIES STATUS: EXTINCT**

The woolly mammoth was Alaska's member of the elephant family. Like today's elephants, mammoths were large animals that traveled in herds and had two white tusks and a trunk. Unlike elephants of today, the mammoths were covered with long, dark hair.

Mammoths lived in Alaska when much of the world's northern areas were covered by glaciers and ice sheets, but much of Interior Alaska was ice-free. Many scientists believe Interior Alaska

was part of a huge grass-covered area that stretched into Asia across a land bridge in the area that is now the Bering Sea. Woolly mammoths fed on grasses in these areas. The mammoth and many other animals that lived on the grassy plain all became extinct about the same time.

What caused the extinction of the mammoth and the other animals? The answer remains a mystery. Scientists have two theories. One is that the climate changed quickly as the ice sheets began to melt. Winters became colder and more snow fell, making it difficult for animals with short legs like the mammoth to move about and find food. As the climate continued to change, the grasslands became forests. Animals that were adapted to life in the grassland could not adapt to life in the forest and they perished. Scientists who favor the theory of changing climate study the ancient remains of plants, but it is difficult to date these remains exactly.

The second theory is that humans crossed a land bridge between Asia and Alaska. Some scientists believe that these people hunted the animals until they were extinct. These scientists believe the mammoths and other animals could not adapt to these new predators. Fossils show that during the Ice Ages in Asia, people hunted mammoths. They ate mammoth meat, used the skins for clothing, and used the skins and bones to construct shelters.



# Wildlife Conservation Is Up to Us!

We may come from differing points of view [see accompanying Teacher's Guide], but a majority of Alaskans agree healthy fish and wildlife populations are important to our quality of life now and in the future. Wild mammals, birds, and fish are integral to our state's cultural and economic identity.



## Section 4 WILDLIFE INSIGHTS

Variety of Perspectives  
Conservation is Effective  
Managing Wildlife  
Traditional Knowledge  
Public Role  
What Can You Do?

### Fact Sheets

Teacher's Guide: Differing Viewpoints  
Muskox Returns to Alaska  
Our Place in the Food Web  
Supernatural History of Ravens  
Natural History of Ravens  
Moose vs. Alaska Railroad  
ADF&G Approach to Moose vs. Railroad  
Hunting Regulation Vocabulary  
Tracking Wildlife Regulations  
Checks & Balances for Regulations  
Workers for Wildlife  
Wildlife Organizations, Careers

## VARIETY OF PERSPECTIVES

Alaskans have a long tradition of dependence on the natural world. Plants, fish, and wildlife provided all that Alaska indigenous peoples needed to survive and define themselves spiritually and culturally.

### *Respect for Wildlife Reaps Benefits*

Traditional Native Alaskan beliefs and practices demonstrated respect for wildlife, including an intolerance for waste.

- An **Aleut** hunter, for example, dressed in elegant clothes when hunting to please the spirits of the sea animals so necessary for survival.
- The **Tlingit** burned or returned all unneeded animal remains to the water so that animal spirits could report to their kind on the respectful treatment by humans. This would ensure the reproduction of future generations of animals.
- **Athabaskans** performed elaborate ceremonies of respect for animals, both those hunted and those respected because of their spiritual power.
- **Inupiat** hunters on the sea ice had a ritual to show respect for the seals that gave themselves to the hunter in a successful hunt. In that ritual, they gave them a drink of fresh water.



- The implements of Bering Sea **Yup'ik** peoples were designed to please to the animals. The Yup'ik believed that the spirit of a seal killed for food would remain in the animal's bladder. The bladders of all animals harvested in a year were kept until the annual Bladder Festival. The animals' spirits were treated as honored guests and then the bladders were thrown into the sea to ensure that more seals would return to the hunters.

### **Wildlife Continues to Lure Newcomers**

In historic times, waves of Russians, Europeans, and Americans came to Alaska in search of wealth from the land. They trapped furbearing animals for the international fur market and, as a result, established settlements, some which remain today. Others came to harvest whales and fish.

Wildlife and fish were Alaska's first economy and they continue to be important mainstays today.

Alaska has become a destination for people who value a direct relationship with wildlife. Many who settled in Alaska have a heritage of hunting and fishing passed down through generations. They depend on local fish and wildlife for food and a connection to the natural world.

The beauty and mystique of Alaska's wildlife and wildlands continues to draw people to Alaska. Today, more than ever before, wildlife viewing is an important part of Alaskan life. This "**non-consumptive use**" of wildlife is expected to increase, possibly impacting habitat.

### **CONSERVATION IS EFFECTIVE**

Because of their commitment to wildlife, both Native and non-Native residents of Alaska are active in wildlife conservation efforts. These include the public process of the Alaska Board of Game, local and regional advisory committees, and hunting and conservation groups.

We have not always managed sustainably. (*refer to INSIGHTS Section 3, When Populations Decline*). The muskox, **extirpated** from Alaska by 1865, is case in point. (*See accompanying "Muskox Returns to Alaska" Fact Sheet*). Their **habitat**, the coastal tundra ecosystem, was still intact. Conservation measures starting with the reintroduction of a small herd in 1930 succeeded in reestablishing the muskox as a viable member of Alaska's tundra ecosystem.

### **MANAGING WILDLIFE FOR MANY INTERESTS**

Reintroduction of formerly abundant species is one tool to help wildlife recover. But many people agree it is wiser and less expensive to avoid the need for reintroduction by practicing conservation in the first place.

**CONSERVATION:** the use of natural resources in a way that assures their continuing availability for future generations; the wise and intelligent use or protection of natural resources.

**WILDLIFE MANAGEMENT:** the application of scientific knowledge and technical skills to protect, preserve, conserve, limit, enhance, or extend the value of wildlife and its habitat.

- **Wildlife managers** use a variety of techniques including regulating harvests, sustaining habitat, and changing habitat for selected species. Modern wildlife management blends the science of gathering data and reaching conclusions with the art of decision-making that occurs during political and legal processes.
- **Social issues** arise over concerns for equal access to wildlife. Wildlife is a natural resource owned in common, but people sometimes compete for its use or have different values, beliefs, and opinions about appropriate behavior of people toward wildlife. Social issues surround "tradeoff" decisions about whether to do something that will alter wildlife habitat or populations.



- **Technology** also plays a key role in many wildlife issues. The tools available to study wildlife are becoming increasingly sophisticated – from satellites to genetic markers. In Alaska, the accessibility of wildlife and their vulnerability to over-harvest has been altered by the technology of motorized vehicles, airplanes, and modern hunting weapons.

### **Traditional Knowledge Joins Team**

Alaska Natives have lived with and relied upon wildlife for thousands of years. Generations have passed on information about habitat needs, population trends, interrelationships between species, migration patterns, and behavioral traits. Observational skills and memories regarding wildlife continue to be an important part of Native tradition.

In the past, wildlife managers looked only at data that could be quantified scientifically. They considered Native knowledge as “anecdotal.” Now traditional knowledge and western science are seen as

complementary. Wildlife managers rely on local hunters for **traditional ecological knowledge** of the health, location, and local historical trends of animals.

Rural citizens and wildlife managers are creating working relationships on advisory boards and in **co-management** of species. Cooperative decisions are being made on regulations, methods of data collection, and methods of reporting harvest information. Successful management of geese on the Yukon-Kuskokwim Delta, walrus, bowhead whales, and the Western Arctic caribou are examples of the benefits of co-management.

For more information on wildlife managers, see following “Workers for Wildlife” Fact Sheet.

### **Public Has Vital Role**

In the United States, *wildlife is a resource owned by the people and managed for their common use.* In Alaska, the authors of the state constitution in 1959 mandated management of fish, wildlife, and other renewable



resources on the principle of **sustained yield** (sustaining human uses into the future).

The Alaska Constitution calls for a participatory system of wildlife management with a Board of Fish and Board of Game. Board members are appointed by the Governor and confirmed by the state legislature. Once appointed, members gather information through a public process to set policies for regulations to be carried out by the Department of Fish and Game, Fish and Wildlife Protection, and the Department of Public Safety. (See following "Tracking Wildlife Regulations" Fact Sheet.)

### **What Can You Do?**

Alaskans feel passionately about wildlife and wild places. The future of Alaska's wildlife depends on you. What can you do?

- Increase your knowledge of wildlife and the ecosystems that support all living things.

- Participate in public hearings
- Support Board members
- Participate on advisory committees
- Attend and speak at Board meetings
- Support wildlife research and management projects
- Act on behalf of wildlife and wild places
- Determine how your actions affect wildlife and act responsibly. (*Consider how you develop the land where you live, what you buy as a consumer, what impact your food choices have on the environment, for example.*)

We can continue to harvest fish and wildlife if we limit harvests to numbers each population can sustain. We can watch, photograph, and enjoy wildlife if we minimize our impact to avoid disturbance of sensitive species at critical times and in crucial areas. And we can continue to develop Alaska, if we maintain adequate areas of wildlife habitat and limit and plan development to minimize habitat loss.



# Dealing with Differing Viewpoints

Controversy is pervasive, even valued, in a democratic society. Controversy occurs when a person's or group's ideas, conclusions, theories, or opinions are in opposition to those of another person or group.

The study of controversial subjects is essential to the education of all citizens in a free society. In preparation for contributing to a healthy society, students must learn to gather and examine evidence; differentiate opinion, fact, and inference; evaluate differing viewpoints with objectivity; and define and justify their personal points of view.

By stressing the use of facts to justify decisions, the importance of developing alternatives, and use of appropriate problem solving skills, teaching about controversial issues can impart real "survival skills" while bringing relevancy to the classroom.

What is controversial in one place and time may not be in another. In Alaska, wildlife-related topics are often controversial. As a state, our identity, tradition, heritage, and economy are linked to wildlife. Although most school curriculum is built around activities that present factual, non-controversial information, there are some topics and activities that are potentially controversial within Alaskan communities. Rather than avoiding these topics, we encourage you to use the following guidelines.

## **Curriculum Selection & Lesson Preparation:**

- Determine whether a specific issue is grade-level appropriate and relevant to the student.
- Choose issues that relate directly to the curriculum being studied and to the goals and objectives of this study.
- Determine whether enough factual information can be gathered on the various points of view related to an issue.

- Be clear about what alternative positions will be presented in dealing with a controversial issue.
- Decide on your own opinion/position on the topic so that you can recognize your own biases.
- Use community resources and expertise, making sure that you choose people and materials to present more than one side of an issue, while being sensitive to differing cultural values in your presentation and selection. Have students prepare questions for guest speakers.
- Design the unit to teach citizenship skills such as critical thinking, listening, decision making, and problem solving as well as loyalty to democratic principles.
- Use your community resources to adapt issues for local relevance, while presenting the "big picture" as well.
- Examine curriculum content and topics for cultural bias and include cultural sensitivity and respect for diversity.

## **In the Classroom:**

- Develop a climate of trust, respect, and openness to free inquiry in the classroom as well as respect for the student's right to privacy, right to hold opinions and perspectives, and value the strength of diversity in our society.
- Distinguish between fact and opinion when analyzing issues.
- Teach students to identify value-laden language that reveals built-in biases in materials. Look for these biases with different perspectives – such as "timber harvest destroys wildlife habitat" versus "timber harvest alters wildlife habitat."
- Have students scrutinize their own values that determine their positions on an issue.



- Have students gather information from as diverse an array of sources as possible.
- Determine if facts were “left out” or slanted because of the bias of the presenter or the materials.
- Teach students to raise questions which clarify the important positions in a controversy rather than attacking positions with which they do not agree.
- Recognize stereotyping and avoid the polarization that results. People and groups should not be strictly categorized. Include multiple players in the same “role” in simulations. Have these players hold different opinions to break down stereotyping.
- Use additional information, community resources, and pointed questioning to assist students in 1) viewing differences in values and opinions as positive and 2) learning to disagree without degrading others. Emphasize that different points of view are not “right” or “wrong.”
- Include activities such as simulations, role-playing, creative writing, music, and dramatizations. This will encourage students “to take positions temporarily” on issues that are different from the ones they currently hold in order to clarify the basis for differences. Have students explain how people within a group or a role could hold different views.
- Use realistic simulations and role playing activities where compromise and tradeoff situations are likely.
- Ask students to evaluate the effects of decisions made on future actions and problems.
- Include effects on different populations and aesthetic, social, cultural and long-term economic costs and benefits in any cost/benefit analysis or identification of impacts.
- Be as politically and religiously neutral as possible on value sensitive issues and clearly delineate your own opinions when presenting them.

- Work on finding agreement on controversial issues by using techniques such as nominal group approach or finding common words (in differing viewpoints).
- When possible, let students choose the topic or issue to be studied.
- Provide opportunities for students to make decisions and engage in actions dealing with the issue.

#### **With the Community:**

- Anticipate the controversial issue in the curriculum and inform parents about how the issues will be treated before they are introduced. Invite them to attend lessons on these topics.
- Be clear about the community values held and be cautious when examining opposing ones.
- If criticized for including a controversial issue in your lessons, do not respond defensively or with anger. Discuss your goals and your methods with critics so they can appreciate your sensitivity to their concerns.
- Before teaching the unit, obtain the support of the school administrator.
- Teach about the “real world” with an emphasis on problem solving, critical thinking, and citizenship skills.

*Text by the Alaska Department of Education with the Alaska Steering Committee for Project Learning Tree and the Alaska Resources Kit: Minerals, Teacher Advisory board.*

*Adapted from the Project WILD handout, “The Teacher’s Role in Dealing with Controversial Issues” by C.E. Knapp; the pamphlet, “Curriculum Guidelines,” by the National Council for the Social Studies; and a journal article in Environmental Education & Information, Vol. 3, #4, 1984, “The Handling of Controversy and Problem Solving in Environmental Education.” Reprinted here by permission from the Alaska Department of Education.*



# Muskox Returns to Alaska

The muskox is a large, shaggy **herbivore** (*plant eater*) called “oomingmak” or “the animal with skin like a beard” in Inupiaq.



© Ashley Reed Dean  
Alaska Wildlife Notebook Series ADFG

## Natural History:

**NO TO BE CONFUSED!** Muskoxen do not have musk glands nor are they closely related to oxen. Muskoxen are ancient Ice Age animals related to sheep, goats, and the takin of the Himalayas.

**WEIGHING IN.** Male muskox may weigh 600 to 800 pounds at maturity. Mature females weigh between 400 to 500 pounds. A young muskox (*calf*) weighs only 22 - 31 pounds at birth. Adults are 3 - 5 feet tall. They live in the arctic regions of Alaska, Greenland, and Canada where their long, thick fur coats let them survive -50°F temperature and blizzard winds.

**DEFENSIVE BEHAVIOR.** Muskoxen are often found in herds of 20 - 30. Both sexes have stout, pointed horns which they use vigorously when challenged. To defend their young, both males and females form a line or circle around the calves, facing the threatening predator. Their circle defense works relatively well against natural predators, particularly wolves.

## History in Alaska

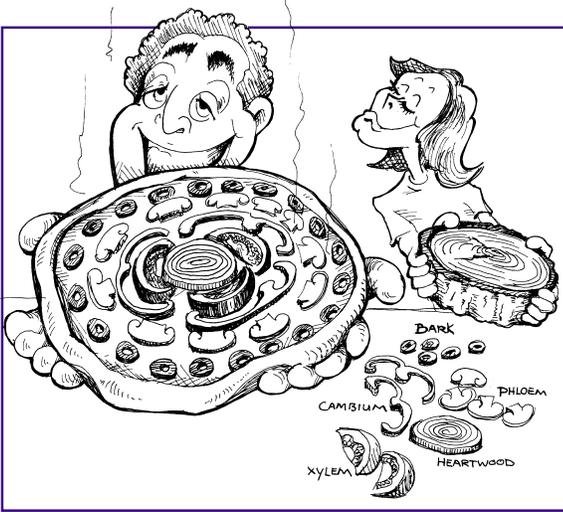
**NO MATCH FOR RIFLES.** Despite surviving the Ice Age and the thousands of years since then, Alaska’s muskox herds were no match for hungry whalers and hunters looking for food. Alaska’s original muskox population disappeared by 1865, due primarily to over-hunting.

**ONLY ISOLATED SURVIVAL.** By 1900, muskoxen survived only in Canada and eastern Greenland.

**CONSERVATION RETURNS MUSKOX.** In an effort to spread the population to more areas to guard against extinction, wildlife officials captured 34 Greenland animals for **reintroduction** to Alaska in 1930. These muskox were released on Nunivak Island between 1935-1936. By 1968, the population had grown to an estimated 750 muskox.

**HERDS RETURN TO FORMER HOMES.** Relocation efforts dispersed muskox to other areas of western and northern Alaska. By 2000, Alaska’s muskox population numbered more than 3,400 in seven established breeding groups.

# Our Place in the Food Web



From early hunter/ gatherer time through the development of agriculture in America, we as humans could easily see our role as **consumers** in the **food web**.

## Current Status

**FOOD? FROM A SHELF!** Urbanization and corporate farming have distanced many of us from the hunt, garden, and fields. For many, the process of gathering food means going to (or ordering from) grocery stores.

**MORE PEOPLE ON EARTH.** The world **population** tally turned 6 billion in the fall of 1999, and estimates predict that number will double in 40 years (1.7% *annual growth rate*). The U.S. population of more than 265 million is growing at a rate of 1.1% annually. Our population will double in 65 years.

**LESS HABITAT.** At the same time, the amount of available open space (wilderness and cropland) continues to decline while human development (roads, cities, airports, industry, and housing) increases.

## Food for Thought

**SURVIVAL NEEDS STAY THE SAME.** One natural rule that has not changed is the list of basic survival needs. All living things require food, water, shelter, and suitable space. Humans as well as wildlife survive by those requirements.

**QUESTIONS THAT MUST BE ASKED.** Where and how we acquire food directly and/or indirectly impacts wildlife. We must eat, as living beings, as part of the food web. But what we eat and where we gather our food are choices. *What did you have for dinner? Where did it come from? How much energy was required to process and transport it? How much land and wildlife were displaced to produce your meal?*

**THROUGH LAYERS OF VALUES.** For non-starving humans, food is usually more complex than the calories we use to heat our bodies. What we eat, how we gather food, and how we prepare it are all part of our cultural identity. Values surrounding food exist across a spectrum from people who only eat vegetables to people who eat meat in every meal, from people who eat processed food from stores to people who harvest all their food directly from the land.

**ALWAYS CONSEQUENCES.** Food continues to be a personal choice. These choices, in a variety of ways, impact wildlife and the **habitat** they need to survive.

*(For current population figures, check the instant counter on <[www.overpopulation.org](http://www.overpopulation.org)> World Population Awareness.)*



# Supernatural History of Raven

RAVEN - Known as *Yetl* (Tlingit), *Nankilslas* "He Whose Voice is Obeyed" (Haida), *Txamsem* "Giant" (Haida). Other Northwest Coast Indian names translate as: "Chief," "Real Chief," "Great Inventor," and "Greedy One."

## CHARACTERISTICS

Raven is a character in legends and tales all over the world. In some tales Raven is a bird, in others, Raven is a human who can turn himself into a bird. In still others, Raven is a supernatural being in a raven's cloak.

In many tales, Raven is greedy and hungry. Some Native American stories are about a Great Flood at the beginning of the world. Raven is sent to find land, but he fails to return because he is feeding on the corpses of the animals that did not survive the flood. As punishment for not returning, Raven turns black and eats dead things today. A similar biblical story describes a raven as the bird sent from Noah's Ark to find land, but the raven never returns.

## ROLE IN THE ENVIRONMENT

According to many northern Native cultures, Raven created the world. He created the land, the waters, humans, and other animals. He stole the daylight, the moon, and the stars from people or animals who were keeping them captive and set them free for the world.

Odin, lord of the Nordic gods, kept two ravens perched on his shoulders; he called them *Hugin* (Thought) and *Munin* (Memory). At dawn, he sent them out to inspect the ends of the earth. They returned at the end of day and whispered all they had seen to Odin, who advised the other Norse gods.

## RELATIONSHIP WITH OTHER ANIMALS

According to the Nunamiut Eskimo, wolves learn the location of caribou by watching the behavior of ravens.

Raven is now black, but many stories relate how he was once white and was later turned black. Some Inupiat and Yup'ik stories say this occurred when the birds were painting each other. In one version, Raven and Loon were painting each other. Raven did a good job painting the Loon, but when it was his turn to be painted, he wouldn't stay still. Loon became angry. Finally, Loon dumped the black soot she was using for paint all over Raven and he became completely black.

In many tales, Raven is a trickster, often fooling or even hurting or killing other animals. According to a traditional Tlingit tale, crows are Raven's nephews. They were once white and were turned black as part of a trick by Raven. Raven went fishing with the crows, but only Raven caught fish. After the crows left the beach, Raven ate all of the fish. When the crows returned, Raven accused the crows of theft. Then he threw ashes on them to turn them black. Another traditional Tlingit tale explains how Raven's mother became Loon after Raven killed a loon and had his mother climb into the loon's skin.

## RELATIONSHIPS WITH HUMANS

In many tales, Raven stole fire and gave it to humans. He also taught humans how to do the things they needed to do to survive. Athabaskan hunters call on ravens for help in moose hunting. Koyukon Athabaskan shamans invoked Raven's power to scare away sickness by mimicking their sounds, spreading their arms like wings, and hopping up and down.

In a biblical story, ravens brought food to the Prophet Elijah when he was in the wilderness.

Ravens were carried on ships by Vikings, Babylonians, and Romans and sent to find land. If the raven did not return, that was a sign it found land and they would follow its direction. Iceland was discovered when the Vikings flew four ravens in four directions and sailed after the raven that did not return.

Ravens warned the guards of Charles II of England that Oliver Cromwell was beginning a sneak attack. Since that day, the Yeoman Raven Master has kept six ravens at the Tower of London for the British royalty. (Wild ravens have been exterminated in London.)

Among many northern indigenous peoples, it is traditionally taboo to kill a raven and they must be released unharmed from traps. The Buryat of Siberia believe anyone who kills a raven will die soon. According to traditional Bering Strait Siberian Yupik beliefs, killing a raven makes the Raven Father very angry and he will send bad weather. A traditional Tlingit belief is that it is unlucky to kill a raven.

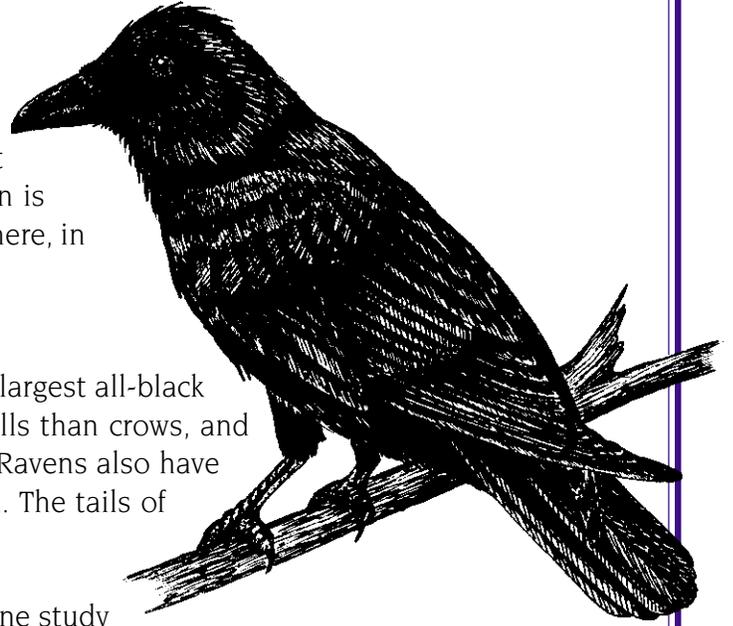


# Natural History of Ravens in Alaska

The common raven, *Corvus corax*, is a member of a family of birds known as the Corvidae that includes the jays, crows, and magpies. The raven is found throughout most of the Northern Hemisphere, in many types of habitats.

## General description

The raven is the largest species of songbird and largest all-black bird in the world. Ravens have larger, stouter bills than crows, and the tip of the upper beak is more down-curved. Ravens also have shaggy throat feathers, and a wedge-shaped tail. The tails of crows are square-cut.



Ravens can produce an assortment of sounds. One study in Alaska discovered that ravens have more than 30 types of vocalizations.

## Life history

Although it is not known for sure, ravens probably breed at 3 - 4 years of age and mate for life. Although they are believed to be long-lived, no one knows how long wild ravens live. One captive bird lived 29 years.

When ravens are not breeding, they often form loose flocks during the day and gather for roosting at night. As many as 800 ravens have been seen in one roost near Fairbanks.

Ravens do not make long migrations as many birds do. Breeding birds use a traditional nesting site each year. When not breeding, they may fly 30 - 40 miles each day from the place where they roost at night to where they feed during the day.

## Food habits

Ravens consume a variety of plant and animal matter. They scavenge and sometimes prey on small animals. Ravens will hide or cache food supplies. Ravens also have the habit, like some hawks and owls, of regurgitating undigested parts of their food in the form of a pellet. An analysis of hundreds of pellets left by roosting ravens at Umiat, indicated that possibly as much as half of their winter diet was small mammals, probably captured live by the ravens.

## Management

The Migratory Bird Treaty of the United States, Canada, Mexico, Japan and Russia protects migratory birds. The treaty was amended in 1972 to protect ravens and other corvids as well. No hunting of ravens is allowed anywhere in Alaska. They can only be killed in the defense of one's property.

*Adapted from Alaska's Wildlife Notebook Series. Alaska Department of Fish and Game.*



# Scenario: Moose and the Alaska Railroad

**MOOSE COUNTRY.** The Alaska Railroad between Anchorage and Fairbanks passes through the Matanuska-Susitna Valley where large numbers of moose typically spend the winter. The moose travel great distances in search of willow and other shrubs they need for food. Willows are plentiful near the tracks because they grow well in the cleared areas.

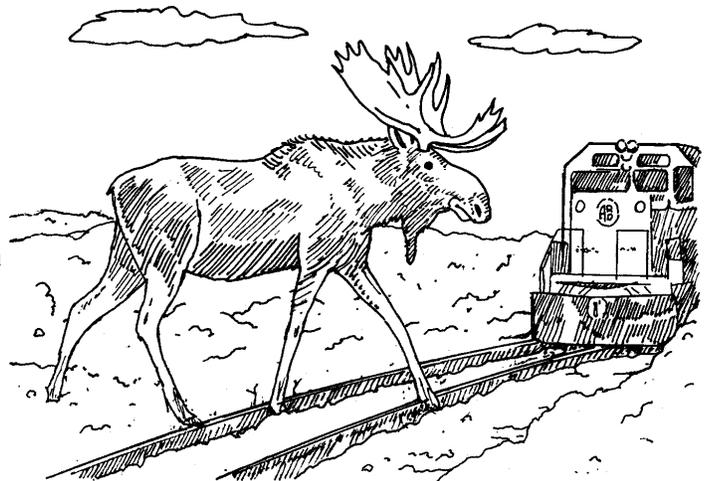
**RAIL TRAILS.** When snows are deep, moose often use the plowed railroad tracks as a trail. They spend less energy along the tracks than traveling through deep snow. Unfortunately, this attraction to the tracks is often fatal. During the winter of 1955-56, 366 moose were killed; in 1984-85, 382; in 1989-90, 711 moose died. One 60-mile section of track between Houston and Talkeetna is especially deadly. (For additional information contact the Alaska Railroad at (907) 265-2300.)

**RUNNING INTO TROUBLE.** Moose traveling on the tracks or feeding nearby often react to an approaching train by running ahead of the train rather than moving off into the deep snow. They have traditionally escaped threats from predators such as wolves by running; however, they can't outrun trains on railroad tracks. When snow is very deep they can become trapped on the tracks. Plowed snow on either side of the tracks creates berms that are too high to cross.

**HOWLING FAILURE.** Railroad managers do not want to schedule fewer trains. They have tried slowing the trains down, but moose continue to be hit. They have tried blowing whistles, using bright lights, and even playing wolf howls, but these methods have not scared the moose off the tracks.

**WHAT TO DO?** Consider the following possibilities and any others you can think of. Assume that you have a limited amount of money to spend each year, but you want to develop a plan that will result in the lowest number of moose/train collisions. Consider the costs and benefits of each possible course of action to people and to the moose population.

- Issue more hunting permits to reduce the size of the moose population
- Cut the willows and other shrubs near the tracks
- Capture and translocate moose to other areas away from the railroad
- Build a fence on both sides of the tracks
- Send a pilot car in front of the train to "sweep" the tracks ahead of each train
- Plow winter trails from the tracks to other areas
- Feed the moose hay or other foods



# ADF&G Approach:

## Moose and the Alaska Railroad

The following are solutions considered by the Alaska Department of Fish and Game to the dilemma of moose being struck by the trains of the Alaska Railroad.

**A. FENCE.** A fence would be costly to build and maintain along 60 miles of railroad and could cut off moose from a portion of their winter range.

**B. CAPTURE.** Translocating moose away from the railroad or allowing more moose hunting may not solve the problem because other moose would eventually move into the area.

**C. HUNTS.** Wildlife managers considered winter moose hunts to temporarily thin the moose population, but such hunts would be difficult in the deep snow. The hunts would also be difficult to schedule because the severity of the winter cannot be predicted.

**D. SWEEPER CARS.** During the winters of 1989-90, wildlife managers asked the railroad to use a pilot car to go ahead of the trains and chase moose from the tracks before the train passed. Wildlife managers also recommended development of a network of packed trails parallel to and branching away from the railroad. These trails were used to divert moose from the plowed railroad where it was easy for them to walk.

**E. FEEDING.** Hay was placed at the end of the packed trails to hold the moose away from the railroad. However, feeding hay to moose to reduce starvation is a questionable solution for several reasons: (1) biologists wonder whether people should artificially support the moose populations above their carrying capacity during severe winters, (2) feeding moose is expensive, and (3) the digestive systems of moose are not designed to process hay.

**F. WORK TOGETHER.** In 1991, the Alaska Railroad and the Alaska Department of Fish and Game signed an agreement to work together to keep the train-caused moose deaths below 75 each year. A variety of methods will be used including (1) a pilot car to clear moose from the tracks before scheduled trains during problem periods, (2) removing shrubs that provide food for moose from beside the tracks, (3) packing trails next to the tracks to divert moose from the railway, and (4) timber harvest and other techniques to increase the winter food supply of willows and other shrubs in areas away from the railroad.

A long-term solution to avoid similar problems along the railroad and highways would be to avoid routes through known moose **winter concentration areas**. The department recommended construction of fencing and a moose underpass under a busy section of highway in Anchorage. The underpass was built in a traditional crossing area that moose use to move between winter and summer ranges. The extensive fencing needed to divert moose toward the underpass.

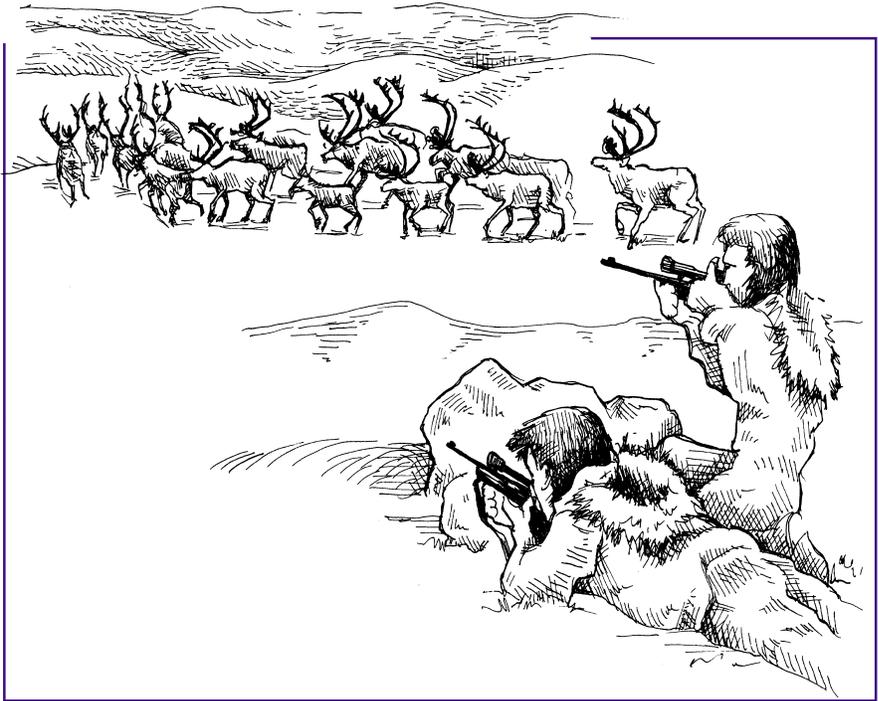
**NOTE: By 1998-99, after implementing some of the management strategies listed above, the number of collisions had dropped to 85 moose. Working together contributes to wildlife conservation.**



# Hunting Regulation Vocabulary

**Bag limit:** the maximum number of animals of any one species a hunter can kill in a given area in a single season.

**Board of Game:** Governor-appointed, legislatively-approved board of Alaska citizens that uses public and agency information to set regulations regarding wildlife harvests.



**Drawing permit:** a permit issued to a limited number of hunters by means of a lottery. Hunters must apply and agree to obey the conditions spelled out in that permit.

**Game Management Units:** division of Alaska into 26 geographical units for managing game. Within these **GMUs**, there may be smaller units, identified with letters. For example, GMU 21B is an area north of Ruby and south of Tanana. Maps of the state's GMUs are available in the *Alaska Hunting Regulations* book and on the ADF&G website. When making proposals, it is important to familiarize yourself with the GMUs that are part of your concern.

**Hunting Regulations:** laws defined by the Board of Game and signed into law by Alaska's lieutenant governor.

**Permit hunt:** a hunt in which permits are required; may be drawing, registration, or Tier II permits.

**Season:** the period of time set to legally hunt a certain species. Hunting seasons are determined through the Board of Game process.

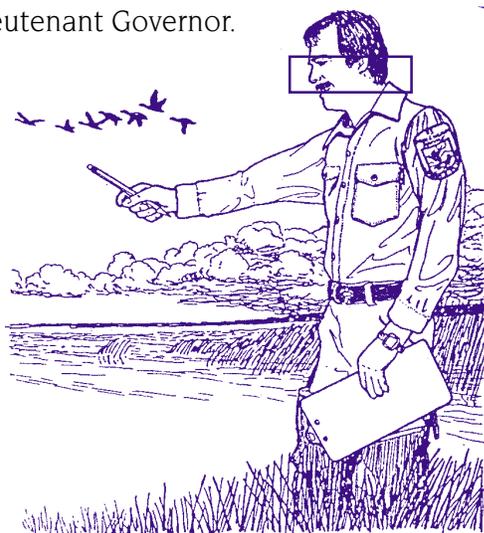
**Statutes:** laws passed by the state legislature that the Board of Game must follow. The Board of Game cannot create regulations outside of authority given to them by legislative statute.

**Tier II:** the Board of Game has identified specific game populations that are customarily and traditionally used for subsistence. In times of shortage, non-subsistence hunting is eliminated. If further hunting reductions are required, Tier II permits are given to hunters *based a predetermined scoring system*. Lots of hunters score the same; the lottery occurs only for the last few remaining permits when the number of hunters with identical scores exceeds the number of permits remaining.

# Tracking Wildlife Regulations

In Alaska, **wildlife management** relies heavily on hunting to maintain healthy and productive wildlife **populations**. The wildlife management **regulations** that control hunting are created through extensive public involvement. Tracking the process involves many residents:

- **Alaska Board of Game (or Board of Fish):** The Governor appoints seven public members who then must be confirmed by the Alaska State Legislature.
- **Fish and Game Advisory Committees:** About 80 communities have advisory committees with up to 15 elected members.
- **Alaska Department of Fish and Game:** Biologists and other staff from the Division of Wildlife Conservation and Division of Subsistence.
- General public.
- Commissioner of the Alaska Department of Fish and Game.
- Alaska Department of Law.
- Alaska Department of Public Safety, Division of Fish and Wildlife Protection.
- United States Fish and Wildlife (USFWS) liaison.
- Lieutenant Governor.



## Board of Game

Meeting two to three times a year, the Board of Game sets hunting regulations. The board does not have time to consider every regulatory topic at each meeting. Instead, it deals with topics on a rotating basis. After setting the next meeting's agenda, the board issues a **Call for Proposals** and sends it to various agencies, groups, and individuals. The announcement is also published in Alaska newspapers.

## Advisory Committees

Fish and Game Advisory Committees provide local forums to discuss fish and wildlife issues and make recommendations to the boards. There are approximately 80 community-based fish and game advisory committees. They meet prior to the *Call for Proposals* deadline to develop proposals that address the board's agenda. Advisory committees meet after proposals are published to comment and provide opposing or supporting arguments.

## How to Make Proposals

Any individual or group in the state can propose a change to a hunting regulation:

1. Submit proposals using the *Regulation Proposal Form* (sample provided for student use – see activity “I Propose...!” in Section 4).
2. Write proposals using clear, concise language.
3. If possible, include the Alaska Administrative Code number (for example, 5AAC 92.990. DEFINITIONS) for the regulation addressed or provide the general heading and page number (for example, “DEFINITIONS” page 18-19) in the current regulation book.
4. State the problem and the reasons why the regulation should change.
5. Submit the proposal to the board before the deadline.

## Tracking Wildlife Regulations (Cont.)

### Tracking the Proposals

After all proposals are reviewed, they are printed and sent out for public comment. Any individual or group in the state may attend board meetings to express their views and ideas about the proposals.

Before the board votes on a proposal, members must consider written comments, public

testimony, and biological information such as wildlife population health and environmental changes, social factors including historic use patterns, and all pertinent court rulings.

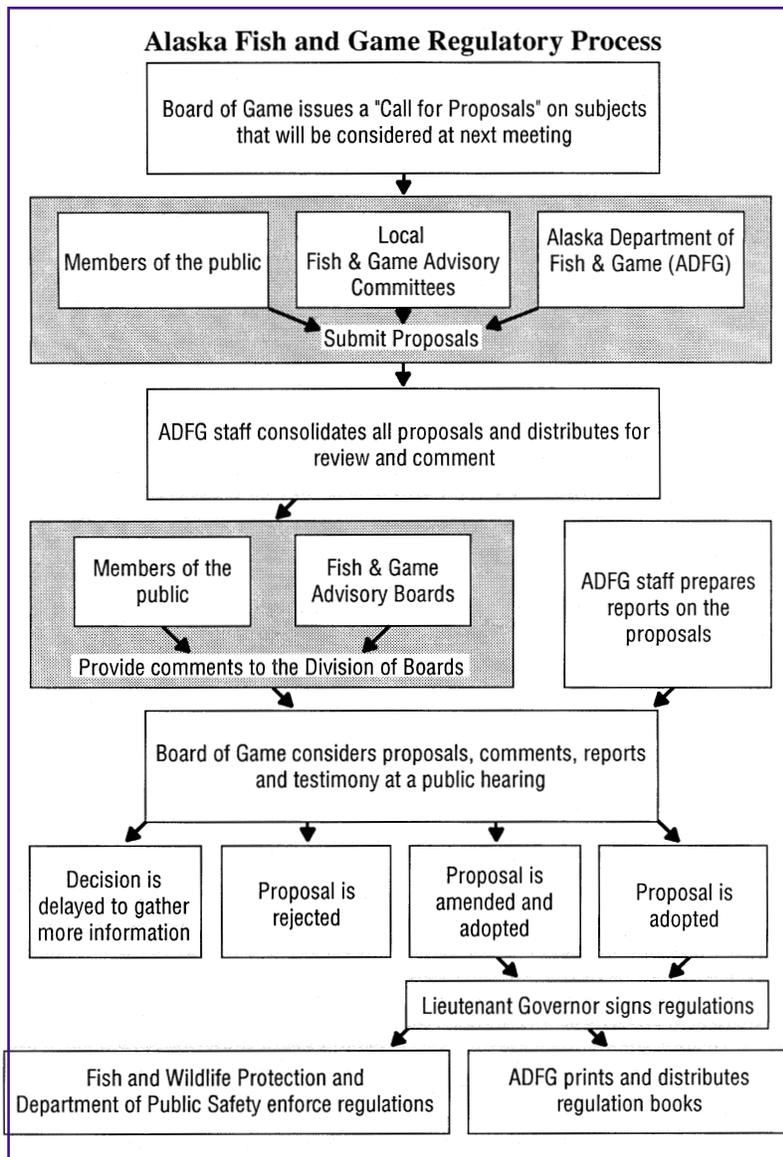
### Next Step for Approval

After the board meeting adjourns, Alaska Department of Fish and Game staff draft the regulations to be entered into the Alaska Administrative Code. The Alaska Department of Law reviews these changes. If approved by the lawyers, the Lieutenant Governor signs the new regulations into law.

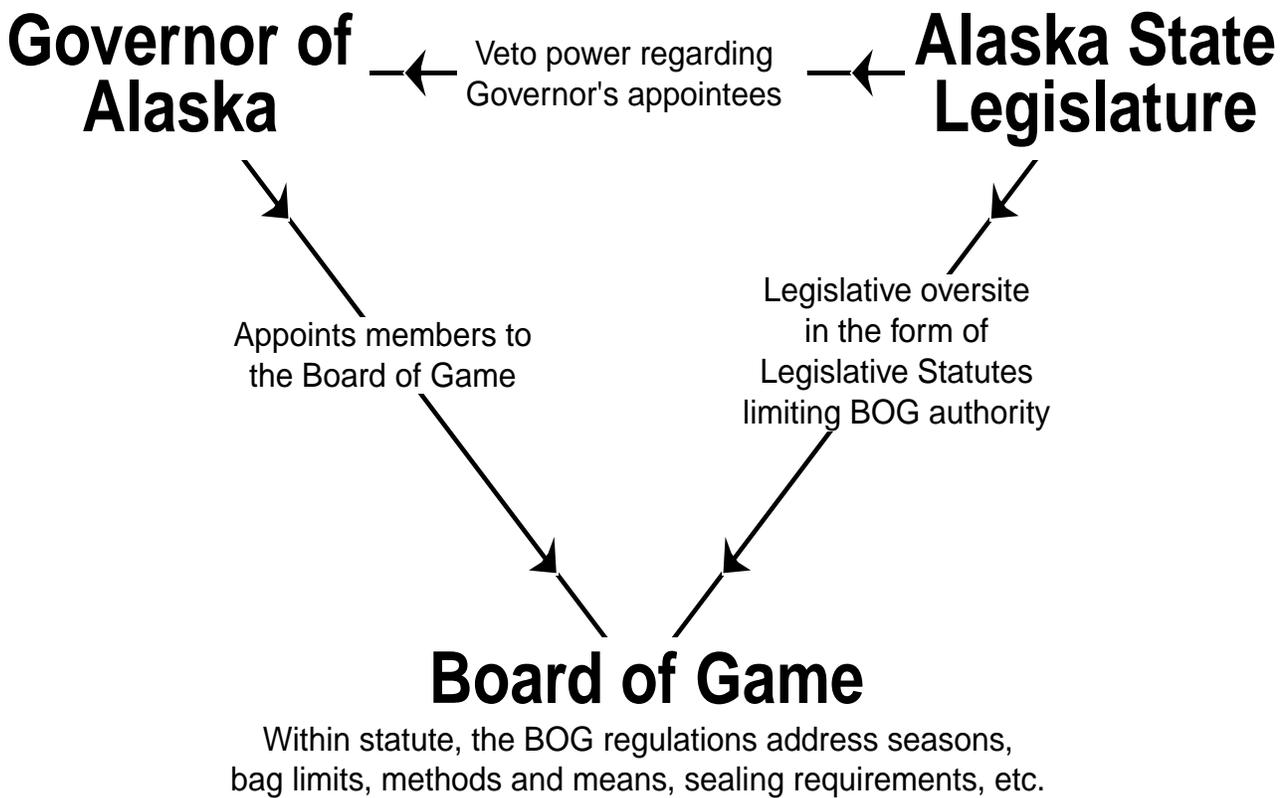
### For Use by the Public

The Alaska Department of Fish and Game creates summaries and “public” versions, written in lay terms. These will become the “Alaska State Hunting Regulations” a publication available free to the public in print and website formats. Regulations are enforced by the Alaska Department of Public Safety’s Division of Wildlife Protection.

NOTE: Waterfowl fit under a different process of regulation because Alaskans share these migratory birds with other states and other nations. The U.S. Fish and Wildlife Service sets harvest guidelines and then works with state waterfowl representatives to set rules and state allocations. Alaska is in the Pacific Flyway.



# Checks & Balances for Wildlife Regulations



# Workers for Wildlife

People work with wildlife in a variety of jobs in Alaska. The Alaska Department of Fish and Game (ADF&G) is responsible for managing most of the wildlife and fish in Alaska while the U.S. Fish and Wildlife Service manages marine mammals and waterfowl.

Staffs of these agencies work as research biologists, management biologists, technicians, educators, naturalists, computer specialists, engineers, administrative staff, and a variety of other jobs.

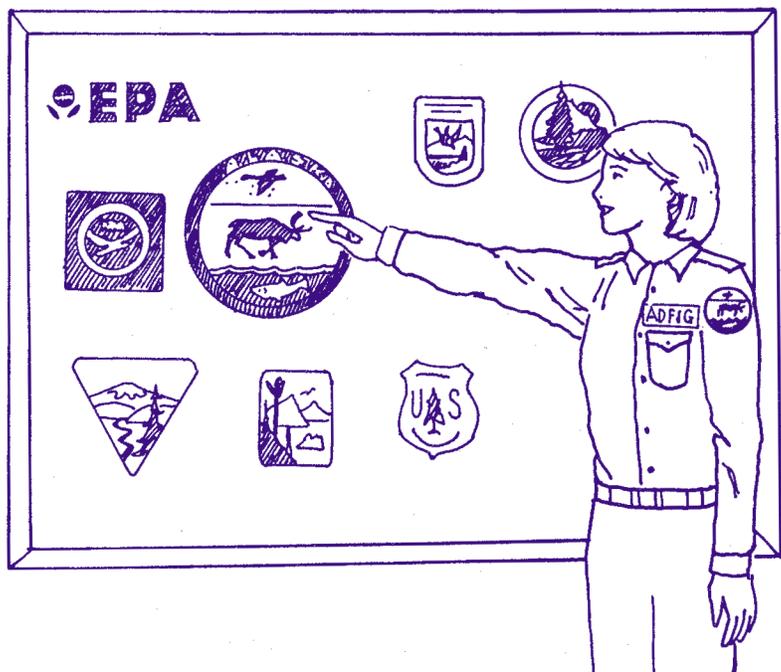
**RULE-MAKING BOARDS.** ADF&G biologists gather information about wildlife populations and harvests. They use this information to make recommendations to the Board of Game and the Board of Fisheries about regulations that set seasons and bag limits for hunting and fishing.

NOTE: Any Alaskan citizen can propose new regulations or changes in existing regulations to the Board, which then votes on all the proposals received (see “Tracking Wildlife Regulations” Fact Sheet in this section).

**MIGRATORY BIRDS.** Alaska is part of the Pacific Flyway Council. ADF&G and rural subsistence hunters make recommendations to the US Fish and Wildlife Service on migratory bird management. Waterfowl biologists work together with villagers to manage migratory birds that nest throughout Alaska.

**NONGAME SPECIES.** ADF&G biologists also gather information about wildlife habitat relationships and wildlife species that are not harvested – called nongame species. Staff members are also part of teams restoring threatened or endangered species. They help the public enjoy wildlife by developing viewing areas and preparing information and educational materials about Alaska wildlife.

**MANY PARTNERS.** ADF&G often works in cooperation with public, private, and governmental organizations including Native organizations, conservation and hunting groups, USDA Forest Service, National Park Service, National Marine Fisheries Service, and the Bureau of Land Management. Many of these organizations make decisions that affect wildlife on the lands they manage. ADF&G biologists provide information and recommendations to land managers to help them minimize negative impacts to wildlife and their habitat.



# Wildlife-related Organizations and Careers

A. **Alaska Department of Fish and Game** (fisheries and wildlife research, management, and education) <[www.state.ak.us/adfg](http://www.state.ak.us/adfg)> Also refer to "Workplace Alaska" on Alaska's web site for state jobs in biology <[www.state.ak.us](http://www.state.ak.us)>

B. **US Fish and Wildlife Service** (research and management of fish and wildlife, conservation education, nature interpretation) <[www.r7.fws.gov](http://www.r7.fws.gov)>

C. **US Geological Survey – Alaska Biological Science Center** (wildlife research on federal lands and in shared ecosystems: studies of fisheries, migratory birds, marine mammals, freshwater and wetlands) <[www.absc.usgs.gov](http://www.absc.usgs.gov)>

D. **National Park Service** (park planning and management, wildlife biology, ecology, law enforcement, recreation, education) <[www.nps.gov](http://www.nps.gov)>

E. **USDA Forest Service** (planning and management, wildlife biology, hydrology, ecology, geology, recreation, fire management and control, personnel, budgeting) <[www.fs.fed.us](http://www.fs.fed.us)>

F. **Bureau of Land Management** (land-use planning, wildlife biology, ecology, education, entomology, nature interpretation, personnel, fire management and control) <[www.blm.gov](http://www.blm.gov)>

G. **Alaska Department of Natural Resources** (land-use planning, management, fire management and control) <[www.dnr.state.ak.us/](http://www.dnr.state.ak.us/)>

H. **Native groups** (wildlife management, land-use planning, environmental education, natural resource law, **lobbying**) Contact groups in your area, the Alaska Native Knowledge Network's regional coordinators <[www.ankn.uaf.edu](http://www.ankn.uaf.edu)> or the Alaska Native Heritage Center <[www.alaskanative.net](http://www.alaskanative.net)>

I. **University of Alaska** or other universities – (research and teaching in wildlife, fisheries, ecology, and management) Contact the Cooperative Extension Service <[www.uaf.edu/coop-ext/](http://www.uaf.edu/coop-ext/)>

J. **Conservation organizations** (These groups use people with careers in biology, ecology, lobbying, natural resource law, conservation, resource education, natural history interpretation, marketing and fund-raising) Examples include: *Alaska Outdoor Council* and *Alaska Fish and Wildlife Conservation Fund* <[www.alaskaoutdoorcouncil.org](http://www.alaskaoutdoorcouncil.org)> Official state affiliate of the NRA.

*Alaska Trappers Association* <[www.alaskatrappers.org](http://www.alaskatrappers.org)>

*National Audubon Society* <[www.audubon.org](http://www.audubon.org)>

*National Wildlife Federation* <[www.nwf.org](http://www.nwf.org)>

*The Nature Conservancy* <[www.tnc.org](http://www.tnc.org)>

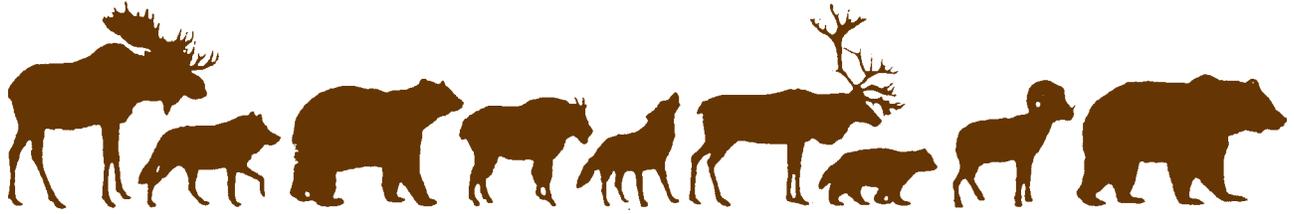
*The Wilderness Society* <[www.wilderness.org](http://www.wilderness.org)>

K. **Tourist guiding companies** ("ecotourism" guides must be knowledgeable about wildlife) *Alaska Wilderness Recreation and Tourism Association* <[www.awrta.org](http://www.awrta.org)>

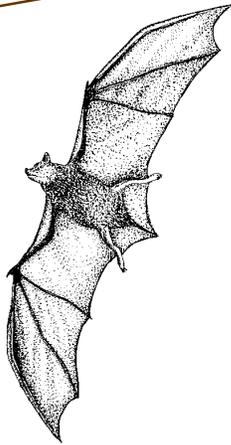
L. **Jobs in Natural Resources** <[www.cyber-sierra.com/nrjobs/natres.html](http://www.cyber-sierra.com/nrjobs/natres.html)> Job openings in the field of Natural Resources. Has links to many career offerings.

M. **Occupational Handbook** <[stats.bls.gov/ocohome.htm](http://stats.bls.gov/ocohome.htm)> National source of career information.





# Alaska Ecology Cards



## 235. LITTLE BROWN BAT F,W

**Traits:** Mammal with forelegs modified to form membranous wings; keen eyesight; active at night

**Habitat:** Forested areas with a lake nearby; roost in caves, tree cavities, or buildings.

**Foods:** Mosquitoes, moths, mayflies, caddisflies; usually feeds over water and in forest openings

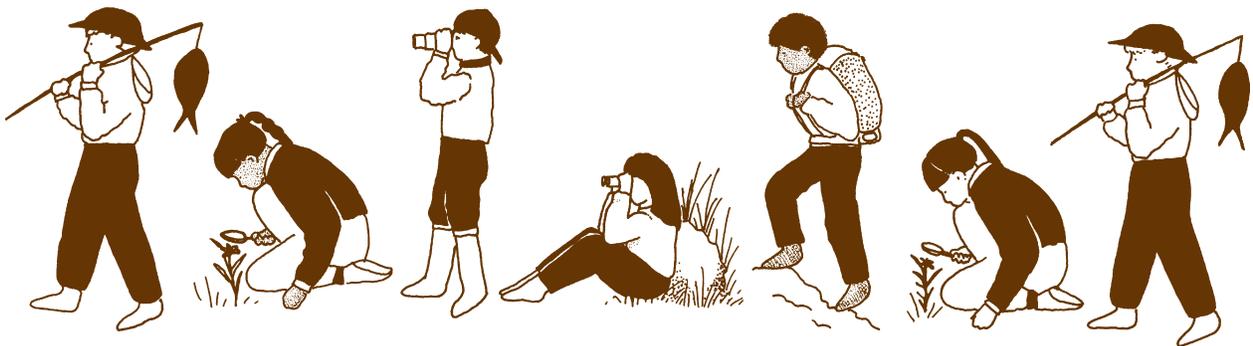
**Eaten by:** Owls, squirrels

**Do You Know?** Bats capture flying insects by using echolocation. A single bat may eat as many as 1,000 mosquitoes in one evening.



**A collection of 270 illustrations of one-celled life, plants, invertebrates, fish, birds, and mammals found in Alaska**

Each illustration is backed by text describing the organism's traits, habitat, food habits, what other organisms eat it for food, and a "do you know?" fact. These cards are suitable for learners of any age. Primary educators may choose to adapt the illustrations and text for young readers.



# Alaska Ecology Cards

## REVISION 2001

The Alaska Department of Fish and Game has additional information and materials on wildlife conservation education.

The *Alaska Wildlife Curriculum* includes:

*Alaska's Ecology & Wildlife*  
*Alaska's Forests and Wildlife*  
*Alaska's Tundra and Wildlife*  
*Alaska's Wildlife for the Future*  
*Alaska Ecology Cards*

We revise the *Alaska Wildlife Curriculum* periodically. For information, or to provide comments on the *Ecology Cards*, please contact us:

**Division of Wildlife Conservation**  
**Attention: Wildlife Education**  
**333 Raspberry Road**  
**Anchorage, AK 99518**  
**907-267-2168**

or visit our web site:  
<http://www.state.ak.us/adfg/>



## Project Managers:

Robin Dublin, Jonne Slemmons

## Editors:

Alaska Department of Fish and Game: Robin Dublin, Karen Lew

Expression: Elaine Rhode

**Original Text:** Susan Quinlan, Marilyn Sigman, Matt Graves

## Reviewers Past and Present:

Alaska Department of Fish and Game: John Wright, Colleen Matt, Larry Aumiller, Jeff Hughes, Jim Lieb, Gary Miller, Mark Schwan, Rick Sinnott, Bill Taylor, Phyllis Weber-Scannell, Howard Golden, Mark Keech, Andy Hoffmann, Fritz Kraus

Alaska Department of Natural Resources: Dan Ketchum  
Cooperative Extension Service: Lois Bettini, Wayne Vandry  
U.S.D.A. Soil Conservation Source: Dan LaPlante, J. David Swanson, Tom Ward, Annette MacDonald

**Illustration:** Conrad Field

The Alaska State Legislature funded this revision of *Alaska Wildlife Curriculum* in support of wildlife conservation education.

The *Alaska Wildlife Curriculum* is a resource for educators teaching today's youth about Alaska's wildlife. We dedicate this curriculum to you and your students.

Copyright 1995, 1999, 2001  
Alaska Department of Fish and Game  
Division of Wildlife Conservation

The Alaska Department of Fish and Game administers all programs and activities free from discrimination on the basis of race, religion, color, national origin, age, sex, marital status, pregnancy, parenthood, or disability. For information on alternative formats for this and other department publications, please contact the department ADA Coordinator at [voice] 907-465-4120, telecommunication device for the deaf [TDD] 1-800-478-3648, or fax 907-465-6078. Any person who believes she/he has been discriminated against should write to ADF&G, PO Box 25526, Juneau, AK 99802-5526, or OEO, U.S. Department of the Interior, Washington, DC 20240.



**Plant or Animal Name****Scientific Name****Plant or Animal Name****Scientific Name****FISHES – VERTEBRATES**

- 136. Slimy Sculpin F,T,W
- 137. Nine-spine Stickleback F,T,W
- 138. Three-spine Stickleback F,T,W
- 139. Blackfish F,T,W
- 140. Whitefish F,T,W
- 141. Burbot F,T,W
- 142. Arctic Grayling T,W
- 143. Eulachon W
- 144. Northern Pike W
- 145. Arctic Char T,W
- 146. Lake Trout F,T,W
- 147. Pacific Herring W
- 148. Sockeye Salmon W
- 149. Pink Salmon W
- 150. Coho Salmon W
- 151. Chum Salmon W

**AMPHIBIANS**

- 152. Wood Frog F,T,W
- 153. Salamander and Newt F

**BIRDS – WATERFOWL**

- 154. Loons F,T,W
- 155. Grebes F,T,W
- 156. Tundra Swan T,W
- 157. Greater White-fronted Goose T,W
- 158. Brant T,W
- 159. Emperor Goose W
- 160. Cackling Canada Goose T,W
- 161. Dusky Canada Goose W
- 162. Northern Pintail T,W
- 163. Oldsquaw T,W
- 164. Canvasback W
- 165. Mergansers T,W
- 166. Eiders T,W
- 167. Scoters F,T,W

**BIRDS – RAPTORS**

- 168. Bald Eagle F,W
- 169. Northern Harrier T,W
- 170. Sharp-shinned Hawk F
- 171. Northern Goshawk F
- 172. Red-tailed Hawk F,W
- 173. Rough-legged Hawk T
- 174. Golden Eagle T
- 175. American Kestrel F
- 176. Merlin F
- 177. Gyrfalcon T

**BIRDS – GROUSE**

- 178. Spruce Grouse F
- 179. Blue Grouse F
- 180. Ptarmigan T
- 181. Ruffed Grouse F
- 182. Sharp-tailed Grouse F

**BIRDS – CRANES**

- 183. Sandhill Crane T,W

**BIRDS – SHOREBIRDS & GULLS**

- 184. Plovers T,W
- 185. Sandpipers T,W
- 186. Phalaropes T,W
- 187. Parasitic Jaeger T,W
- 188. Glaucous Gull T,W
- 189. Terns F,T,W

**BIRDS – OWLS**

- 190. Northern Saw-whet Owl F,W
- 191. Great Horned Owl F
- 192. Great Gray Owl F
- 193. Boreal Owl F
- 194. Northern Hawk Owl F
- 195. Snowy Owl T,W
- 196. Short-eared Owl T,W

**BIRDS – HUMMINGBIRD**

- 197. Rufous Hummingbird F

**BIRDS – KINGFISHER**

- 198. Belted Kingfisher F,T,W

**BIRDS – WOODPECKERS**

- 199. Northern Flicker F

- Cottus cognatus*
- Pungitius pungitius*
- Gasterosteus aculeatus*
- Dallia pectoralis*
- Genera: Prosopium, Coregonus
- Lota lota*
- Thymallus arcticus*
- Thaleichthys pacificus*
- Esox lucius*
- Salvelinus alpinus*
- Salvelinus namaycush*
- Clupea pallasii*
- Oncorhynchus nerka*
- Oncorhynchus gorbuscha*
- Oncorhynchus kisutch*
- Oncorhynchus keta*

- Rana sylvatica*
- Order: Caudata

- Genus: *Gavia*
- Genus: *Podiceps*
- Cygnus columbianus*
- Anser albifrons*
- Branta bernicla*
- Chen canagica*
- Branta canadensis minima*
- Branta canadensis occidentalis*
- Anas acuta*
- Clangula hyemalis*
- Aythya valisineria*
- Genus: *Mergus*
- Genera: *Polysticta*, *Somateria*
- Genus: *Melanitta*

- Haliaeetus leucocephalus*
- Circus cyaneus*
- Accipiter striatus*
- Accipiter gentilis*
- Buteo jamaicensis*
- Buteo lagopus*
- Aquila chrysaetos*
- Falco sparverius*
- Falco columbarius*
- Falco rusticolus*

- Dendragapus canadensis*
- Dendragapus obscurus*
- Genus: *Lagopus*
- Bonasa umbellus*
- Tympanuchus phasianellus*

- Grus canadensis*

- Genera: *Pluvialis*, *Charadrius*
- Calidris mauri*
- Genus: *Phalaropus*
- Stercorarius parasiticus*
- Larus hyperboreus*
- Genus: *Sterna*

- Aegolius acadicus*
- Bubo virginianus*
- Strix nebulosa*
- Aegolius funereus*
- Surnia ulula*
- Nyctea scandiaca*
- Asio flammeus*

- Selasphorus rufus*

- Ceryle alcyon*

- Colaptes auratus*

- 200. Hairy/Downy Woodpeckers F
- 201. Black-backed Woodpecker F
- 202. Three-toed Woodpecker F
- 203. Red-breasted Sapsucker F

**BIRDS – SONGBIRDS**

- 204. Flycatchers F,T,W
- 205. Horned Lark T
- 206. Swallows F,T,W
- 207. Gray Jay F,T
- 208. Steller's Jay F
- 209. Black-billed Magpie F,W
- 210. Northwestern Crow F,W
- 211. Common Raven F,T,W
- 212. Chickadees F
- 213. Red-breasted Nuthatch F
- 214. Brown Creeper F
- 215. Winter Wren F
- 216. American Dipper F
- 217. Warblers F
- 218. Kinglets F
- 219. Northern Wheatear T,W
- 220. American Robin F,T,W
- 221. Varied Thrush F
- 222. Small Thrushes F,T,W
- 223. Water Pipits F,T,W
- 224. Bohemian Waxwing F,W
- 225. Northern Shrike F,T,W
- 226. Sparrows F,T,W
- 227. Snow Bunting T
- 228. Lapland Longspur T
- 229. Gray-Crowned Rosy Finch T
- 230. Common Redpoll F,T
- 231. Pine Grosbeak F
- 232. Crossbills F
- 233. Pine Siskin F

**MAMMALS**

- 234. Shrews F,T,W
- 235. Little Brown Bat F,W
- 236. Collared Pika T
- 237. Snowshoe Hare F
- 238. Tundra Hare T
- 239. Woodchuck F
- 240. Marmots T
- 241. Red Squirrel F
- 242. Northern Flying Squirrel F
- 243. Arctic Ground Squirrel T
- 244. Beaver F,T,W
- 245. Deer Mouse F,T
- 246. Voles F,T,W
- 247. Lemmings T,W
- 248. Muskrat T,W
- 249. Meadow Jumping Mouse F
- 250. Porcupine F
- 251. Coyote F,T,W
- 252. Wolf F,T,W
- 253. Arctic Fox T,W
- 254. Red Fox F,T,W
- 255. Black Bear F
- 256. Brown Bear F,T,W
- 257. Marten F
- 258. Ermine F,T,W
- 259. Least Weasel F,T
- 260. Mink F,T,W
- 261. Wolverine F,T
- 262. River Otter T,W
- 263. Lynx F
- 264. Sitka Black-tailed Deer F
- 265. Moose F,W
- 266. Caribou F,T
- 267. Mountain Goat T
- 268. Muskox T
- 269. Dall Sheep T
- 270. Humans F,T,W

- Genus: *Picoides*
- Picoides arcticus*
- Picoides tridactylus*
- Sphyrapicus ruber*

- Family: Tyrannidae
- Eremophila alpestris*
- Family: Hirundinidae
- Perisoreus canadensis*
- Cyanocitta stelleri*
- Pica pica*

- Corvus caurinus*
- Corvus corax*
- Genus: *Parus*
- Sitta canadensis*
- Certhia americana*
- Troglodytes troglodytes*
- Cinclus mexicanus*
- Family: Emberizidae

- Genus: *Regulus*
- Oenanthe oenanthe*
- Turdus migratorius*
- Ixoreus naevius*
- Family: Turdidae

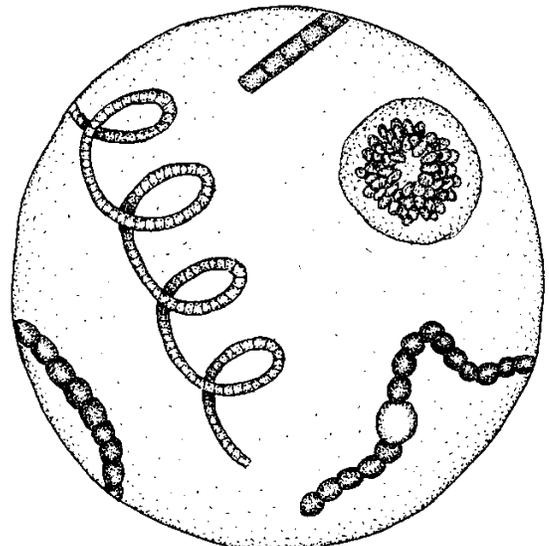
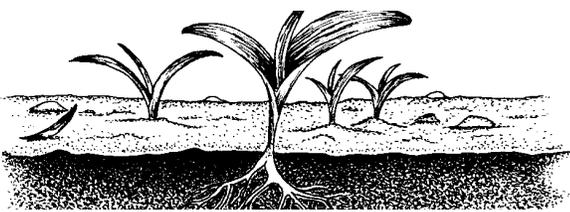
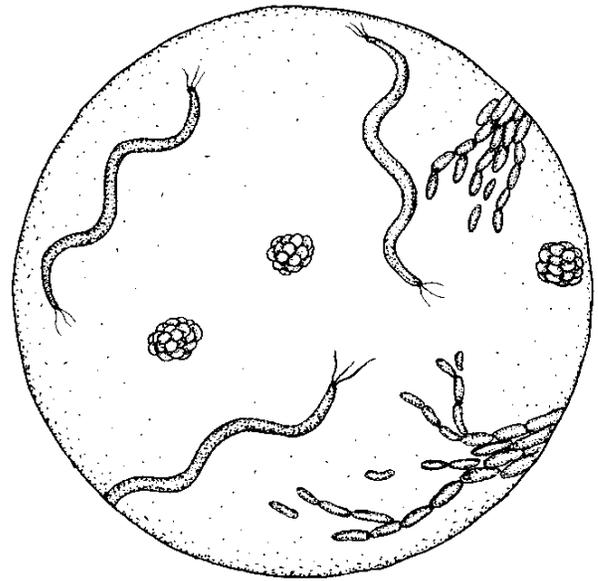
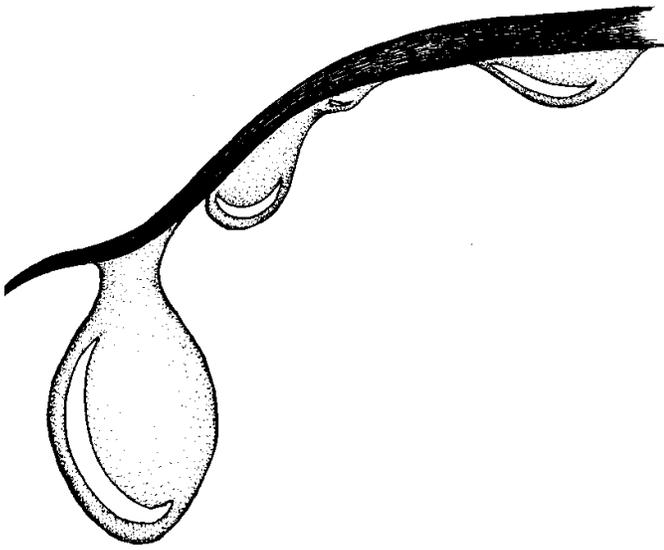
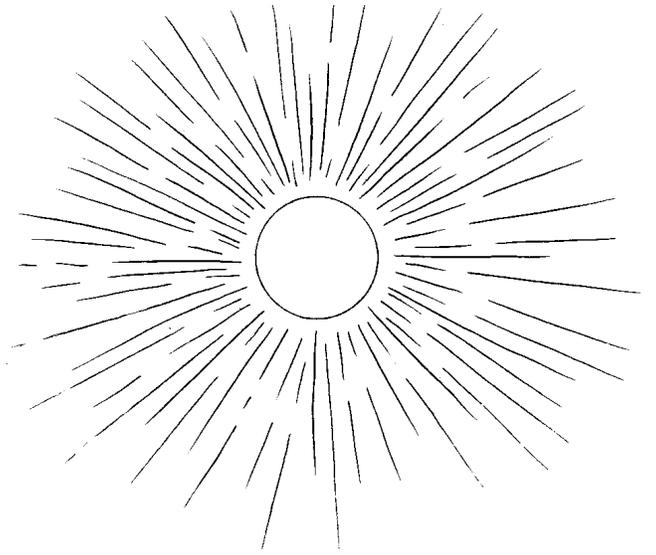
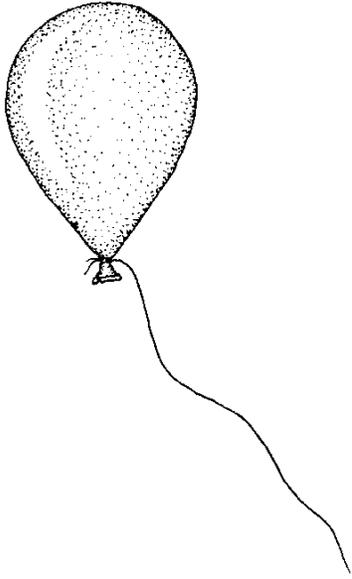
- Anthus spinoletta*
- Bombicilla garrulus*
- Lanius excubitor*
- Family: Emberizidae
- Plectrophenax nivalis*
- Calcarius lapponicus*
- Leucosticte arctoa*
- Carduelis flammea*
- Pinicola enucleator*
- Genus: *Loxia*
- Carduelis pinus*

- Genus: *Sorex*
- Myotis lucifugus*
- Ochotona collaris*
- Lepus americanus*
- Lepus timidus*
- Marmota monax*
- Genus: *Marmota*
- Tamiasciurus hudsonicus*
- Glaucomyus sabrinus*
- Spermophilus parryi*
- Castor canadensis*
- Peromyscus maniculatus*
- Genus: *Microtus*
- Genera: *Lemmus*, *Dicrostonyx*, *Mictomys*

- Ondatra zibethica*
- Zapus hudsonius*
- Erethizon dorsatum*
- Canis latrans*
- Canis lupus*

- Alopex lagopus*
- Vulpes vulpes*
- Ursus americanus*
- Ursus arctos*
- Martes americana*
- Mustela erminea*
- Mustela nivalis*
- Mustela vison*
- Gulo gulo*

- Lutra canadensis*
- Lynx canadensis*
- Odocoileus hemionus*
- Alces alces*
- Rangifer tarandus*
- Oreamnos americanus*
- Ovibus moschatus*
- Ovis dalli*
- Homo sapiens*



## 4. SUN

F,T,W

**Traits:** The sun is a dwarf yellow star and a dense ball of gases and dust.

**Occurrences:** The sun is located in the center of our solar system, 93 million miles from planet Earth.

**Values:** Plants and other producers capture the energy in sunlight and, through photosynthesis, store it in the form of sugar. They use this “stored sunlight energy” to grow and reproduce.

**Do You Know?** The amount of solar energy striking the earth every day is about 1.5 billion times greater than the amount of electricity generated each year in the United States.

## 5. BACTERIA

F,T,W

**Traits:** Bacteria (monerans) are single-celled microscopic organisms that have no chlorophyll and that multiply by simple division. They occur in three main forms: round, rod-shaped, and spiral.

**Habitat:** Every moist environment

**Foods:** Dead plants, fungi, animal materials; some kinds of bacteria live as parasites of living things, and some are able to make their own food.

**Eaten by:** Protozoans and some fungi

**Do You Know?** Some types of bacteria live in the digestive tracts of animals and aid in digestion.

## 6. CYANOBACTERIA

F,W

**Traits:** Cyanobacteria (monerans) are microscopic organisms that are single-celled or in colonies of cells. They can appear blue-green, brown, red, or yellow depending on pigments.

**Habitats:** Small ponds, lakes, estuaries, open ocean

**Foods:** Make their own by photosynthesis

**Eaten by:** Protozoans, roundworms, segmented worms, springtails, mites

**Do You Know?** The Red Sea gets its name from the occasional abundance of blue-green algae, which is really red.

## 1. AIR

F,T,W

**Traits:** Air is made of several gases, including nitrogen, oxygen, and carbon dioxide.

**Occurrences:** Air surrounds us, but we rarely notice that we breathe it every minute we live.

**Values:** The thin layer of air that blankets the earth provides living things with oxygen and carbon dioxide. It traps heat from the sun and blocks harmful high-intensity light rays.

**Do You Know?** Although the sky above us looks endless, the earth’s atmosphere is actually very thin. If the earth were the size of an apple, the atmosphere would be the same thickness as the apple’s skin.

## 2. WATER

F,T,W

**Traits:** Water molecules are made of two atoms of hydrogen and one atom of oxygen.

**Occurrence:** As a *liquid* in rain, lakes, rivers, oceans; as a *solid* in ice, snow; as a *gas* in clouds, humidity, evaporation; some collects underground in the water table.

**Values:** All living things need water for most life processes.

**Do You Know?** Water cycles continuously from clouds to rain or snow to plants, rivers, lakes, and oceans, then back to clouds. Today we are using the same “recycled” water that dinosaurs used thousands of years ago.

## 3. SOIL

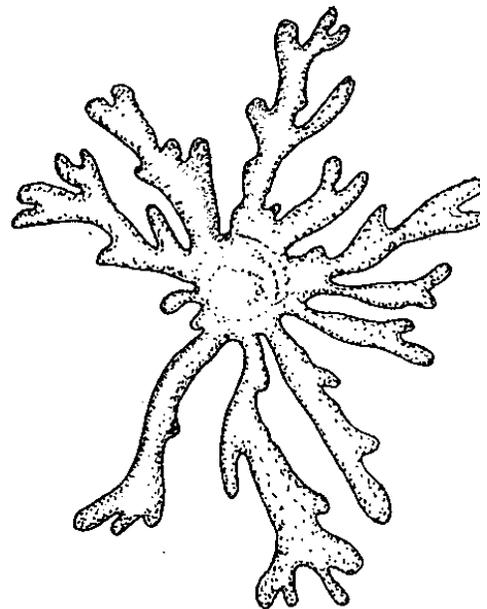
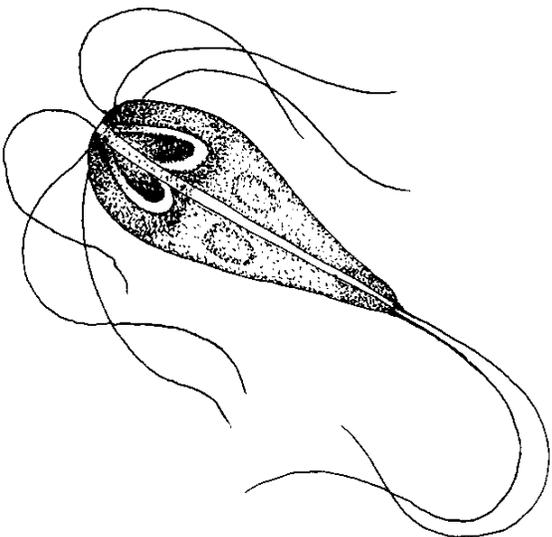
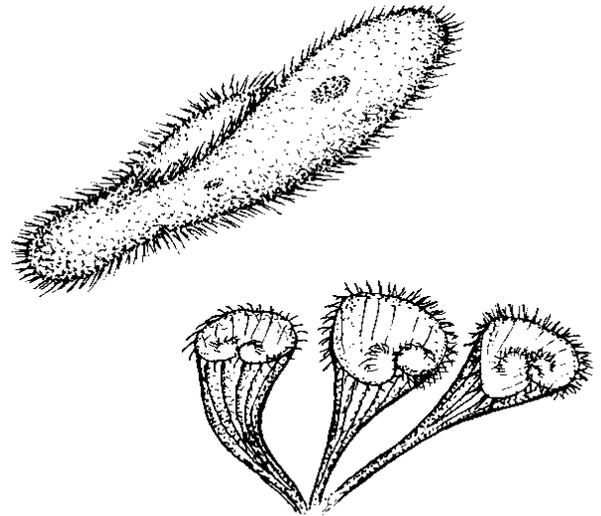
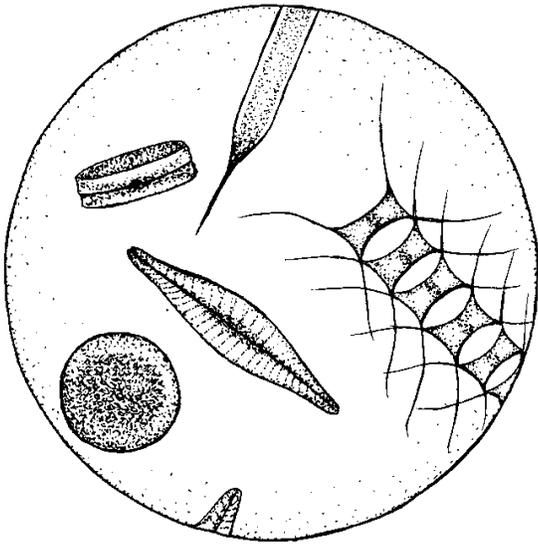
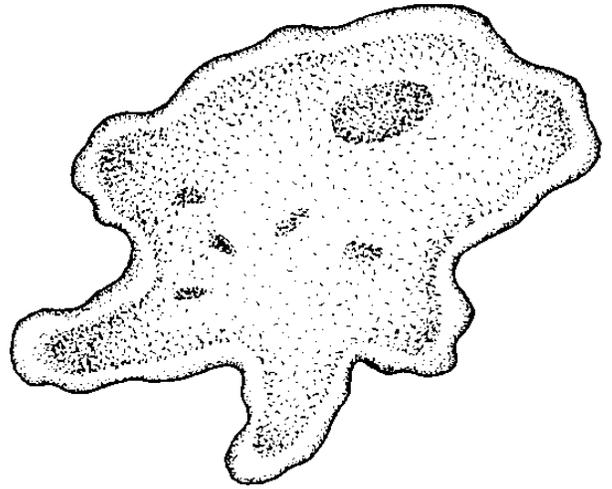
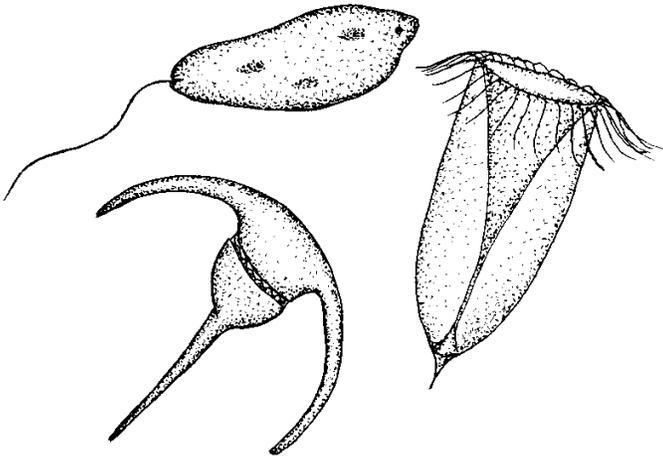
F,T,W

**Traits:** Rocks are made of elements and compounds. Wind and water erodes rocks into fine sand and clay particles, which become organic mineral soils. Organic soils are enriched by nutrients from decomposed plants, animals, and other living things.

**Occurrence:** Much of the land on earth is covered by soil.

**Values:** Most plants (producers) require soil to grow. Soil anchors them and feeds their roots.

**Do You Know?** A teaspoon of soil may contain 3-10 billion microscopic organisms.



## 10. AMOEBAS

W

**Traits:** Microscopic organisms (protists) that move and capture prey by “pseudopodia” (false feet), which are flowing extensions from their bodies

**Habitat:** Fresh and salt water

**Foods:** Small organisms, including other protozoans, bacteria, algae, diatoms

**Eaten by:** Other protozoans

**Do You Know?** Certain kinds of amoebas cause diseases, such as amoebic dysentery in people.

## 7. PROTOZOANS

F,T,W

**Traits:** Microscopic organisms (protists) each made of a single cell or group of identical cells

**Habitat:** Water droplets on leaves, leaf litter, under rocks, and in soil

**Foods:** Dead plant material and animal wastes; some eat bacteria, algae, or other protozoans.

**Eaten by:** Protozoans, round worms, segmented worms

**Do You Know?** Some protozoans live in the intestines of certain animals and aid them in digestion of foods. Many are parasites of animals.

## 11. CILIATES

W

**Traits:** Microscopic, single-celled organisms (protists) that have cilia (short, hairlike structures), which they use to move around and capture food

**Habitat:** Fresh and salt water; some live inside of, or attached to, other organisms.

**Foods:** Rotifers, protozoans, bacteria, algae, detritus, diatoms; some are parasites on other organisms.

**Eaten by:** Protozoans, roundworms, segmented worms, fish larvae

**Do You Know?** Certain ciliates live in the digestive tracts of hoofed mammals and help them digest their foods.

## 8. DIATOMS

F,W

**Traits:** Microscopic, single-celled organisms (protists) that live individually or in colonies; diatoms have two lenslike shells made of silica (an element of glass).

**Habitat:** Fresh and salt water

**Foods:** Make their own by photosynthesis

**Eaten by:** Amoebas, small crustaceans, larvae of invertebrates, fish

**Do You Know?** When diatoms die, their shells fall to the bottom of the sea. Large deposits formed over centuries are now mined and used by industry in a variety of products.

## 12. SLIME MOLDS

F

**Traits:** Slimy covering on logs, trees, and moist soil; they are sometimes covered with small flaglike fruiting bodies. During part of its life, the slime mold slowly rolls along like an amoeba and leaves a trail of slime.

**Habitat:** Wet, shaded locations in forests

**Foods:** Bacteria and other microscopic organisms

**Eaten by:** Unknown

**Do You Know?** The classification of slime molds is still being debated. Some scientists consider them fungi, while others consider them to be protists. This organism has nine distinct life cycles.

## 9. FLAGELLATES

W

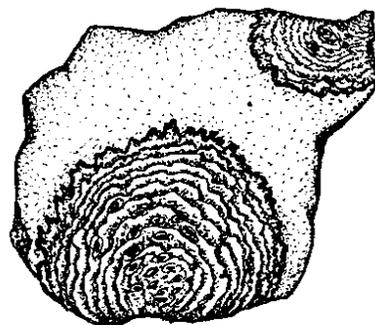
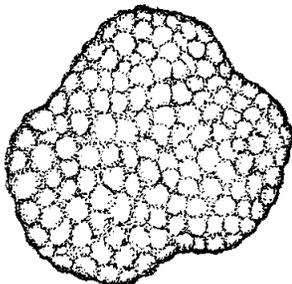
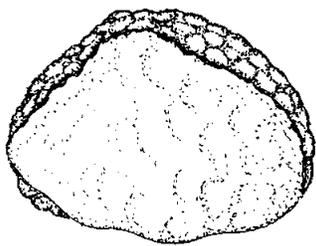
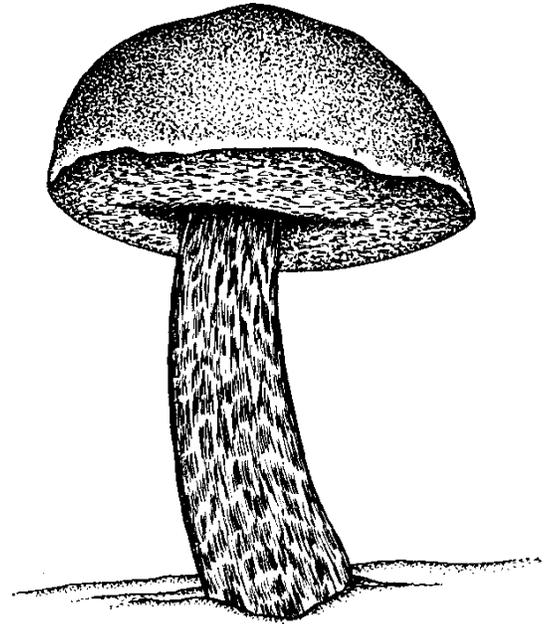
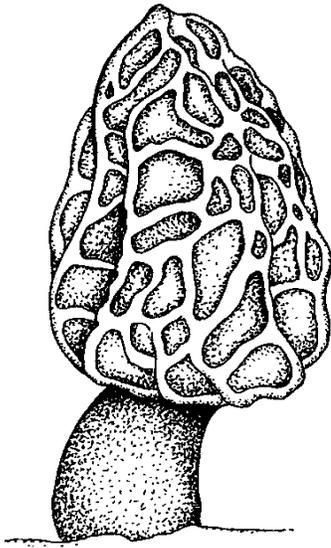
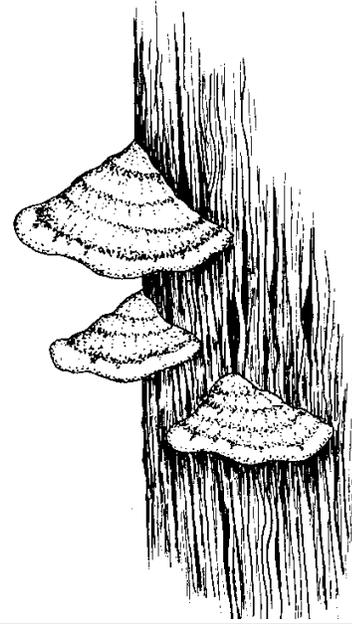
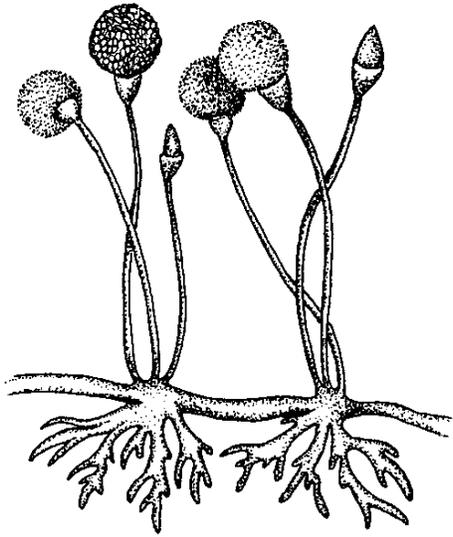
**Traits:** Microscopic, single-celled organisms (protists) with long, whiplike structures called flagella, which help them move

**Habitat:** Fresh and salt water; some are parasites on other organisms.

**Foods:** Produce their own food through photosynthesis, some eat other microscopic organisms.

**Eaten by:** Zooplankton, small crustaceans, larvae of invertebrates, fish

**Do You Know?** Red tides that can kill thousands of fish are caused by vast swarms of certain kinds of flagellates.



## 16. SHELF FUNGI

F

**Traits:** Fungi with a fruiting body (called a conk) that grow from trees or logs and form a shelflike structure; the conks grow and produce spores each year.

**Habitat:** Old trees, logs, or other wood

**Foods:** Dead wood

**Eaten by:** Millipedes and a variety of insects

**Do You Know?** Some species of shelf fungi are parasites on living trees. They slowly decay the dead heartwood of the tree and may also attack living parts of the tree. Eventually the tree may be weakened and killed.

## 13. MOLDS, MILDEWS, AND RUSTS

F,T

**Traits:** These fungi look like a fine powder, fuzz, or furry coating on plant parts or animal droppings. Molds, mildews, and rusts can also be abnormal growths.

**Habitat:** Dead plants or waste materials; certain kinds can grow on living plants or insects.

**Foods:** Dead plant materials (rarely wood); some species live as parasites on plants or insects.

**Do You Know?** Some of these fungi, particularly rusts, are parasites of plants and cause abnormal growths such as galls or witches brooms.

## 17. MUSHROOMS

F,T

**Traits:** Fungi with fruiting bodies that consist of stalks and caps; the undersides of the caps are made of many slits or tubes.

**Habitat:** Soil, leaf litter, rotting logs, and dead vegetation

**Foods:** Mainly dead plant material and animal wastes

**Eaten by:** Lemmings, ground squirrels, fungus gnats, caribou, humans

**Do You Know?** Most fungi that grow in tundra areas, such as the gilled mushroom, are able to grow at temperatures lower than can those that grow in warmer environments.

## 14. MORELS

F

**Traits:** Mushroomlike fungi that look like natural sponges on stalks; the hollow dome-shaped cap is gray-brown to sandy colored and looks like a honeycomb.

**Habitat:** Varies by species, favor spruce forests and old burns

**Foods:** Dead plant material and animal wastes

**Eaten by:** Squirrels, voles, mice, humans

**Do You Know?** Morels are considered one of the finest edible mushrooms and are much sought after in North America and Europe. They grow abundantly in the spring following a forest fire.

## 18. CRUSTOSE LICHENS

F,T

**Traits:** One of four types of lichen, this type looks like a thin crust on rocks and trees.

**Habitat:** Forest and tundra environments

**Foods:** Make their own food by photosynthesis

**Eaten by:** Mites, nematodes

**Do You Know?** Lichens are made of two kinds of organisms: algae and fungi. Algae capture energy through photosynthesis while fungi provide a protective shell and also help absorb water from rain. Sometimes they absorb pollution.

## 15. TRUFFLES

F

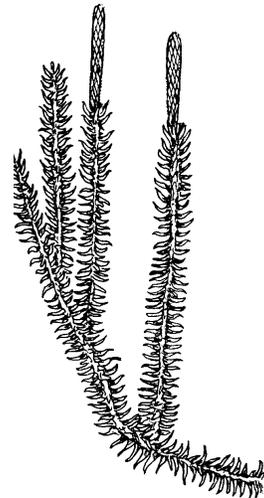
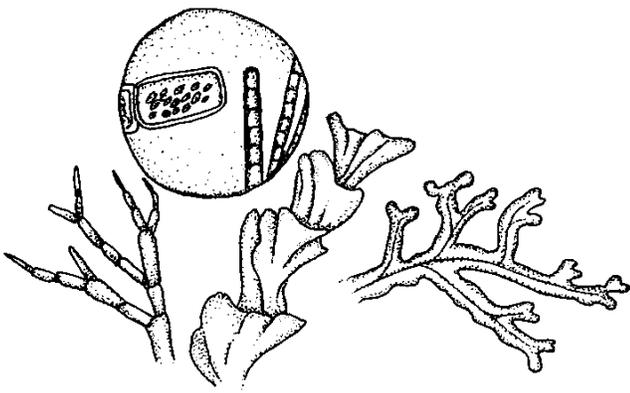
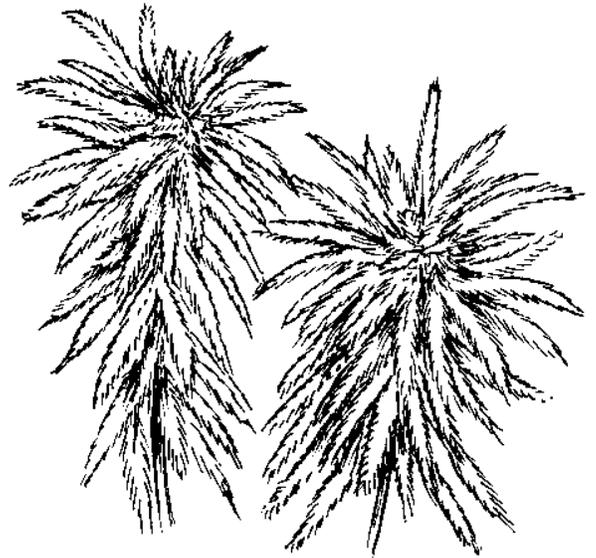
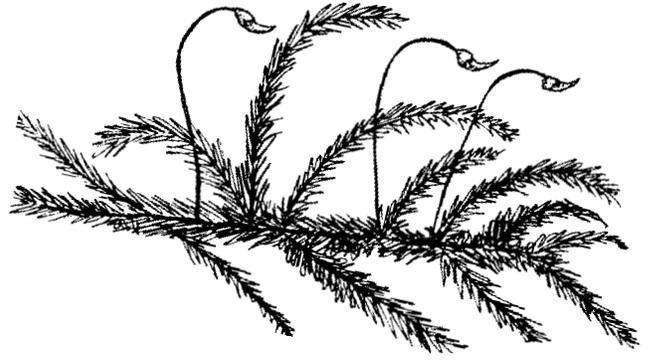
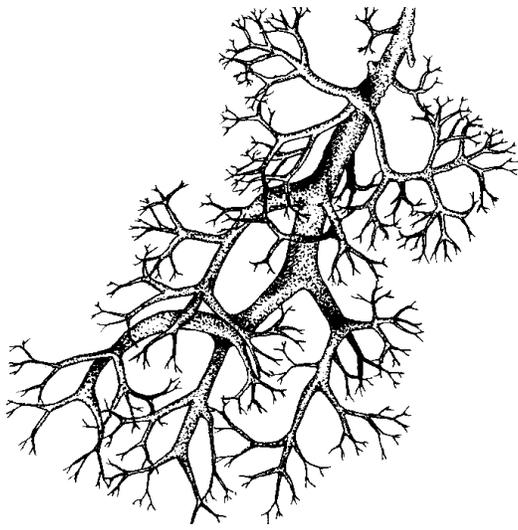
**Traits:** Fungi that produce underground fruiting bodies that look like spongy balls

**Habitat:** Underground in forests, usually in symbiosis with a tree

**Foods:** Sugar supplied by the tree or other plant it associates with and on minerals absorbed from the soil

**Eaten by:** Flying squirrels, voles, humans

**Do You Know?** These fungi help trees and other plants obtain the minerals they need to grow. The organisms that eat them spread their spores throughout the forest.



## 22. MOSSES

F,T

**Traits:** Small plants, either flat and scalelike or with stems and leaves; lack water-conducting cells and true roots; they reproduce by spores that grow in caplike structures, or capsules, at the tips of long stalks.

**Habitat:** Moist soil, rocks, and logs

**Foods:** Make their own by photosynthesis

**Eaten by:** Springtails, mites

**Do You Know?** Mosses have the ability to alternate periods of growth and dormancy, which allows them to survive harsh environments.

## 19. FRUTICOSE LICHENS

F,T

**Traits:** This member of the Fungi Kingdom looks like fine hairs or branches growing on trees and rocks.

**Habitat:** Forest and tundra environments

**Foods:** Lichens make their own food by photosynthesis.

**Eaten by:** Caribou, lemmings, mites, nematodes

**Do You Know?** Lichens are one of the most common climax species that dominates undisturbed tundra and boreal forest habitats. They are two kinds of organisms (fungi and algae) living in symbiosis.

## 23. SPHAGNUM MOSS

F,T,W

**Traits:** A soft-stemmed moss with featherlike leaves, varying from white to green to pink

**Habitat:** Wet sites in coastal wetlands, muskegs, tundra, and forests; often forms thick, spongy mats that cover large areas

**Foods:** Makes its own by photosynthesis

**Eaten by:** Certain small invertebrate animals and microscopic organisms

**Do You Know?** Sphagnum mosses have been used as a substitute for gauze in surgical dressings and as diaper lining by Native Americans.

## 20. FOLIOSE LICHENS

F,T

**Traits:** This member of the Fungi Kingdom resembles curly leaves growing on trees and rocks. It is two kinds of organisms (fungi and algae) living in symbiosis.

**Habitat:** Forest and tundra environments

**Foods:** Lichens make their own food by photosynthesis.

**Eaten by:** Lemmings, mites, nematodes

**Do You Know?** Lichens are able to survive years of unfavorable conditions by becoming dormant. Some specimens have been revived after 100 years of dormancy.

## 24. CLUB MOSSES

F,T

**Traits:** Ground cover plants with stems growing upward or along the ground; tiny, single-veined leaves in pairs or spirals around the stem; the spores develop in conelike structures located at the tips of upright stalks.

**Habitat:** Moist soils in forest and tundra environments

**Foods:** Make their own by photosynthesis

**Eaten by:** Springtails, mites

**Do You Know?** Club mosses become inactive during harsh living conditions and then resume activities when living conditions are good. Despite their name, club mosses are more closely related to ferns than to mosses.

## 21. GREEN ALGAE

W

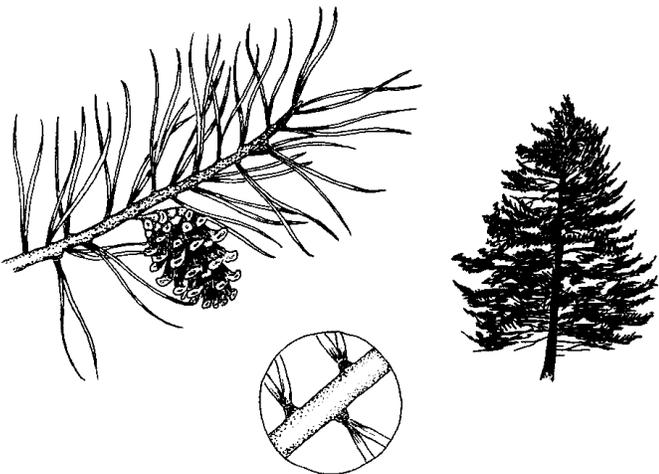
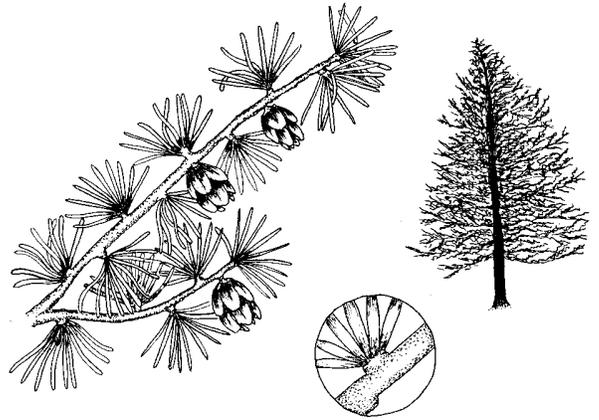
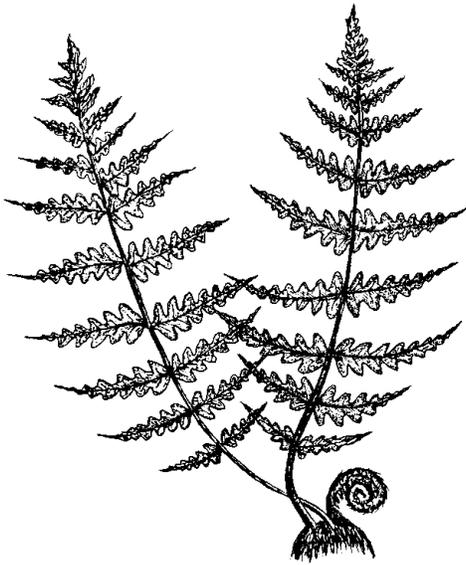
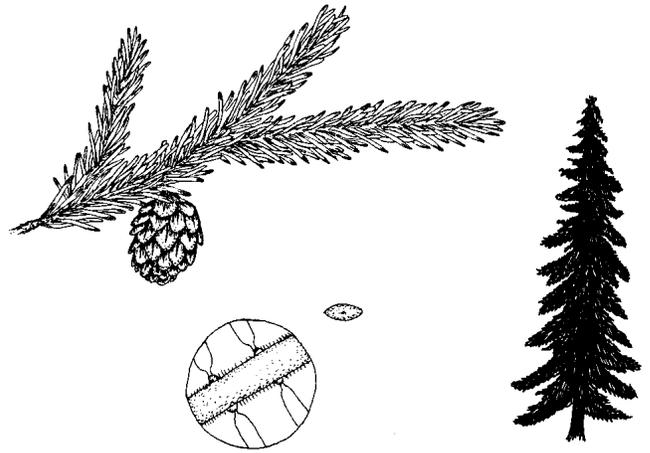
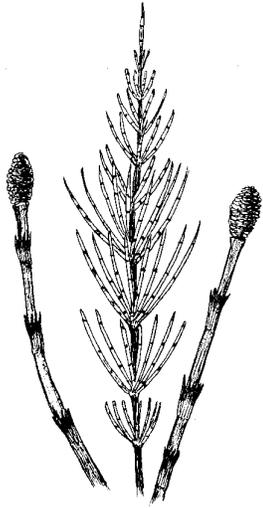
**Traits:** Green algae are single-celled organisms capable of photosynthesis. They occur individually, in filaments, or in colonies. The cells store food in the form of starch.

**Habitat:** Green algae can grow wherever water occurs. Some grow in damp or moist soil or in tree bark.

**Foods:** Make their own by photosynthesis

**Eaten by:** Protozoans, roundworms, small crustaceans, certain mollusks, other aquatic invertebrates, fish, geese, ducks

**Do You Know?** Some algae join with certain fungi to form lichens.



## 28. BLACK SPRUCE

F,W

**Traits:** Small conifer (evergreen) tree with short sparse branches that often droop; needles are long, stiff, blue-green and occur on all sides of the twig; the twigs are covered with very short, reddish hairs.

**Habitat:** Wet bogs, muskegs, and lake margins throughout central, eastern, and southern Alaska

**Foods:** Makes its own by photosynthesis

**Eaten by:** Red squirrels, porcupines, beetles, horntails, aphids, carpenter ants, crossbills, redpolls

**Do You Know?** The stiff-scaled cones of the black spruce stay on the tree for many years and are opened by fire or years of drying in the sun.

## 25. HORSETAIL

F,T,W

**Traits:** Ground-cover plant with distinctly jointed stems that grow from an underground rhizome

**Habitat:** Wet, moist, and dry soils in forests, tundra, and wetlands

**Foods:** Makes its own by photosynthesis

**Eaten by:** Bears, moose, grouse

**Do You Know?** Horsetail stems contain silica (an element in sand). They can be used like a scouring brush to clean pots and pans. Horsetails were among the dominant plants when dinosaurs roamed the earth; many kinds grew to tree size then. Today, only one species grows more than 6 1/2 feet (2 m) tall.

## 29. TAMARACK

F,W

**Traits:** A small- to medium-sized conifer tree with dark gray bark; the leaves are needles that are deciduous (shed in fall) and grow in clusters of 12-20.

**Habitat:** Muskegs throughout central and parts of western Alaska

**Foods:** Makes its own by photosynthesis

**Eaten by:** Porcupines eat the inner bark. Red squirrels cut cones and seeds. Voles and some birds eat the seeds.

**Do You Know?** Tamarack is the only Alaska conifer that sheds its leaves in winter. A certain species of mushroom, the yellow-pored bolete mushroom, grows only with tamaracks.

## 26. FERNS

F,T

**Traits:** Plants with stems, leaves, and roots; most have stems that grow underground; leaves (called fronds) are usually divided into very fine parts; reproduces by spores on the undersides of the leaves or on special fronds

**Habitat:** Moist habitats; most common in coastal forests

**Foods:** Make their own by photosynthesis

**Eaten by:** Grouse, deer, hares, springtails, slugs, humans (in early spring)

**Do You Know?** Young blades or fronds, called fiddleheads, first appear curled at the base of the plant and are edible.

## 30. WHITE SPRUCE

F

**Traits:** Conifer tree with four-angled, sharply pointed needles with white lines on all sides, hairless twigs, and thin gray bark; cones are long, hang downward, and fall off at maturity.

**Habitat:** Well-drained soils in boreal forest

**Foods:** Makes its own by photosynthesis

**Eaten by:** Spruce grouse, porcupines, crossbills, red squirrels, bark and longhorn beetles, horntails, certain moths and flies, spruce aphids, carpenter ants, redpolls, siskins

**Do You Know?** White spruce is used extensively in Alaska for log cabins.

## 27. LODGEPOLE PINE

F,W

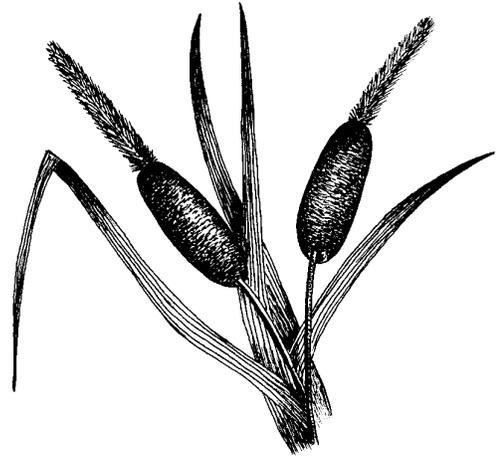
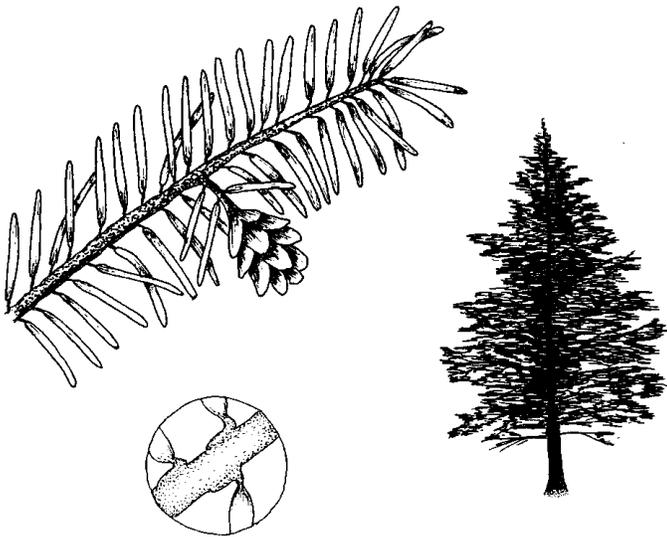
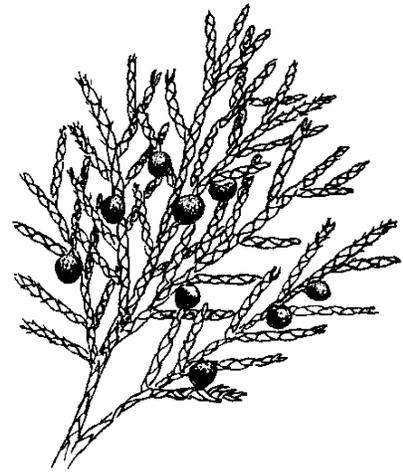
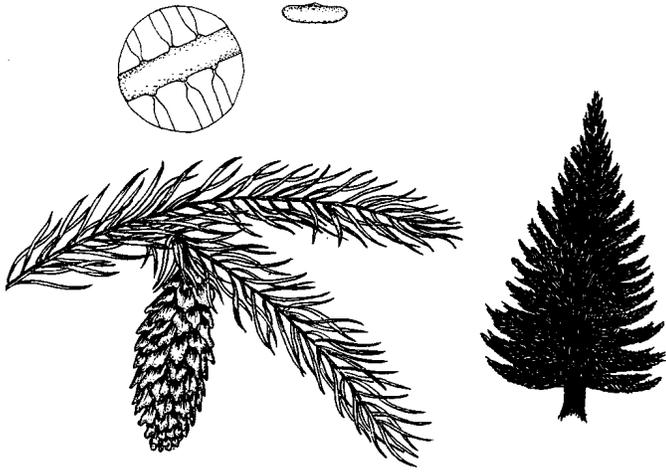
**Traits:** A low-spreading or scrubby conifer tree that has two needles per bundle; sometimes grows as a shrub in poor soil

**Habitat:** Open muskegs and along open lake shores in southeast Alaska; intolerant of shade

**Foods:** Makes its own by photosynthesis

**Eaten by:** The seeds are eaten by pine grosbeaks and squirrels. Porcupines eat the bark. Deer and moose browse younger trees.

**Do You Know?** The lodgepole pine along with its close relative, the shore pine, are the only true pines naturally found in Alaska.



### 34. ALASKA CEDAR

F

**Traits:** Conifer tree with scalelike, flattened leaves in sprays, drooping branches, and gray to brown bark with shreds and fissures; the round cones have four to six scales, each with a pointed knob in its center.

**Habitat:** Wet, cool climate of coastal rainforest

**Foods:** Makes its own by photosynthesis

**Eaten by:** Wood-boring insects, aphids, other herbivorous insects

**Do You Know?** Natives of southeast Alaska made their canoe paddles from this durable, aromatic wood.

### 31. SITKA SPRUCE

F

**Traits:** Conifer tree with sharply pointed needles, flattened with slight ridge; hairless twigs; gray to purplish-brown bark; cones with stiff, long scales fall off every year.

**Habitat:** Well-drained soils in wet, moderate climates of coastal rainforest

**Foods:** Makes its own by photosynthesis

**Eaten by:** Red squirrels, crossbills, porcupines, deer mice, bark beetles, horntails, certain moths and flies, spruce aphids, carpenter ants

**Do You Know?** Sitka spruce is the largest and one of the most valuable trees in Alaska. It is also the state tree.

### 35. CATTAIL

W

**Traits:** Tall plant with broad leaves on a central, reddish-brown spike

**Habitat:** Shallow water and marshes in Interior Alaska

**Foods:** Makes its own by photosynthesis

**Eaten by:** Muskrats

**Do You Know?** Called “the supermarket of the marsh,” all parts can be eaten by humans.

### 32. WESTERN HEMLOCK

F

**Traits:** Conifer tree with needles arranged in two rows along a hairy twig; needles have two white lines on the underside; reddish-gray outer bark with red inner bark

**Habitat:** Coastal forests on deep, well-drained soil at low elevations

**Foods:** Makes its own by photosynthesis

**Eaten by:** Deer, red squirrel, blue grouse, crossbills, pine siskins, bark beetles, horntails, certain moths and flies, spruce aphids, sawflies

**Do You Know?** Alaska Indians made coarse bread from the inner bark of this tree and of the shore pine tree.

### 36. BURR REED

T,W

**Traits:** Plant with long, flat leaves whose flowers and seeds occur in round, burrlike clusters

**Habitat:** Deep or shallow water from alpine to lowland areas

**Foods:** Makes its own by photosynthesis

**Eaten by:** Ducks, swans, sandhill cranes, common snipes, muskrats

**Do You Know?** The shape of the flower heads gives this plant its name. Male and female flowers occur in separate burrs on the same plant.

### 33. MOUNTAIN HEMLOCK

F

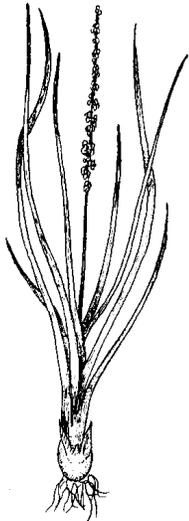
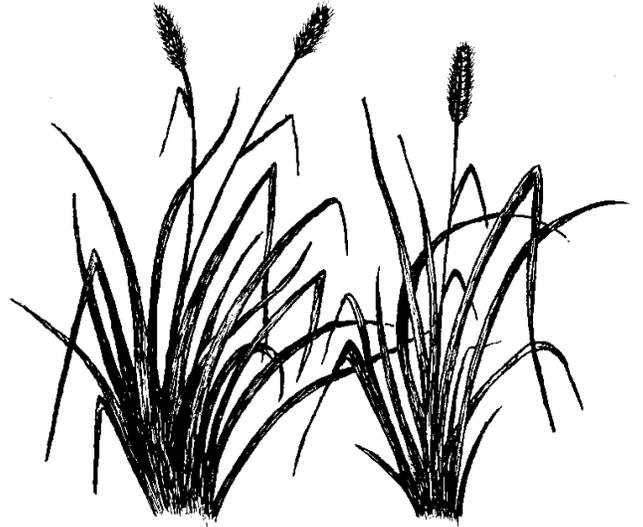
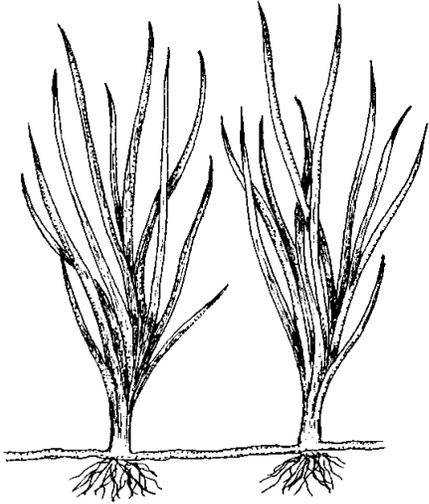
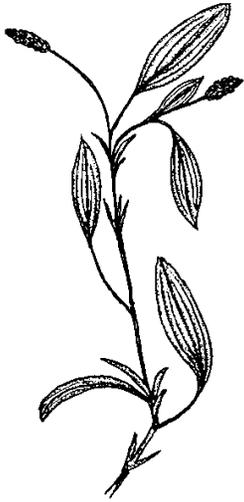
**Traits:** Conifer tree with rounded, blunt needles; fine hair on twigs; gray to dark brown bark; thin-scaled cones hang down

**Habitat:** Wet, moderate climates on well-drained and poorly drained sites of the coastal rainforest

**Foods:** Makes its own food by photosynthesis.

**Eaten by:** Red squirrels, crossbills, porcupines, larvae of bark and longhorn beetles, certain moths and flies, sawflies

**Do You Know?** This tree's scientific name honors the German naturalist Karl Heinrich Mertens who discovered it near Sitka, Alaska, in 1827.



## 40. PENDENT GRASS

T,W

**Traits:** Emergent, aquatic grass (plant) with long, narrow leaves; small, red-brown flowers occur in one to seven tight clusters (spikelets) at the top of a tall stalk.

**Habitat:** Shallow water of wet tundra and along lake shores and stream banks

**Foods:** Makes its own by photosynthesis

**Eaten by:** Geese, ducks, certain insects, snails other aquatic invertebrates; it is a major spring forage for brown and black bears.

**Do You Know?** Loons and grebes use the leaves and hollow stems of this grass to build nests that float on the water.

## 37. PONDWEED

W

**Traits:** Aquatic plant with floating leaves having parallel veins; the leaves are submerged on young plants and are long and narrow in most species. Flowers occur in a spike.

**Habitat:** Shallow to deep water in lakes and ponds throughout Alaska

**Foods:** Makes its own by photosynthesis

**Eaten by:** Insect larvae, snails, muskrat, waterfowl

**Do You Know?** There are about 40 species of pondweed in North America, almost all of which are important either as food or shelter for animals.

## 41. GRASSES

F,T,W

**Traits:** Ground cover plants with long, narrow leaves

**Habitat:** Wet, moist, and dry soils depending on the species

**Foods:** Make their own food by photosynthesis

**Eaten by:** Bison, lemmings, voles, ground squirrels, marmots, goats, sheep; the seeds are eaten by snow buntings, longspurs, redpolls.

**Do You Know?** Their long, narrow leaf shape is less likely to be shredded or ripped by strong winds.

## 38. EELGRASS

W

**Traits:** A marine (salt water) plant with slender, branched, green stems and leaves with parallel veins; separate male and female flowers grow on the same plant.

**Habitat:** Shallow estuaries and lagoons around the world

**Foods:** Makes its own by photosynthesis

**Eaten By:** Ducks, geese, fish, a variety of marine invertebrates (including mollusks and crustaceans), humans

**Do You Know?** Eelgrass is the primary food for brant geese on their staging areas and wintering grounds.

## 42. AGRICULTURE GRAINS

W

**Traits:** Grains are actually types of grasses that once grew wild. They have narrow leaves, small green flowers, and round, hollow stems.

**Habitat:** Large agriculture fields throughout the world in regions of moderate climates; barley is grown in Alaska.

**Foods:** Make their own by photosynthesis

**Eaten by:** Bison; many waterfowl eat shoots and seeds, especially during migration and wintering. People worldwide depend upon grains for bread, cereal, and other foods.

**Do You Know?** Some national wildlife refuges grow special crops of grains just for waterfowl to eat during winter.

## 39. ARROWGRASS

W

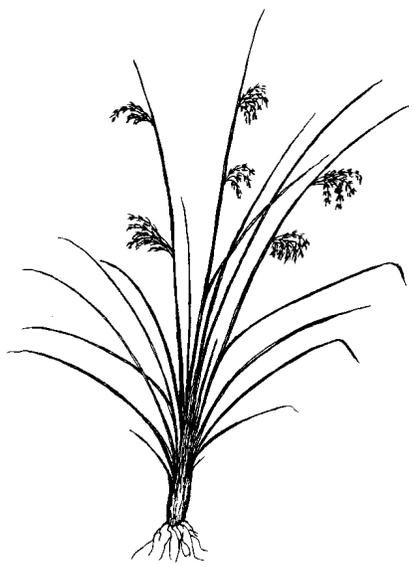
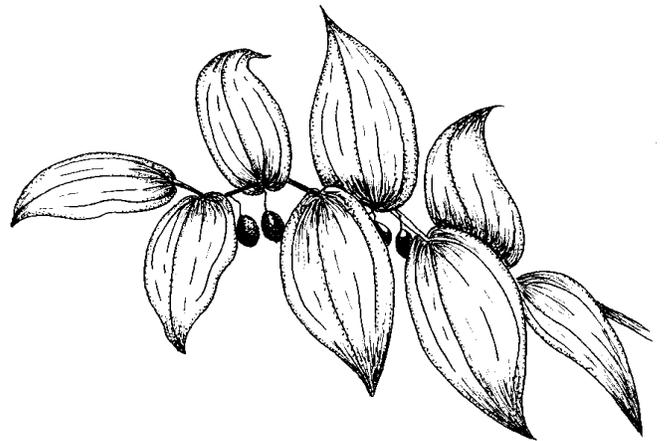
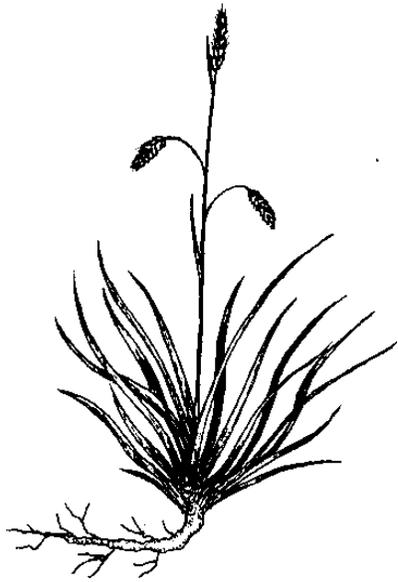
**Traits:** An emergent, aquatic plant with long, narrow leaves that rise from a horizontal root; the rounded fruits are loosely arranged along the stem. May grow 4 to 35 inches (10-89 cm) tall, but they are usually small. This plant contains small amounts of cyanide.

**Habitat:** Fresh or salt water wetlands

**Foods:** Makes its own by photosynthesis

**Eaten by:** Ducks, geese, some aquatic invertebrates

**Do You Know?** The same species of arrowgrass that occur in Alaska also grow in Canada, Europe, Asia, and Siberia.



#### 46. TWISTED STALK

F

**Traits:** Ground-cover plant with long leaves emerging from stem on alternate sides; its pink bell-like flowers grow beneath the leaves, and its berries are orange to dark red.

**Habitat:** Coastal forest sites with open canopies

**Foods:** Makes its own by photosynthesis

**Eaten by:** Moth and butterfly larvae, leafhoppers, true bugs, aphids, slugs, snails, mites, grouse, pine grosbeaks, voles, moose, hares, bears

**Do You Know?** The stem of this plant changes angles of growth between leaves to form a staircase shape.

#### 43. SEDGES

T,W

**Traits:** Herbs with long, narrow leaves that have parallel veins and solid, usually triangular, stems ("sedges have edges" to their stems); the tiny, inconspicuous flowers grow in clusters.

**Habitat:** Shallow water, mud, or moist soil of fresh or salt water wetlands

**Foods:** Make their own by photosynthesis

**Eaten by:** Caribou, muskoxen, ground squirrels, lemmings, voles, geese, seed-eating birds such as snow buntings, longspurs, rosy finches

**Do You Know?** The long, narrow leaf shape of sedges reduces fraying by strong winds.

#### 47. WILD IRIS

W

**Traits:** Tall plant with broad, grasslike leaves having parallel veins and a thick, round flower stalk; flowers have three large, purple-violet petals.

**Habitat:** Bogs, meadows, shorelines, riverbanks

**Foods:** Makes its own by photosynthesis

**Eaten by:** Unknown; may be poisonous to most animals

**Do You Know?** This plant is poisonous and causes vomiting.

#### 44. COTTON GRASS

T,W

**Traits:** Herb with long, narrow leaves and solid stems; tiny, inconspicuous flowers grow in tight clusters. Tufts of white cottonlike bristles are present on the seeds.

**Habitat:** Wet tundra, muskegs, coastal wetlands, stream or lake margins

**Foods:** Makes its own by photosynthesis

**Eaten by:** Caribou, muskoxen, lemmings, voles, geese, seed-eating birds such as longspurs, redpolls, snow buntings

**Do You Know?** Tussocks formed by cotton grass provide shelter and nest sites for small tundra birds and mammals.

#### 48. WILLOWS

F,T,W

**Traits:** Broadleaf (deciduous) tree or shrub with long, narrow leaves; both male and female flowers occur in soft, fuzzy catkins.

**Habitat:** Wetlands, forests, and tundras throughout northern regions of the world; prefer moist or wet sites

**Foods:** Make their own by photosynthesis

**Eaten by:** Muskoxen, caribou, moose, snowshoe hares, ptarmigan, redpolls, beaver

**Do You Know?** Willow bark contains salicylic acid, the active ingredient in aspirin, and was used as a painkiller at least 2,400 years ago.

#### 45. RUSHES

T,W

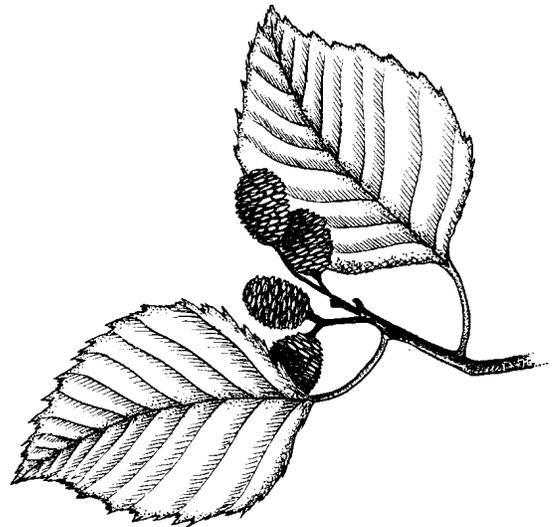
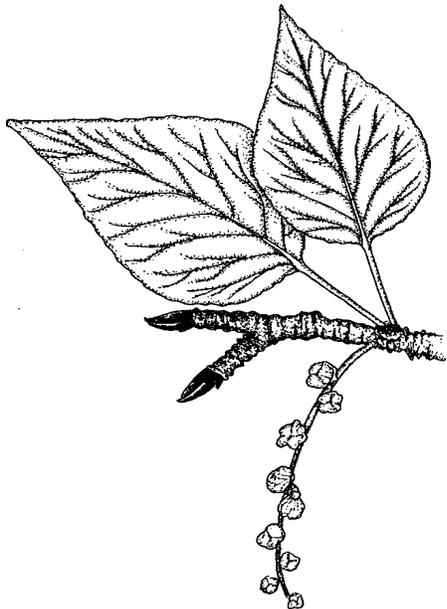
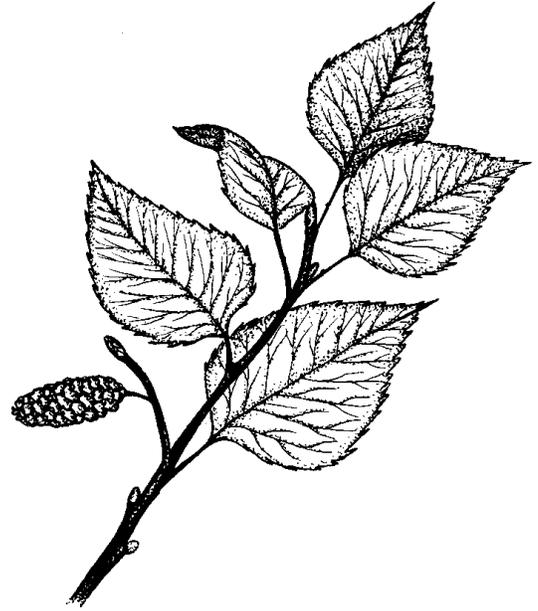
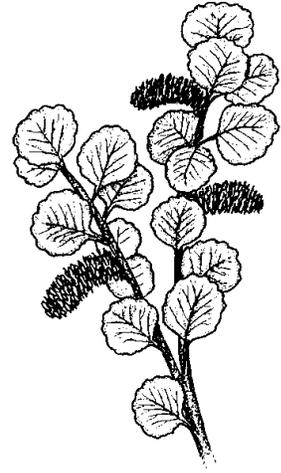
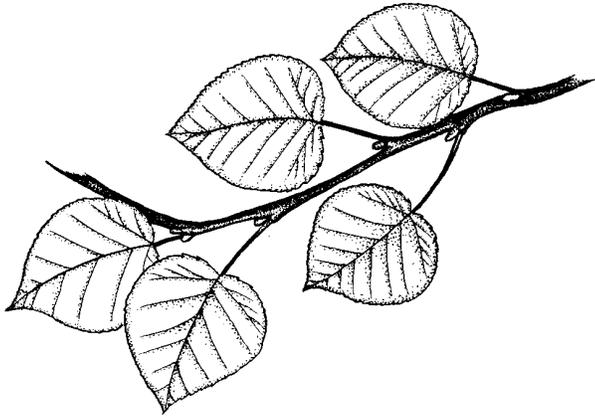
**Traits:** Emergent, aquatic plants with round leaves that have parallel veins; the tiny flowers have three greenish petals and grow in clusters along the side of the leaves.

**Habitat:** Marshes, wet tundra, riverbanks, estuaries, and ponds in temperate, subarctic, and arctic regions

**Foods:** Make their own by photosynthesis

**Eaten by:** Some aquatic invertebrates; seeds are eaten by seed-eating birds.

**Do You Know?** Rushes compete with other aquatic plants and sometimes crowd out other species.



## 52. DWARF BIRCH

F,T,W

**Traits:** A low, broadleaf shrub with small, round deciduous leaves; male and female flowers grow on the same plant in catkins.

**Habitat:** Moist soil, muskegs, rocky alpine slopes, tundra

**Foods:** Makes its own by photosynthesis

**Eaten by:** Ptarmigan, caribou, muskoxen, and seed-eating birds such as redpolls, longspurs, snow buntings

**Do You Know?** This shrub can grow horizontally to avoid the wind and to take advantage of warm soil temperatures. Its perennial growth allows it to survive and reproduce despite the short growing season in tundra regions.

## 49. ASPEN

F

**Traits:** Broadleaf (deciduous) tree with round leaves sharply pointed at the tip; whitish or greenish-gray bark containing black scars and knots; the male and female flowers are on different trees producing cottony seeds.

**Habitat:** Well-drained soils on warm slopes

**Foods:** Makes its own by photosynthesis

**Eaten by:** Moth larvae, aphids, true bugs, leafhoppers, mites, pine grosbeaks, ruffed grouse, moose, snowshoe hares

**Do You Know?** Aspen trees often grow in dense pure stands, especially following forest fires. They live about 80-100 years.

## 53. PAPER BIRCH

F

**Traits:** Broadleaf (deciduous) tree with toothed leaf edges and white, smooth bark; the male and female flowers appear on the same twig, and the seeds develop on a conelike fruit.

**Habitat:** Boreal forests; grows best on sites without permafrost

**Foods:** Makes its own by photosynthesis

**Eaten by:** Moth larvae, aphids, metallic wood borers, pine grosbeaks, redpolls, ruffed grouse, moose, hares

**Do You Know?** Birch are generally found in a mixture with white or black spruce, which replace it in the successional sequence after a fire. Birch sap is used to make syrup.

## 50. BALSAM POPLAR

F

**Traits:** Broadleaf (deciduous) tree with spade-shaped leaves having small, rounded teeth; gray bark containing deep furrows; the male and female flowers grow on different trees. The long, egg-shaped seed capsules within long catkins have tiny, cottony seeds.

**Habitat:** Well-drained soils in boreal forests

**Foods:** Makes its own by photosynthesis

**Eaten by:** Aphids, moth larvae, sawflies, true bugs, leafhoppers, moose, snowshoe hares, pine grosbeaks, beaver

**Do You Know?** The wood of balsam poplar is used for boxes, crates, and pulpwood.

## 54. ALDER

F,W

**Traits:** Broadleaf (deciduous) tree with horizontal lines (lenticels) on a smooth, gray bark; the leaf margins are finely toothed, and the fruit is a dark brown cone appearing in groups of three to nine.

**Habitat:** Disturbed sites such as gravel slopes, flood plains, landslides, and along streams and marshes

**Foods:** Makes its own by photosynthesis

**Eaten by:** Deer and moose browse the twigs and leaves. Some birds eat the buds and seeds.

**Do You Know?** Alder roots usually have root nodules that fix nitrogen from the air and enrich the soil. They help other trees grow.

## 51. BLACK COTTONWOOD

F

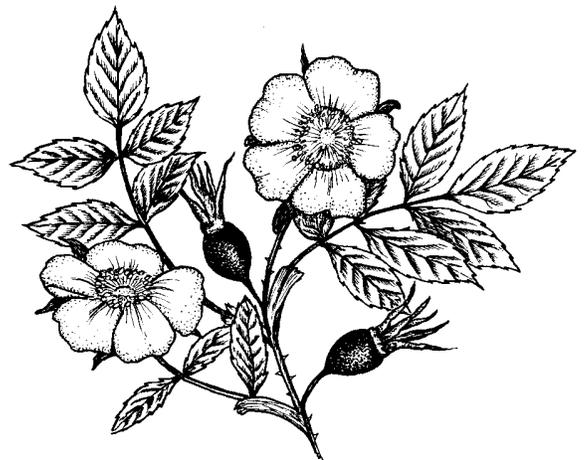
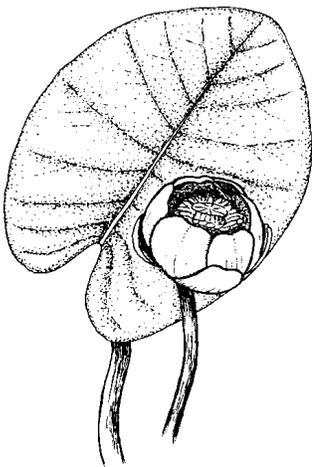
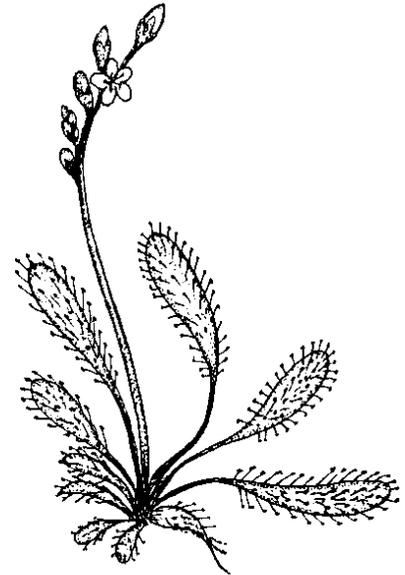
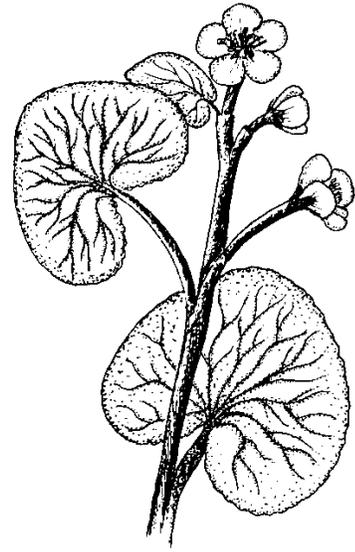
**Traits:** Broadleaf (deciduous) tree with spade-shaped leaves having small, rounded teeth; gray bark containing deep furrows when full-grown; the male and female flowers grow on different trees; round, three-parted seed capsules within long catkins; tiny cottony seeds

**Habitat:** River bottoms in coastal forests

**Foods:** Makes its own by photosynthesis

**Eaten by:** Moth larvae, aphids, leafhoppers, true bugs, blue grouse, pine grosbeaks

**Do You Know?** Black cottonwood is the largest broadleaf tree in Alaska, growing rapidly to heights of 80 to 100 feet (24-30 m) at maturity.



## 58. MARSH MARIGOLD

W

**Traits:** A small herb with shovel-shaped, net-veined leaves and showy yellow flowers

**Habitat:** Wet and moist places

**Foods:** Makes its own by photosynthesis

**Eaten by:** Moose, muskrats, some aquatic invertebrates

**Do You Know?** Marsh marigolds are poisonous when raw, but are edible after careful boiling.

## 55. WATER SMARTWEED

W

**Traits:** Aquatic plant with long petioles (small stem that attaches leaf to a main stem) on oblong, smooth-edged leaves; leaves often tinged with red; pink flowers grow in dense spikes (upright cluster)

**Habitat:** Wetlands, ponds, bogs

**Foods:** Makes its own by photosynthesis

**Eaten by:** Muskrats, moose, ducks, some aquatic invertebrates

**Do You Know?** This plant grows in wetlands of northern areas around the world.

## 59. SUNDEW

W

**Traits:** Small carnivorous plant with sticky glands covering the leaves; the small flowers have five petals.

**Habitat:** Common in muskeg bogs

**Foods:** Makes its own by photosynthesis and eats insects

**Eaten by:** Unknown

**Do You Know?** Sundew plants trap insects on their sticky leaves; the leaves close around the trapped insect and digest it. The nitrogen and phosphorus in an insect's body are valuable nutrients that the sundew needs to produce its flowers.

## 56. MOSS CAMPION

T

**Traits:** A low-growing, densely tufted plant that looks like a small cushion; has short, flat leaves covered with stiff hairs; small pink-purple flowers

**Habitat:** Dry soil in alpine and lowland tundra

**Foods:** Makes its own by photosynthesis

**Eaten by:** Dall sheep, mountain goats

**Do You Know?** The low growth form and cushion shape of this plant allow it to withstand severe winds and to retain heat.

## 60. WILD ROSE

F

**Traits:** Broadleaf shrub with leaves made of three to nine leaflets whose leaves emerge from the stems on alternate sides; stems covered with small thorns and large pink flowers

**Habitat:** Shaded understory of mature boreal forest, in old burn sites, tall shrub thickets, and along beaches

**Foods:** Makes its own by photosynthesis

**Eaten by:** Moth larvae, aphids, pine grosbeaks, grouse, thrushes, hares, mice, humans

**Do You Know?** The fruit of the rose, called rose hips, is one of the richest known food sources of vitamin C.

## 57. YELLOW POND LILY

T,W

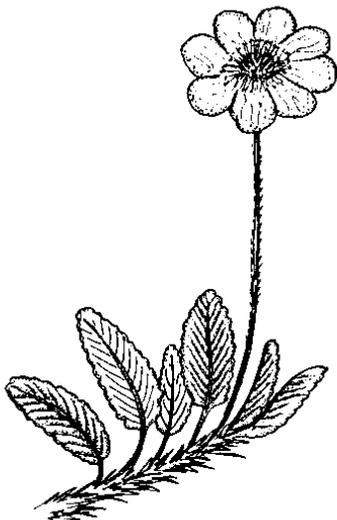
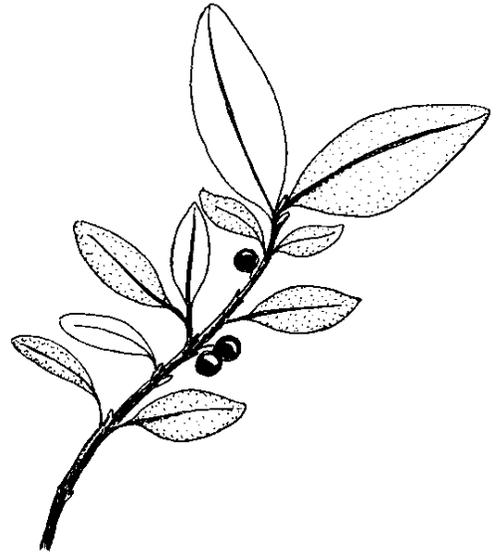
**Traits:** Floating, aquatic plant with large, long-stemmed, heart-shaped floating leaves; its large, yellow flowers have seven to nine petals.

**Habitat:** Ponds and slow streams throughout most of Alaska; bogs and muskegs except in western Alaska and north of the Brooks Range

**Foods:** Makes its own by photosynthesis

**Eaten by:** Roots eaten by muskrats, ducks, and, traditionally, by Alaska Natives.

**Do You Know?** Seeds may be popped like popcorn and served as a cereal or snack.



## 64. MARSH FIVEFINGER

W

**Traits:** A sprawling plant with a woody rootstalk.; leaves are toothed and in separate groups of five to seven leaflets; its flowers are purplish-brown with five pointed petals.

**Habitat:** Very wet meadows, marshes, shallow water, along streams

**Foods:** Makes its own by photosynthesis

**Eaten by:** Unknown

**Do You Know?** Also called marsh cinquefoil.

## 61. MOUNTAIN ASH

F

**Traits:** Broadleaf (deciduous) tree with oblong, toothed leaves, each made of 9-11 leaflets; smooth gray bark, red berries, and showy flowers in large clusters

**Habitat:** Moist, cool climates in coastal forests

**Foods:** Makes its own by photosynthesis

**Eaten by:** Aphids, true bugs, leafhoppers, moth larvae; berries are eaten by pine grosbeaks, waxwings, thrushes, and jays. The leaves and buds are a favorite of moose.

**Do You Know?** The fruits from this tree are eaten by many birds, especially in winter.

## 65. SOAPBERRY

F

**Traits:** Broadleaf shrub with oval leaves growing in pairs (opposite) along the stem and covered with reddish-brown hairs on the underside; has small, yellow flowers and red to yellow berries

**Habitat:** Dry, well drained, woody places near rivers and lakes

**Foods:** Makes its own by photosynthesis

**Eaten by:** Bears, grosbeaks, waxwings, grouse, insects such as aphids, larval moths, butterflies

**Do You Know?** The raw berry of this plant is very bitter because of the presence of "saponin," a chemical also found in detergents.

## 62. RASPBERRY AND SALMONBERRY

F

**Traits:** Broadleaf shrubs with leaves made of three leaflets, toothed along edges; showy white or pink flowers; yellow to red fruit of many small seeds encased in fleshy coats

**Habitat:** Moist, cool forest climates

**Foods:** Make their own by photosynthesis

**Eaten by:** Aphids, true bugs, leafhoppers, moth larvae, slugs, grouse, grosbeaks, jays, waxwings, thrushes, crows, sparrows, voles, deer mice, deer, moose, bears, hares, foxes, marten, humans

**Do You Know?** The fruit from these plants are delicious eaten raw and make a very good jam.

## 66. FIREWEED

F

**Traits:** Herb (plant) with long, narrow leaves on a stalk, many reddish-purple flowers along the top of its stem, and cottony seeds

**Habitat:** Disturbed soils and forests with open canopies that allow plenty of sunlight to reach the ground

**Foods:** Makes its own by photosynthesis

**Eaten by:** Moth larvae, aphids, gall aphids, certain flies, true bugs, leafhoppers, slugs, redpolls, sparrows, moose, hares, bears

**Do You Know?** Fireweed is one of the first plants to appear after a fire, sometimes just a few days following a fire. People eat fireweed honey.

## 63. DRYAS

F,T

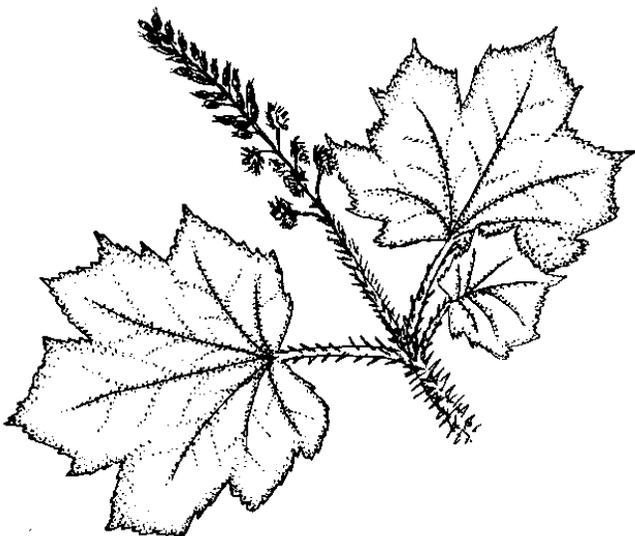
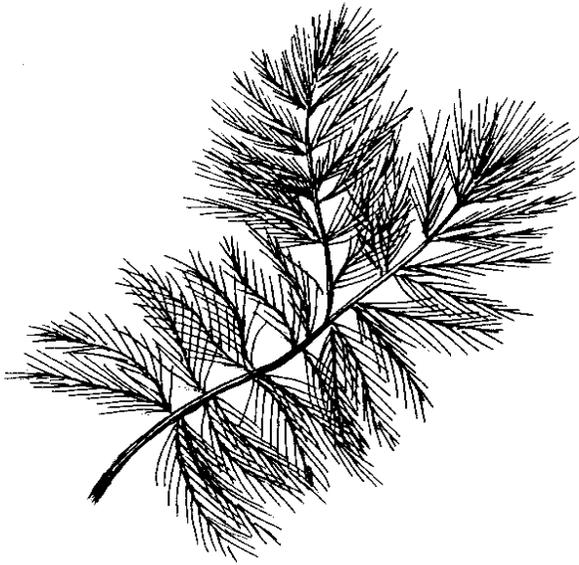
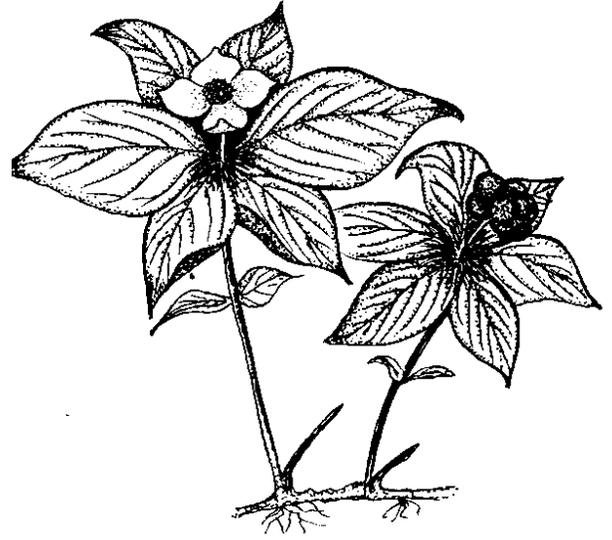
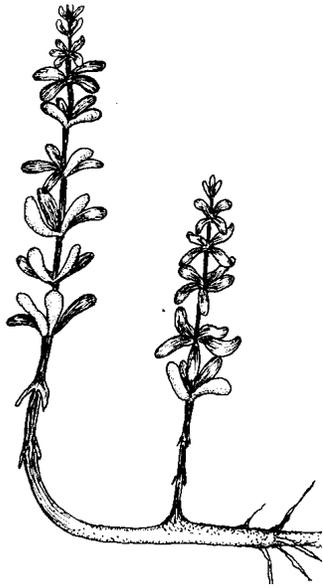
**Traits:** A low-growing, evergreen, herbaceous shrub with narrow, sometimes wavy-edged, leaves; this dwarf plant often appears matted.

**Habitat:** Dry soil of boreal forest and tundra

**Foods:** Makes it own by photosynthesis

**Eaten by:** Caribou, lemmings, ground squirrels, Dall sheep

**Do You Know?** The small, leathery leaves of dryas lose less water than do other kinds of leaves and are more resistant to winds.



## 70. BUNCHBERRY

F

**Traits:** Ground cover plant with four to six oval-shaped leaves arranged in a circle around a central flower cluster; tiny flowers surrounded by white petal-like bracts; clusters of red berries

**Habitat:** Mature and old-growth coastal forests, boreal forests, subalpine forests

**Foods:** Makes its own by photosynthesis

**Eaten by:** Aphids, moth larvae, true bugs, leafhoppers, pine grosbeaks, thrushes, sparrows, red squirrels, voles, mice, deer

**Do You Know?** This plant depends on mycorrhizal fungi to help it obtain soil nutrients and on insects to pollinate its flowers.

## 67. MARE'S TAIL

W

**Traits:** Emergent, aquatic plants with 6-12 pale green leaves in a whorl (circle) around the stem; its flowers grow between the stem and leaf.

**Habitat:** In Alaska, one species grows in shallow running water, one in mountain streams, and one in estuaries.

**Foods:** Makes its own by photosynthesis

**Eaten by:** Ducks, certain sandpipers, some aquatic invertebrates

**Do You Know?** Only a few species of mare's tail exist; they occur in wetlands worldwide.

## 71. SKUNK CABBAGE

F

**Traits:** Herb (plant) with large leaves having smooth edges; its flowers grow on a spike surrounded by a bright yellow, modified leaf. It produces its own heat by a chemical reaction to melt snow, allowing its leaves to quickly emerge in the spring.

**Habitat:** Wet, shaded locations in coastal forests

**Foods:** Makes its own by photosynthesis

**Eaten by:** Slugs, bears, deer

**Do You Know?** Skunk cabbage depends upon flies to pollinate its flowers and attracts these pollinators with a skunklike odor.

## 68. WATER MILFOIL

W

**Traits:** Emergent, aquatic plant with finely divided leaves that form a circle around the stem; its flowers grow on a spike that sticks above water.

**Habitat:** Shallow, slow-moving or still waters

**Foods:** Makes its own by photosynthesis

**Eaten by:** Muskrats, ducks, some shorebirds

**Do You Know?** The male flowers have larger petals than do the female ones, and both male and female flowers grow on the same plant.

## 72. CROWBERRY

F,T

**Traits:** Hardy, low-growing evergreen shrub whose fruit is an edible blue-black berry

**Habitat:** Moist or wet ground in alpine and lowland tundra and boreal forests

**Foods:** Makes its own food by photosynthesis

**Eaten by:** Berries eaten by lemmings, voles, geese, plovers, snow buntings, longspurs, rosy finches, humans

**Do You Know?** The small, wax-coated leaves are resistant to drying by wind and cold. This plant reduces its exposure to the wind by growing close to the ground. Crowberry is a perennial.

## 69. DEVIL'S CLUB

F

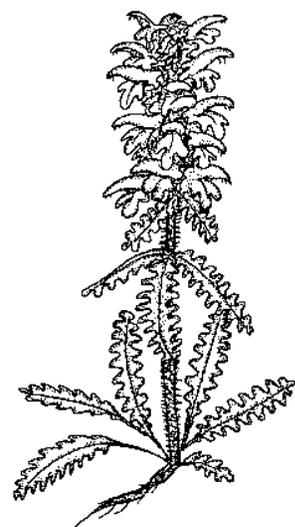
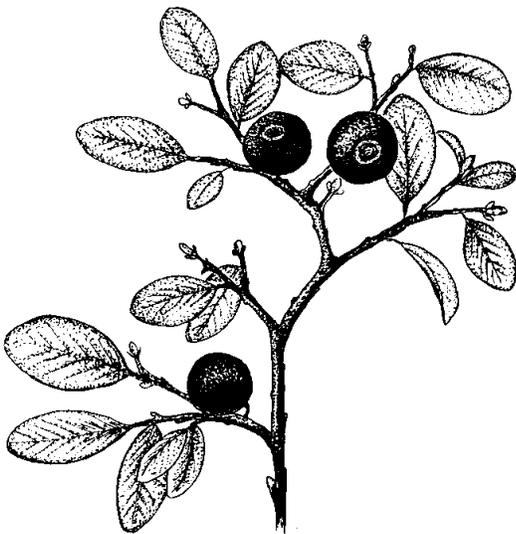
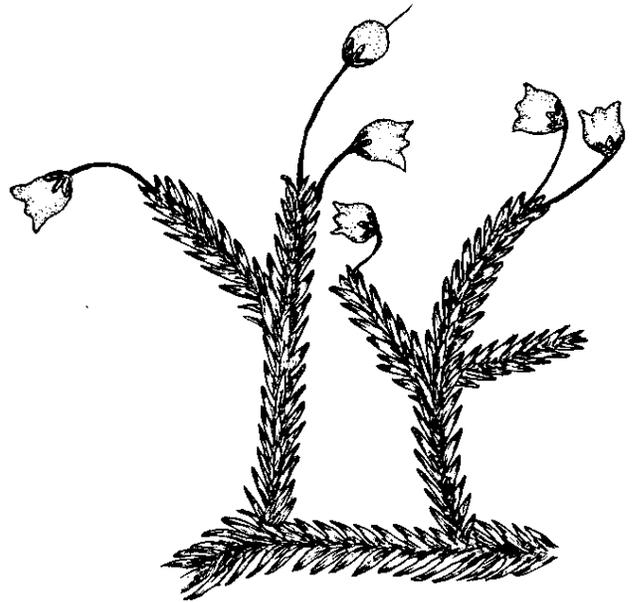
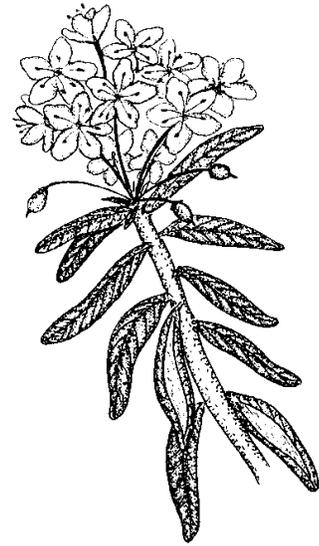
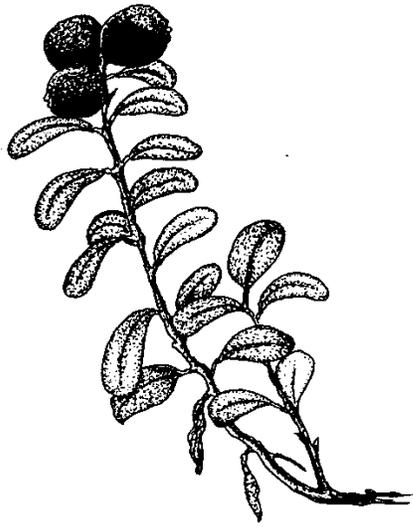
**Traits:** Spines cover the stems and very large leaves of this plant. Large cluster of flowers; fruit is a red berry.

**Habitat:** Coastal forests: old-growth stands and clearings

**Foods:** Makes its own by photosynthesis

**Eaten by:** Deer, red squirrels, leafhoppers, true bugs

**Do You Know?** The bark, stems, and ash have been used by the Tanaina, Eskimo, and Haida people as a remedy for fever and colds and as a general cure-all.



## 76. LABRADOR TEA

F,W

**Traits:** Shrub with long, narrow leaves that are thick and rolled under on the sides and have reddish-brown, hairy undersides; sweet-smelling white flowers grow in clusters at ends of twigs; its fruit is a capsule.

**Habitat:** Poorly drained soils, muskegs, old-growth forests

**Foods:** Makes its own by photosynthesis

**Eaten by:** Moth larvae, aphids, true bugs, leafhoppers, snowshoe hares

**Do You Know?** The strongly aromatic leaves of this plant can be used to make a tasty tea.

## 73. LOWBUSH CRANBERRY (also called LINGONBERRY)

F,T,W

**Traits:** Ground cover plant with small, oval leaves; small, white to pink bell-shaped flowers; small, edible red berry.

**Habitat:** Moist soils in alpine and lowland tundra and boreal forests

**Foods:** Makes its own food by photosynthesis

**Eaten by:** Bears, lemmings, voles, ptarmigan, grouse, geese, plovers, snow buntings, longspurs, moth larvae, aphids, leafhoppers, cranes, humans

**Do You Know?** The small, wax-coated leaves of low-bush cranberry are resistant to drying by wind and cold.

## 77. HEATHER

T

**Traits:** Low-growing, mosslike shrub with white, bell-shaped flowers

**Habitat:** Dry soil of alpine and arctic tundra

**Foods:** Makes its own by photosynthesis

**Eaten by:** Lemmings, ground squirrels

**Do You Know?** Heather's perennial growth allows it to survive despite the short growing seasons in tundra regions. The bell-shaped flowers retain solar heat and deflect wind from the seed-producing flower parts.

## 74. ALPINE BEARBERRY

F,T,W

**Traits:** Low-growing shrub with evergreen leaves and small, white, bell-shaped flowers; fruit is an edible berry.

**Habitat:** Dry and moist soil in alpine and lowland tundra, forests, and muskegs

**Foods:** Makes its own food by photosynthesis

**Eaten by:** Bears, voles, lemmings, ptarmigan, geese, plovers, humans

**Do You Know?** Bearberry plants depend on mycorrhizal fungi to help them obtain nutrients from the soil. In exchange, they provide sugars to the fungi. These plants depend on animals to transport their seeds.

## 78. LOUSEWORT

T

**Traits:** Perennial plant with one to two simple stems arising from the roots and topped by a large flower spike; a dense gray wool covers the plant.

**Habitat:** Dry soil of alpine and lowland tundra

**Foods:** Makes its own by photosynthesis

**Eaten by:** Ground squirrels, lemmings, caribou

**Do You Know?** The dead leaves of this plant do not fall off. They help protect the shoots and flower buds during winter. Lousewort is pollinated by bumble bees.

## 75. BLUEBERRY

F,T,W

(also called HUCKLEBERRY)

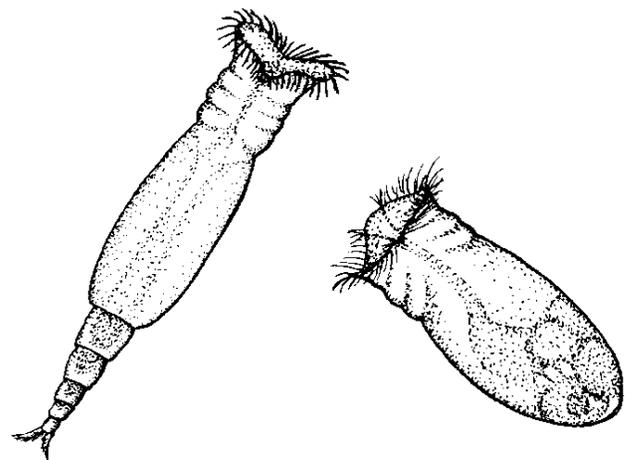
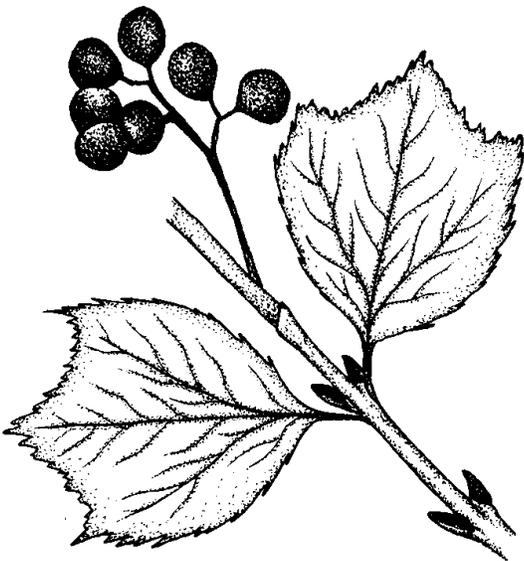
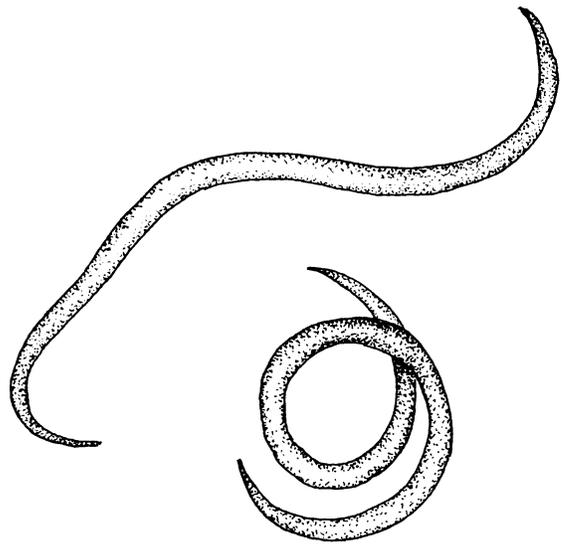
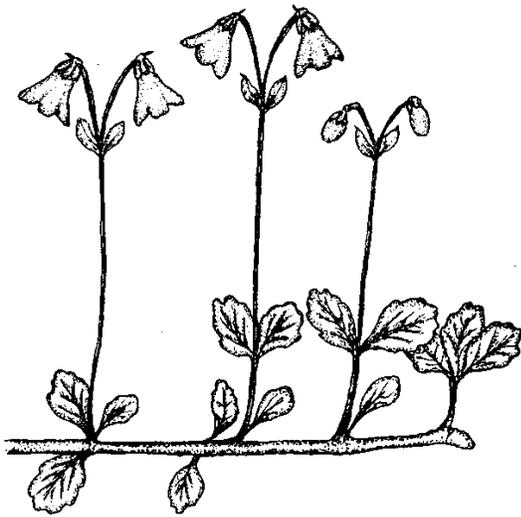
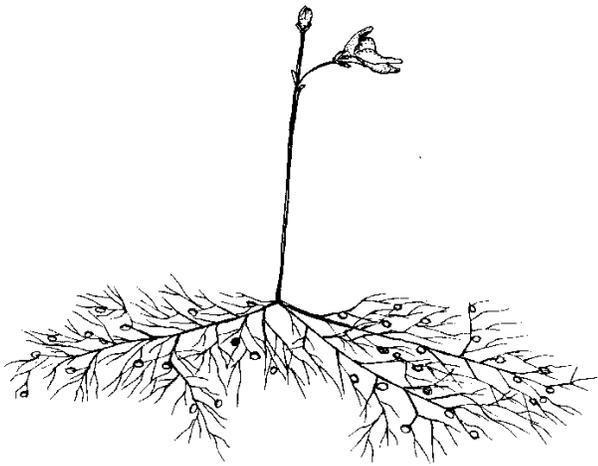
**Traits:** Shrub with small, oval leaves having smooth edges; small, bell-like flowers; blue, black, or red berries.

**Habitat:** Well-drained soils in wet, moderate climates

**Foods:** Makes its own by photosynthesis

**Eaten by:** Moth larvae, aphids, gall aphids, certain flies, true bugs, leafhoppers, slugs, snails, deer, pine grosbeaks, jays, voles, mice, thrushes, bears, cranes, humans

**Do You Know?** The berries are available in late fall and make good pies, jams, and jelly.



## 82. HAREBELL

T

**Traits:** A slender, delicate perennial plant with clusters of blue bell-shaped flowers

**Habitat:** Dry to moist soil in rock crevices of alpine tundra

**Foods:** Makes its own by photosynthesis

**Eaten by:** Lemmings, voles, ground squirrels, hares

**Do You Know?** This plant's blue, cup-shaped flowers absorb and retain heat better than do light-colored flowers of other shapes.

## 79. BLADDERWORT

W

**Traits:** Carnivorous aquatic plant with finely divided, underwater leaves, bearing small flowers that stick out of the water

**Habitat:** Ponds and lakes throughout Alaska

**Foods:** Makes its own by photosynthesis; also feeds on small insects.

**Eaten by:** Ducks

**Do You Know?** Small air sacs (or bladders) on the underwater leaves are traps for insects. When an insect touches the sensitive hairs outside the trap, the air sac pops open. Water then rushes in, carrying the unsuspecting insect into the trap, and the bladderwort then eats it.

## 83. ROUNDWORMS

F,T,W

**Traits:** Slender worms tapered at both ends, without any segments; invertebrate animals

**Habitat:** Soil, mosses, lichens, leaves, or waste materials, also in water

**Foods:** Dead things, algae, insects, or waste material

**Eaten by:** Centipedes, other invertebrates

**Do You Know?** These worms often hitch rides to new areas on the legs of flies, beetles, birds, or mammals.

## 80. TWINFLOWER

F

**Traits:** Ground cover plant with small, oval leaves with tips divided into three parts; the small, pink, bell-shaped flowers grow in pairs on a tall stalk, and the fruit is a capsule.

**Habitat:** Boreal and coastal forests with an open canopy that allows light to reach the forest floor

**Foods:** Makes its own by photosynthesis

**Eaten by:** Moth larvae, leafhoppers, true bugs, deer, voles, sparrows, grouse

**Do You Know?** Twinflower needs mycorrhizal fungi to help it get soil nutrients, and it depends on insects to pollinate its flowers.

## 84. ROTIFERS

F,T,W

**Traits:** Microscopic invertebrate animals having one or more rings of cilia at the front end of the body

**Habitat:** Fresh water, or on mosses, other plants, or lichens

**Foods:** Aquatic detritus (dead organic matter), protozoans, other small animals

**Eaten by:** Roundworms, other invertebrates

**Do You Know?** Terrestrial rotifers survive severe environmental conditions by going dormant for as long as three to four years.

## 81. Highbush CRANBERRY

F

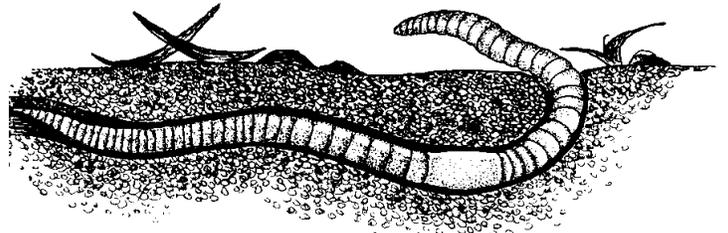
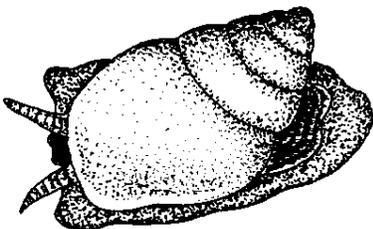
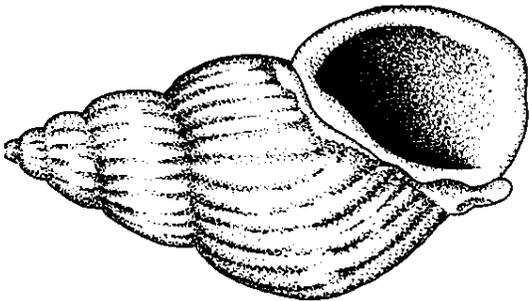
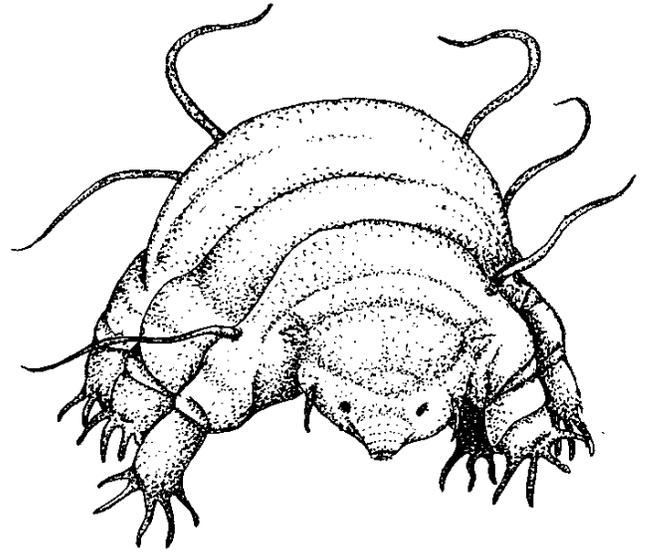
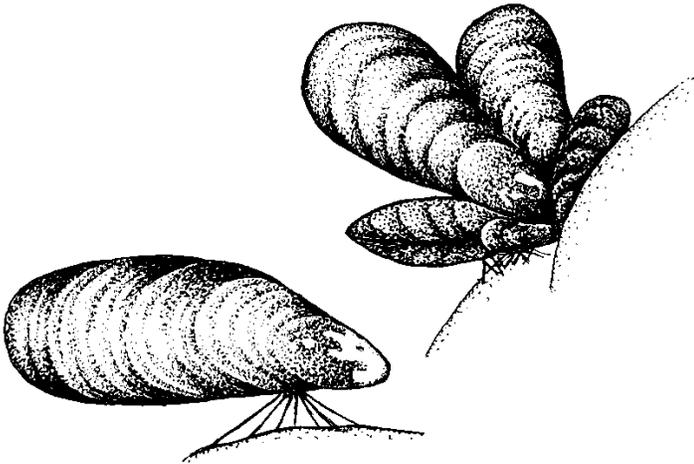
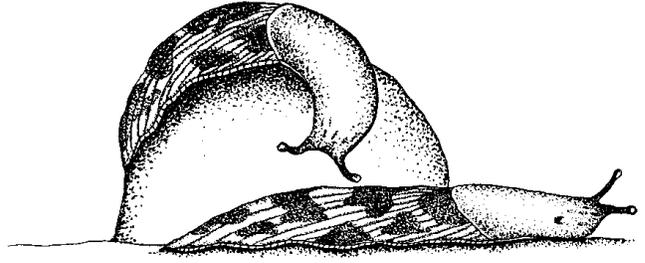
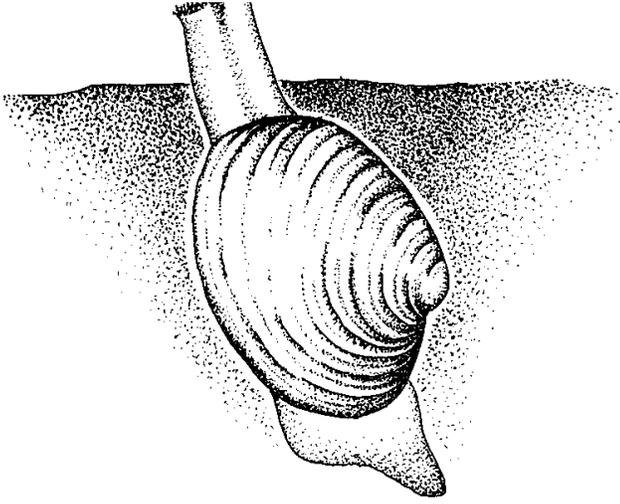
**Traits:** Shrub with three-lobed leaves growing in pairs along the stem; white flowers in clusters at the end of short twigs; bright red berries

**Habitat:** Understory in aspen and birch forests; grows best in well-drained, warm sites

**Foods:** Makes its own by photosynthesis

**Eaten by:** Moth and butterfly larvae, leafhoppers, true bugs, aphids, other insects, ruffed and spruce grouse, pine grosbeaks, voles, moose, hares, bears, humans

**Do You Know?** Highbush cranberry is also called "cramp bark" because the bark is a natural source of muscle relaxant.



## 88. SLUGS

F

**Traits:** A snail-like invertebrate animal without a shell; it has four antennae, with eyes that are located on the tips of one pair of antennae.

**Habitat:** Moist or wet forests, mainly in coastal Alaska; the larvae lives on rotten leaves and logs.

**Foods:** Leaves of plants, including skunk cabbage, salmonberry, and others

**Eaten by:** Certain ground beetles

**Do You Know?** In dry air, a typical slug will lose as much as 16 percent of its body weight per hour if it is active. If dry conditions continue, death will result in a few hours.

## 85. CLAM

W

**Traits:** Invertebrate animal (mollusk) with two-valved shells hinged on one side, a small head, and a compressed body

**Habitat:** Varies by species; some burrow in sand, mud, or rocks.

**Foods:** Filter detritus, algae, protozoans, small crustaceans, insect larvae from the water

**Eaten by:** Snails, sea stars, certain fish, diving ducks, emperor geese, shorebirds, sea otters, humans

**Do You Know?** Clams can burrow very rapidly by extending their “foot” into the sand or mud, expanding the tip to act as an anchor, and pulling themselves down.

## 89. WATER BEARS

F,T,W

**Traits:** Tiny to microscopic invertebrate animals. They are chubby with eight short legs having four to eight claws on each leg; they can survive for years in an inactive state when conditions are bad.

**Habitat:** In the water film around mosses and lichens

**Foods:** Fluids from inside the cells of mosses and lichens

**Eaten by:** Roundworms, centipedes, other invertebrates

**Do You Know?** Most of a water bear’s life is spent in a dried, desiccated state. When water is available, it swells to four to five times its dried-up size.

## 86. MUSSEL

W

**Traits:** Invertebrate animal (mollusk) with two-valved shells hinged on one side, a small head, and a compressed body; they attach themselves to a surface with “byssal threads.”

**Habitat:** Rocks or wharf pilings in salt water

**Foods:** Filter detritus, algae, protozoans, small crustaceans, insect larvae from the water

**Eaten by:** Snails, sea stars, certain fish, diving ducks, emperor geese, shorebirds, sea otters, humans

**Do You Know?** Mussels are edible.

## 90. SEGMENTED WORMS

F,T,W

**Traits:** Slender-bodied worms with distinct segments along the body; invertebrate animals

**Habitat:** Many habitats; moist soil and decaying vegetation in forests

**Foods:** Varies by species; those that live in soil eat decaying vegetation, algae, or other invertebrate animals.

**Eaten by:** Thrushes, centipedes, ground beetles

**Do You Know?** Some segmented worms, called leeches, are parasites on other animals, including mammals, fish, birds, insects, snails and worms.

## 87. SNAIL

W

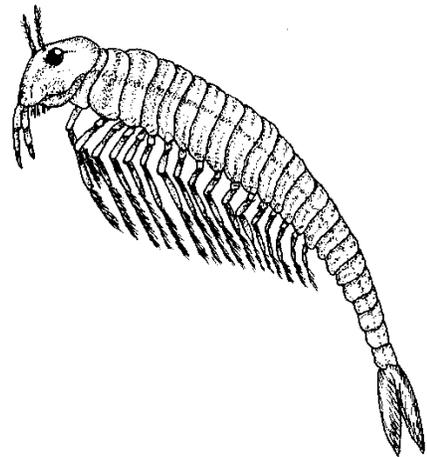
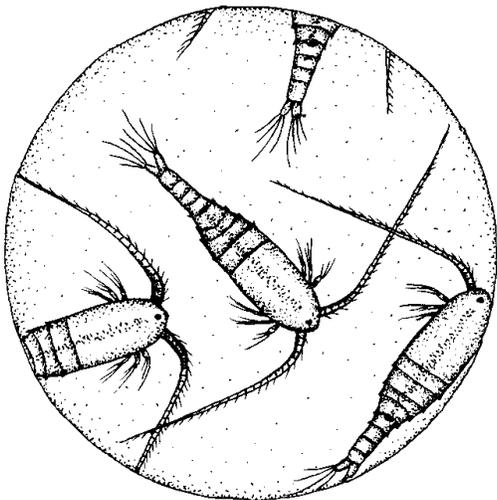
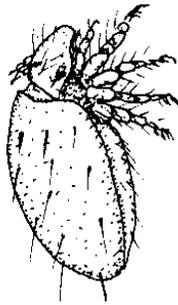
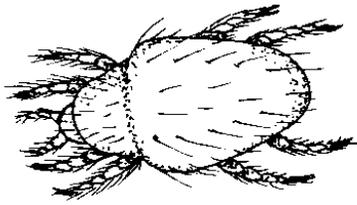
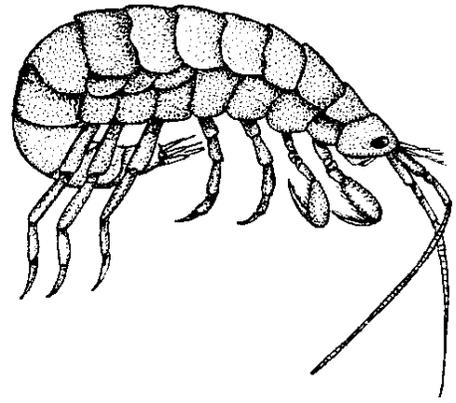
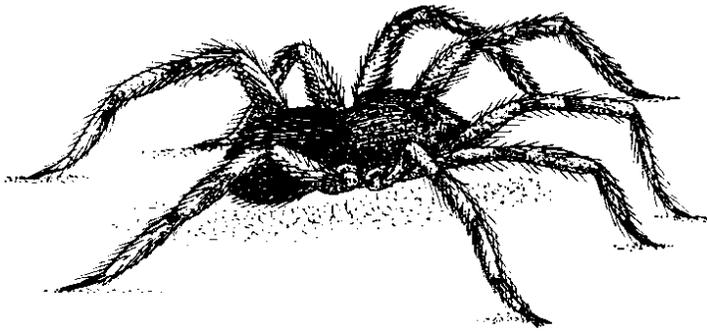
**Traits:** Invertebrate animal (mollusk) with flat creeping foot, a one-piece shell, and a well-developed head

**Habitat:** Land as well as water; on rocks, sandy or silty bottoms, and aquatic plants in either fresh or salt water

**Foods:** Fresh-water snails graze on algae, aquatic plants, detritus, and fungi. Some marine forms prey on other marine animals, including other mollusks.

**Eaten by:** Crustaceans, fish, birds, mammals

**Do You Know?** There are more than 35,000 species of snails.



## 94. AMPHIPOD

W

**Traits:** Crustacean with many legs, a hard exoskeleton, and a body compressed from side to side; eyes of amphipods not on stalks (unlike shrimp); invertebrate animal

**Habitat:** Salt water, fresh-water lakes and ponds

**Foods:** Detritus and small invertebrates

**Eaten by:** Fish, water birds, whales, other aquatic predators

**Do You Know?** Beach amphipods, sometimes called sand fleas, are only 0.75 inches (2 cm) long, but they can leap 1.1 yards (1 m); that is farther than any organism of their size.

## 91. SPIDER

F,T,W

**Traits:** Small invertebrate animals with eight legs; the body appears divided into a large abdomen and a small head with large fangs.

**Habitat:** Soil, leaf litter, plants, rotten logs

**Foods:** Mainly insects such as aphids, flies, rove beetles, springtails, bristletails, others

**Eaten by:** Insect-eating birds such as thrushes and winter wrens

**Do You Know?** The silk produced by spiders may stretch as much as one-fourth its length before breaking. It is one of the strongest natural fibers known.

## 95. WATER FLEA

W

**Traits:** Crustacean (invertebrate animal) with a body compressed side to side; hard shell covers body but not head; uses second set of antennae to swim

**Habitat:** Lakes, ponds, streams

**Foods:** Filters detritus, protozoans, rotifers, crustaceans, algae, diatoms and other plankton from the water

**Eaten by:** Ducks, shorebirds, diving beetles, other aquatic invertebrates, fish

**Do You Know?** Females produce two kinds of eggs: thin-shelled eggs in the summer, which develop without fertilization, and thick-shelled ones in winter, which are fertilized by males.

## 92. MITE

F,T

**Traits:** Tiny to microscopic invertebrate animals, each with eight legs and a pear-shaped body

**Habitat:** Mosses, rotten leaves, humus, forest soils

**Foods:** Varies by species; many prey on roundworms, other mites, and insect larvae; others feed on plants (dead or live) and animals.

**Eaten by:** Centipedes, some ground beetles, ladybird beetles, winter wrens, thrushes, sparrows

**Do You Know?** Some mites ride on the backs of carrion beetles. Other mites parasitize other animals.

## 96. FAIRY SHRIMP

W

**Traits:** Crustacean (invertebrate animal) that swims upside down; 20 body segments with appendages on the first 11-12 segments; eyes on stalks; no hard shell covering body

**Habitat:** Small ponds, springs, meltwater pools

**Foods:** Detritus, small crustaceans, rotifers, protozoans, algae, diatoms and other plankton

**Eaten by:** Ducks, phalaropes, water shrews, diving beetles, other aquatic invertebrates, fish

**Do You Know?** Females are often more abundant than males. In some types, no males are known and develop from eggs that have never been fertilized.

## 93. COPEPOD

W

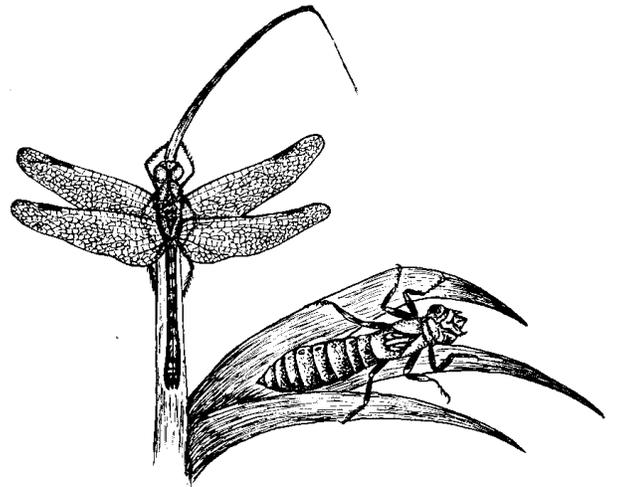
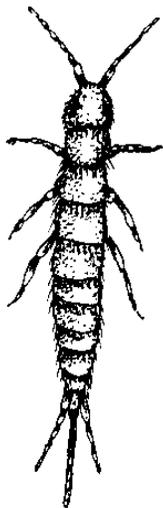
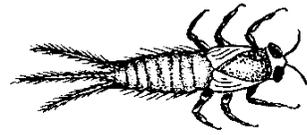
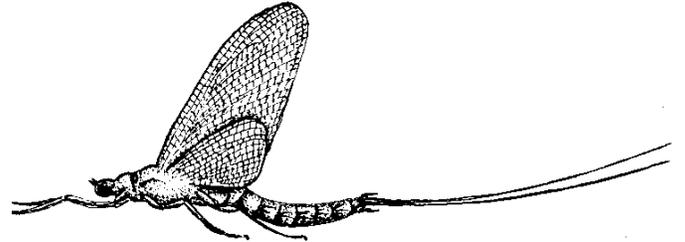
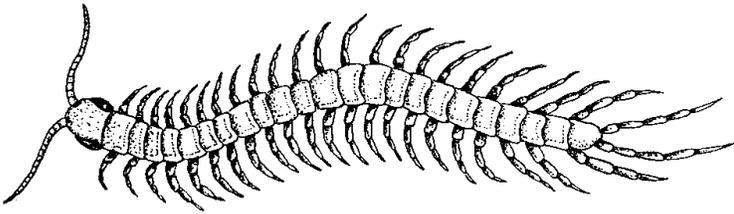
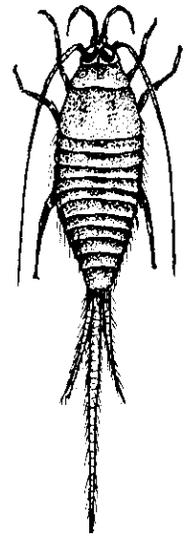
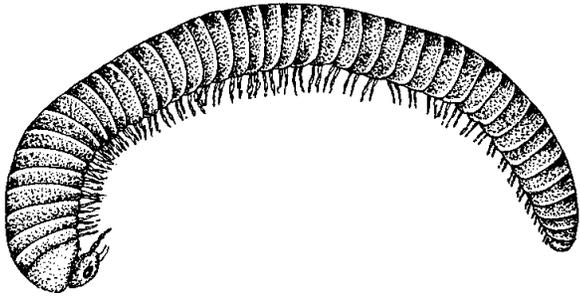
**Traits:** Crustacean (invertebrate animal) with a short, cylindrical body of ten segments; the first few segments have appendages

**Habitat:** Fresh and salt water wetlands and at sea

**Foods:** Filter detritus or algae from the water; some capture small zooplankton. Some are parasites on the gills of fish and large crustaceans.

**Eaten by:** Fish and other aquatic animals, including whales

**Do You Know?** Although they are tiny, copepods and other small crustaceans are the chief food of humpback and gray whales.



**100. BRISTLETAIL****F**

**Traits:** Wingless insects with three tail-like parts and long antennae, often covered with scales; chewing mouthparts; invertebrate animals

**Habitat:** Damp or moist litter and soil of forests and meadows; under bark of logs or under rocks

**Foods:** Decaying leaves

**Eaten by:** Centipedes, shrews, thrushes, ground beetles

**Do You Know?** These insects are able to run rapidly or jump.

**97. MILLIPEDE****F**

**Traits:** Slender-bodied, wormlike invertebrate animals with distinct segments along the body, two leglike structures on each segment

**Habitat:** In Alaska's coastal forests: under rocks or logs and in rotten leaves, wood or soil

**Foods:** Varies by species; decaying plants and fungi or centipedes, worms, or insects

**Eaten by:** Thrushes, sparrows, wrens, ground beetles

**Do You Know?** Some kinds have poison glands that secrete hydrogen and cyanide. Millipedes will coil up when disturbed.

**101. MAYFLIES****W**

**Traits:** Delicate insects with two to three hairlike parts at the end of the abdomen; rear wings are smaller than forewings; invertebrate animal

**Habitat:** Adults: near water; nymphs: streams, lakes, ponds

**Foods:** Nymphs feed on diatoms, algae, and detritus; adults cannot feed because their mouth parts do not function.

**Eaten by:** Diving beetles, frogs, fish, waterfowl, shorebirds

**Do You Know?** Most adult mayflies live for only two to three days; some live for just one to two hours.

**98. CENTIPEDE****F**

**Traits:** A small, wormlike invertebrate animal with two legs on each of its body segments; all have poison claws for capturing prey.

**Habitat:** Soil and humus or beneath stones, bark, or logs

**Foods:** Invertebrates that live in the soil, including springtails, bristletails, ground beetles, fly larvae, flea larvae, mites, worms, snails

**Eaten by:** Thrushes, winter wrens

**Do You Know?** Centipedes have poison glands on their jaws that can cause pain if they bite you. Not usually dangerous to people.

**102. DRAGONFLY****F,W**

**Traits:** Insect with long, narrow abdomen; six legs, large eyes and four wings; invertebrate animal

**Habitat:** Adults: near water; nymphs: bottom of streams and ponds or on aquatic plants

**Food:** Adults prey on small flying insects, including mosquitos and black flies. Nymphs prey on mosquito larvae, snails, tadpoles, and small fish.

**Eaten by:** Adults eaten by flycatchers, fish, and swallows; dippers feed on nymphs.

**Do You Know?** Adults catch mosquitos in the air with their basketlike legs and eat their prey "on the wing."

**99. SPRINGTAIL****F,T,W**

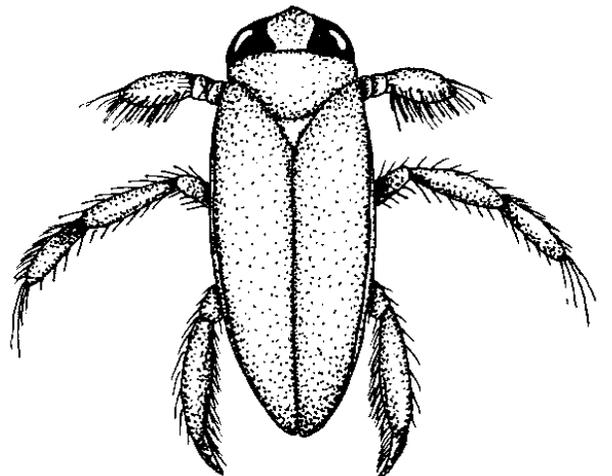
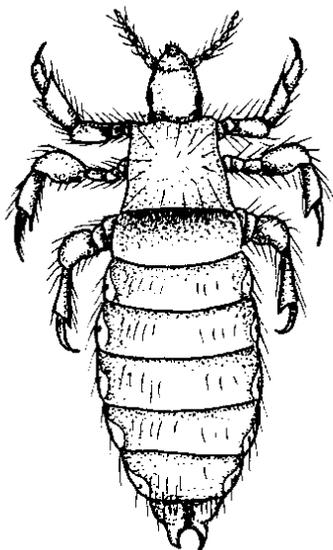
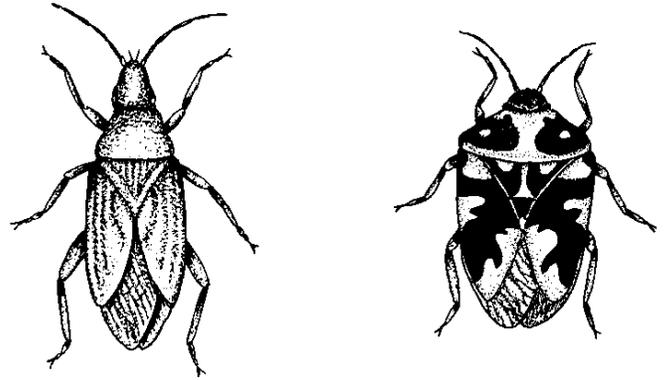
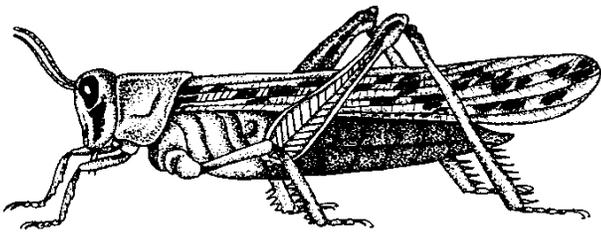
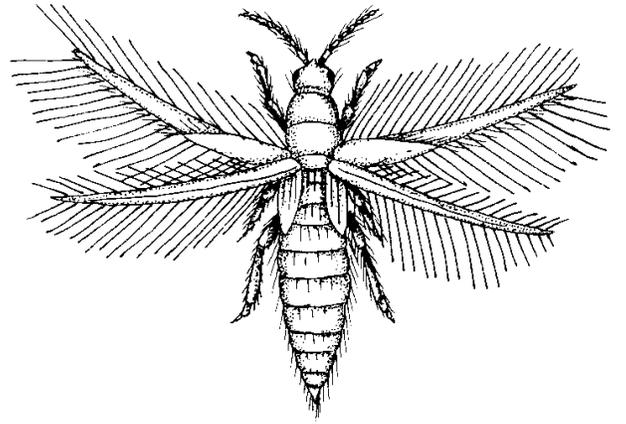
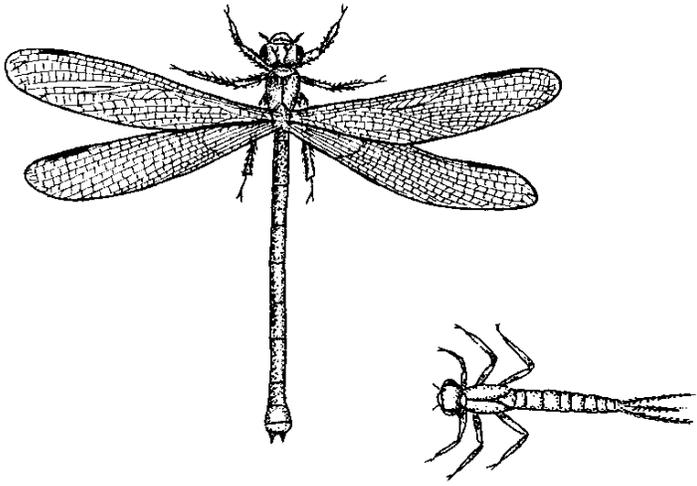
**Traits:** A small, wingless insect (invertebrate animal) with chewing mouthparts and a tube on the underside of the first abdominal segment

**Habitat:** Soil, litter, decaying logs, mosses; some in trees, and a few live in groundwater

**Foods:** Algae, lichens, pollen, fungal spores, decaying materials

**Eaten by:** Centipedes, ground beetles, spiders, shrews, birds

**Do You Know?** This insect's furcula (tail-like forked organ) folds down under the body and releases, springing the animal three to four inches (7-10 cm) into the air.



**106. THRIP****F**

**Traits:** Tiny winged or wingless long-bodied insects; if winged, they have four narrow wings with fringes of long hairs; antennae, sucking mouthparts

**Habitat:** Flowers and leaves of plants

**Foods:** Flowers, leaves, buds, fruits; few eat fungal spores, mites, and small insects.

**Eaten by:** Warblers, chickadees, creepers, wrens, ants, hornets, ground beetles, lacewings

**Do You Know?** Some thrips carry microscopic organisms that cause plant diseases.

**103. DAMSELFLY****W**

**Traits:** Insects with very large eyes and short antennae; adults have four wings of the same size.

**Habitat:** Adults: near water; nymphs: on aquatic plants or the bottom of streams and ponds

**Foods:** Adults prey on flying insects, including midges and mosquitos. Nymphs eat mosquito larvae, tadpoles, and small fish.

**Eaten by:** Diving beetles, frogs, fish, waterfowl, shorebirds

**Do You Know?** Fossil records indicate that some prehistoric relatives of damselflies had wingspans of 27 inches (69 cm).

**107. TRUE BUG****F,T,W**

**Traits:** Front wings thick, colored, and hardened near body; wings thin and often clear at the tips; held flat over body. Beaklike mouthparts at front of head

**Habitat:** Variety of habitat types

**Foods:** Varies by species; some live only on the species of plant they eat; others are predatory.

**Eaten by:** Chickadees, thrushes, warblers, shrews, wasps, ground beetles

**Do You Know?** Many true bugs give off odors to repel predators.

**104. GRASSHOPPER****F,W**

**Traits:** Insects with large hind legs for jumping; thickened, narrow front wings and hind wings that are clear and large; all have chewing mouthparts.

**Habitat:** Places with herbs and grasses

**Foods:** Leaves, stems, other parts of plants

**Eaten by:** American kestrels and other insect-eating birds

**Do You Know?** Grasshoppers serve as an important food source for birds and mammals.

**108. WATER BOATMAN****W**

**Traits:** Aquatic insect with four long legs used for swimming; front legs modified to form scoops; the nymphs and adults look alike.

**Habitat:** Margins of lakes, ponds, estuaries

**Foods:** Decaying leaves

**Eaten by:** Diving beetles, frogs, fish, waterfowl, shorebirds

**Do You Know?** Water boatmen are like scuba divers. They trap an air bubble under their wings at the water surface, then use this "air tank" to breathe while diving underwater.

**105. LICE****F,T,W**

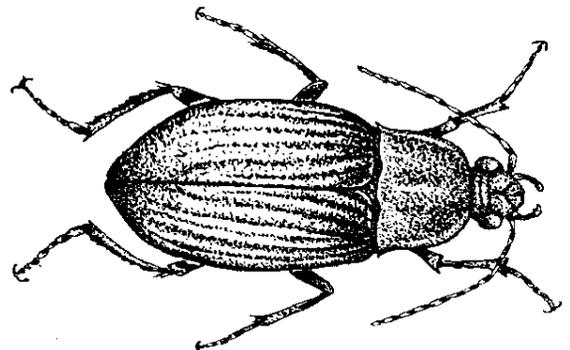
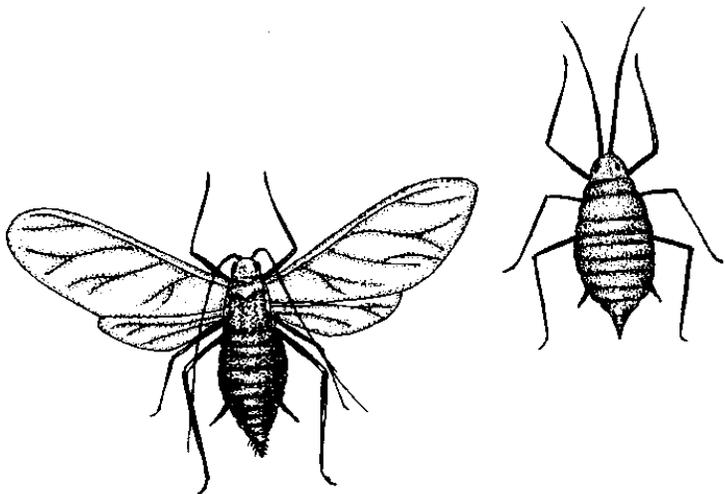
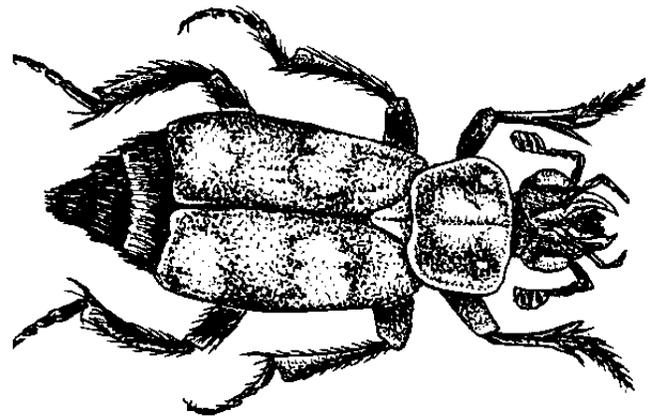
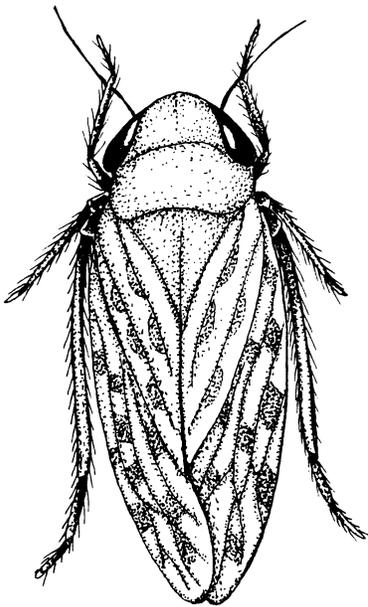
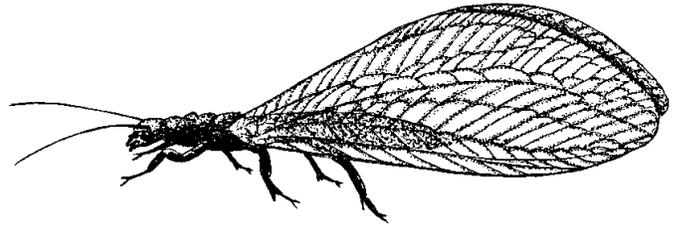
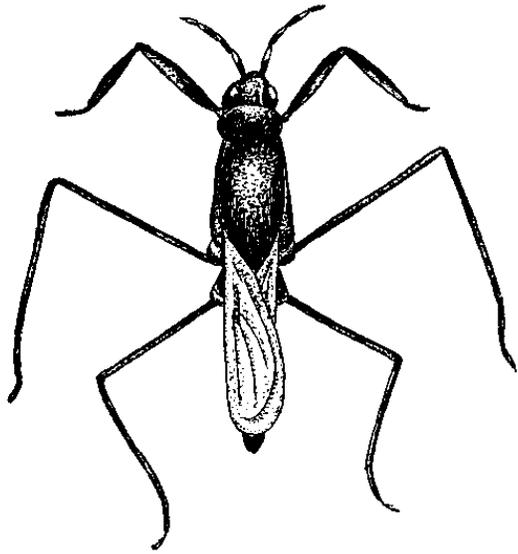
**Traits:** Small, wingless insects with sucking or chewing mouthparts; invertebrate animals

**Habitat:** Skin, fur, or feathers of birds and mammals

**Foods:** Varies by species; some suck blood of mammals or birds; others eat skin, feathers, or fur.

**Eaten by:** Sometimes eaten by birds or mammals during grooming

**Do You Know?** All lice are parasites of birds or mammals. Some blood-sucking lice carry microscopic organisms that cause diseases in mammals and birds.



## 112. LACEWINGS

F,W

**Traits:** Green or brown insects with large, clear wings with netlike veins; small head with large eyes and chewing mouthparts; long antennae

**Habitat:** Leaves of trees and shrubs; Eggs are attached to a leaf by a thread the female forms. Larvae spin cocoons.

**Foods:** Adults eat pollen, nectar, and aphid honeydew. Larvae prey on mites, aphids, and other insects.

**Eaten by:** Thrushes, warblers, chickadees, kinglets, hornets, dragonflies, bats, shrews

**Do You Know?** Green lacewings have glands on their bodies that emit foul odors when the insect is handled.

## 109. WATER STRIDER

F,T,W

**Traits:** Insect with body and long legs covered with stiff, waterproof hair that allows the insect to “skate” across the water surface

**Habitat:** Ponds and streams

**Foods** Small living or dead insects on the water surface

**Eaten by:** Fish, water birds, water shrews

**Do You Know?** A water strider will sink and drown if the hairs on its legs become wet and it cannot reach a place to dry out.

## 113. CARRION BEETLES

F,T

**Traits:** Large, round-bodied insects with thickened front wings; black with red, orange, or yellow markings; clubbed antennae

**Habitat:** Soil and litter of forests and other habitats

**Foods:** Dead animals and other insects, such as fly larvae, that feed on dead animals; the adult female lays her eggs and buries them with a dead animal.

**Eaten by:** Thrushes, shrews, mice, voles

**Do You Know?** All carrion beetles have mites riding on their backs. These mites get a free ride to new food sources, but do not harm the beetle. This is an example of commensalism.

## 110. LEAFHOPPERS

F,T,W

**Traits:** Insect with front pair of wings thin and clear, or only slightly colored; held rooflike over body; Beaklike mouth comes out of the rear underside of the head; one or more rows of spines on the hind legs.

**Habitat:** Plants in forests and other habitats

**Foods:** Sap of plants

**Eaten by:** Warblers, thrushes, chickadees, shrews, ground beetles, centipedes

**Do You Know?** Leafhoppers often discharge a clear, watery fluid called “honeydew,” which attracts other insects (especially ants).

## 114. GROUND BEETLES

F,T

**Traits:** Dark, flattened insects with thick front wings and grooves running from front to back; long legs, large mouthparts

**Habitat:** In most habitats on land

**Foods:** Varies by species; dead animal remains, insects (such as caterpillars), slugs, snails

**Eaten by:** Jays, thrushes, wrens, sparrows, centipedes

**Do You Know?** Most ground beetles are active only at night and hide during the day under logs, rocks, or leaf litter. Tundra species produce antifreeze that allows them to survive freezing temperatures.

## 111. APHIDS

F,T,W

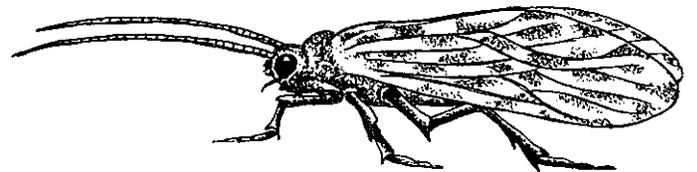
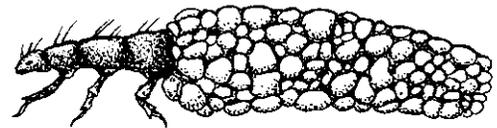
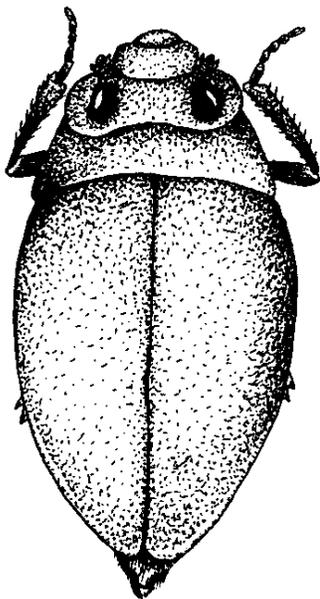
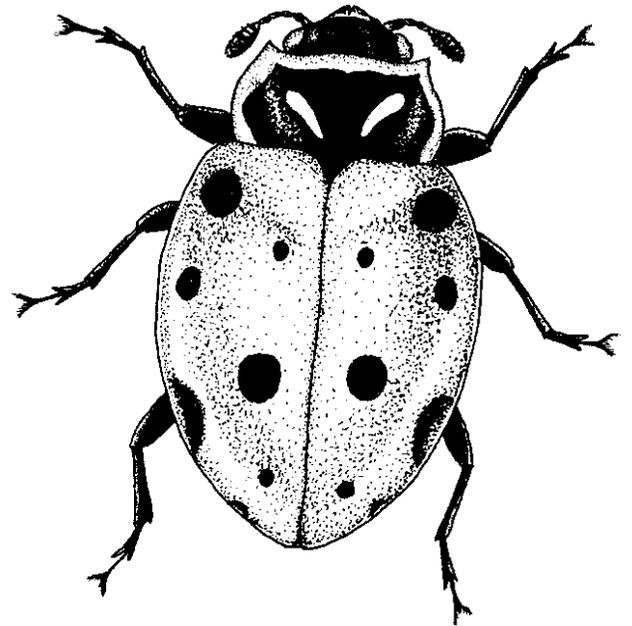
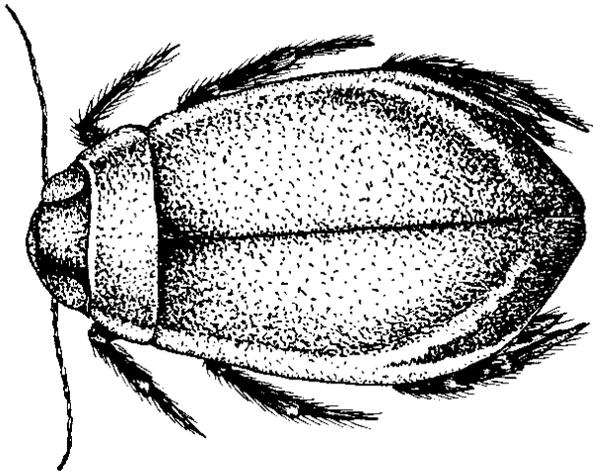
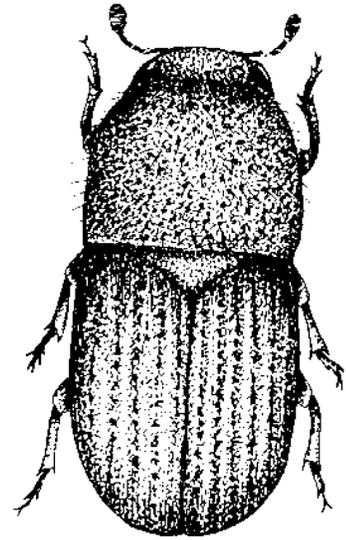
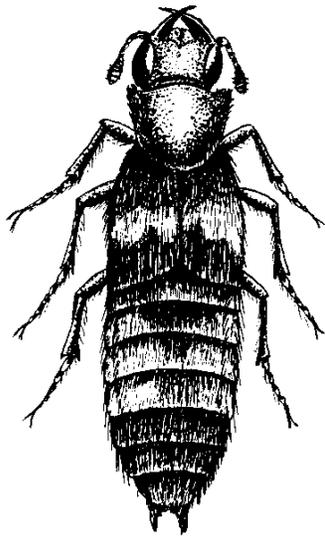
**Traits:** Pear-shaped insects with winged and wingless forms in the same species; most have two tubes (called cornicles) on the top of their abdomens.

**Habitat:** Leaves and stems of plants

**Foods:** Sap of plants; they cause plant leaves to wilt, curl, and turn yellow

**Eaten by:** Ants, wasps, ladybugs, warblers, chickadees, kinglets, wrens, sparrows

**Do You Know?** Aphids produce a secretion, called honeydew. To obtain this honeydew, certain ants protect and tend aphids.



## 118. BARK BEETLES

F

**Traits:** Small, round-bodied insects with thickened front wings; small antennae with clubs on the tips

**Habitat:** Under tree bark

**Foods:** Varies by species; majority eat the underside of tree bark or wood; others eat fungi that grow in the tunnels the beetles bore into wood

**Eaten by:** Woodpeckers, brown creepers, ichneumon larvae

**Do You Know?** Most bark beetles need fungi to break down and digest wood. Some species have these microscopic organisms living in their stomachs.

## 115. ROVE BEETLES

F,T

**Traits:** Dark, flattened insects with short, thick front wings and long, slender bodies; some have large mouthparts that cross at the tips; May be covered by hairs

**Habitat:** Soil in forests and other habitats

**Foods:** Varies by species; dead animal or plant remains, insects such as ants

**Eaten by:** Thrushes, jays, wrens, sparrows, centipedes, ground beetles, mice, shrews

**Do You Know?** Some rove beetles live in the nests of mammals.

## 119. LADYBIRD BEETLES

F

**Traits:** Brightly colored insects with very round bodies and thickened front wings, usually with spots on them; larvae are usually dark with bands of color and covered with spines.

**Habitat:** Leaves and stems of plants in forests, shrub thickets, and meadows

**Foods:** Aphids, other small insects, mites; a few species eat plant leaves.

**Eaten by:** Warblers, chickadees, thrushes

**Do You Know?** Also known as ladybugs, the adult beetles gather by the thousands and hibernate under fallen branches and rocks.

## 116. DIVING BEETLES

W

**Traits:** Aquatic insects; adults are oval-shaped and have legs with hairlike fringes; Larvae have large heads, long mandibles, and eight to ten abdominal segments.

**Habitat:** Ponds, lakes, streams, rivers, estuaries

**Foods:** Adults and larvae prey on aquatic insects, small fish, and tadpoles.

**Eaten by:** Fish, water birds, water shrews

**Do You Know?** Diving beetles obtain air at the surface of the water, but can remain underwater by carrying an air bubble with them.

## 120. CADDISFLIES

W

**Traits:** Adults have wings covered with hairs. Long antennae. Larvae have hooklike parts at the ends of their abdomens and some have feathery gills.

**Habitat:** Adults are nocturnal and rest in cool, dark places. Larvae live in ponds, lakes, and streams.

**Foods:** Adults eat flower nectar. Larvae eat aquatic plants, algae, diatoms, and aquatic insect larvae.

**Eaten by:** Diving beetles, frogs, fish, waterfowl, shorebirds

**Do You Know?** Many larvae build cases made of leaves, twigs, or sand in which to pupate.

## 117. WHIRLIGIG BEETLES

W

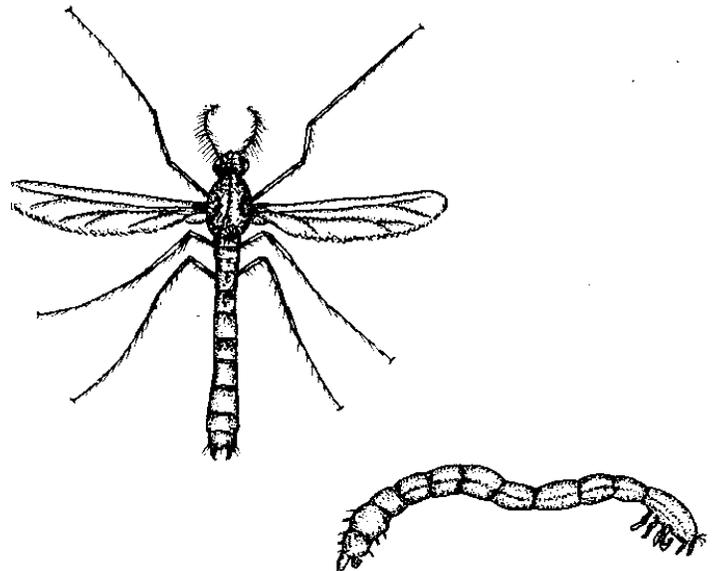
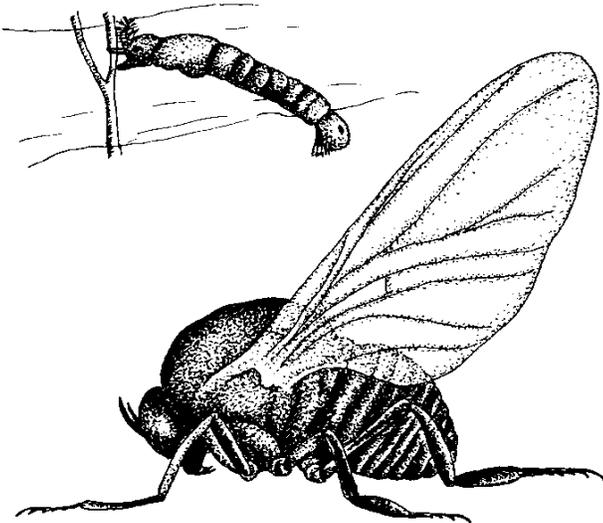
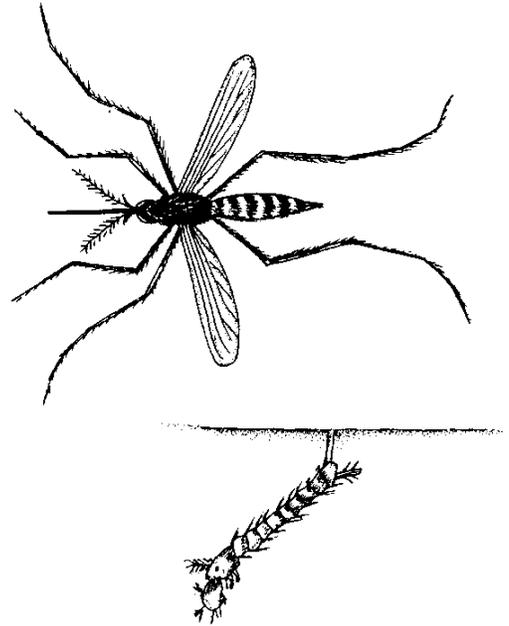
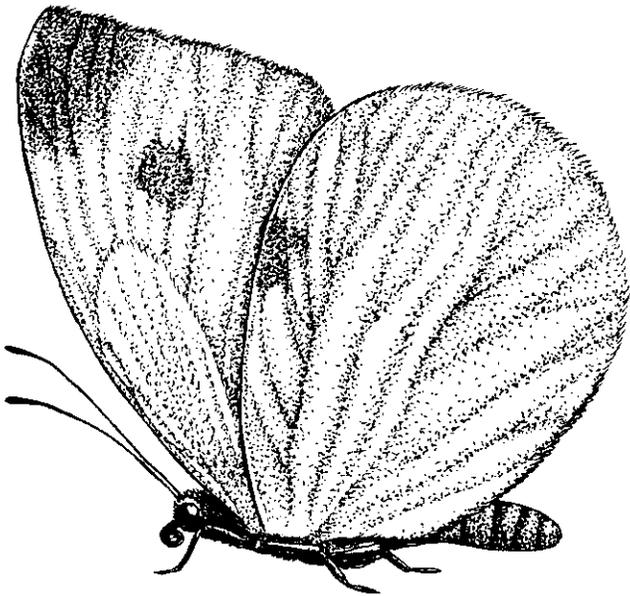
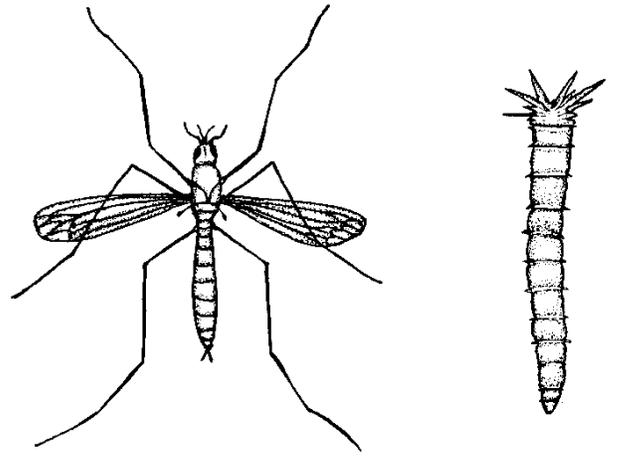
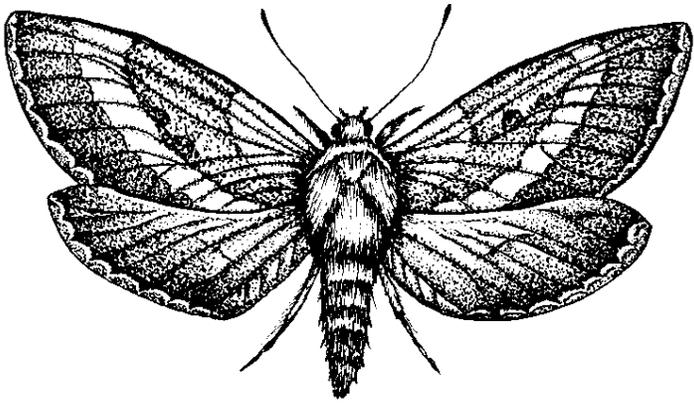
**Traits:** Aquatic insects; adults are flat, oval-shaped and have two eyes on top of the head and two on the bottom. They are black or greenish and often swim in circles together. Larvae are slender and have feathery gills on abdomens.

**Habitat:** Ponds, lakes, streams

**Foods:** Insect larvae, small fish, tadpoles

**Eaten by:** Fish, water birds

**Do You Know?** Whirligig beetles can see underwater and above water at the same time.



## 124. CRANE FLY

F,T,W

**Traits:** Long-legged, mosquito-like insects with two clear wings

**Habitat:** Adults: damp habitats with abundant vegetation; larvae: moist soil and decaying plants in forests; some live in water.

**Foods:** Some adults eat flower nectar. Larvae eat algae, detritus, and larvae of other insects.

**Eaten by:** Bats, shrews, insect-eating birds, centipedes, spiders, other insect-eating invertebrates

**Do You Know?** Although craneflies look like giant mosquitoes, they do not bite. They do, however, eat mosquitoes.

## 121. MOTH

F,T

**Traits:** Insects with four large wings with powderlike scales; large eyes, long antennae, and tubelike mouths that coil up when not in use

**Habitat:** Adults use a variety of habitats. Larvae can only live on certain plants.

**Foods:** Adults eat flower nectar. Larvae eat plant leaves, fruit, stems, and roots.

**Eaten by:** Bats, shrews, ground beetles, warblers, flycatchers, swallows, chickadees, kinglets

**Do You Know?** Larvae spin cocoons. Some larvae make tents of silk threads.

## 125. MOSQUITO

F,T,W

**Traits:** Adult insects have scales and long, tubular mouthparts (proboscis) for sucking. Larvae are wormlike.

**Habitat:** All types; larvae are aquatic and live in ponds, lakes, and still waters.

**Foods:** Adult females suck blood from birds and mammals. Adult males feed on flower nectar. Larvae feed on algae, protozoans, and detritus.

**Eaten by:** Adults are eaten by dragonflies, fish, frogs, birds, bats. Larvae are eaten by fish and water birds.

**Do You Know?** Some female mosquitoes carry microscopic organisms that cause diseases in mammals and birds.

## 122. BUTTERFLY

F,T,W

**Traits:** Adults have four large wings with powderlike scales; large, compound eyes, long antennae with clubs at the tips, and tubelike mouths that coil up when not in use.

**Habitat:** Adults use a variety of habitats. Larvae can live only on certain plants.

**Foods:** Adults eat flower nectar. Larvae eat plant leaves, fruit, stems, or roots.

**Eaten by:** Warblers, flycatchers, ground beetles, wasps, dragonflies

**Do You Know?** Larvae form a chrysalis for pupation.

## 126. MIDGE

F,T,W

**Traits:** An adult has six long legs, a long narrow abdomen, and two wings that are narrow at the base. Larvae are aquatic.

**Habitat:** Adults swarm over water and moist habitats. Larvae live in water or wet moss.

**Foods:** Adults eat flower nectar and pollen. Larvae eat algae or plant material or filter microscopic organisms from the water. Some prey on other insects.

**Eaten by:** Fish, aquatic animals, birds, shrews, ground beetles

**Do You Know?** Adults live for only five to ten days. Larvae live as long as seven years.

## 123. BLACK FLY

F,T,W

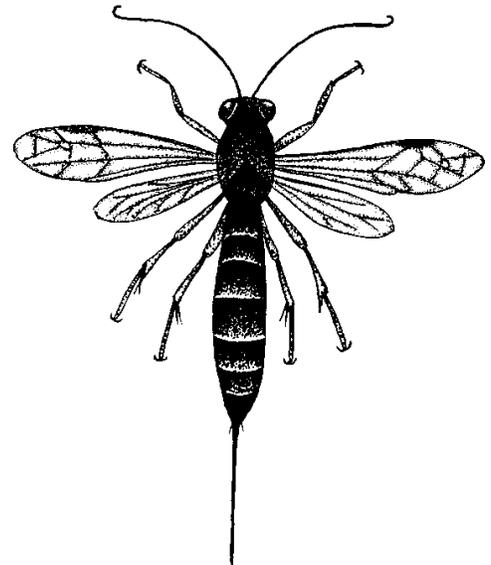
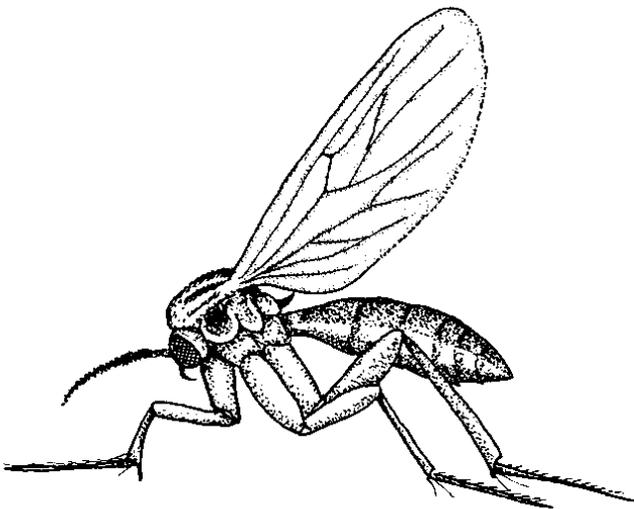
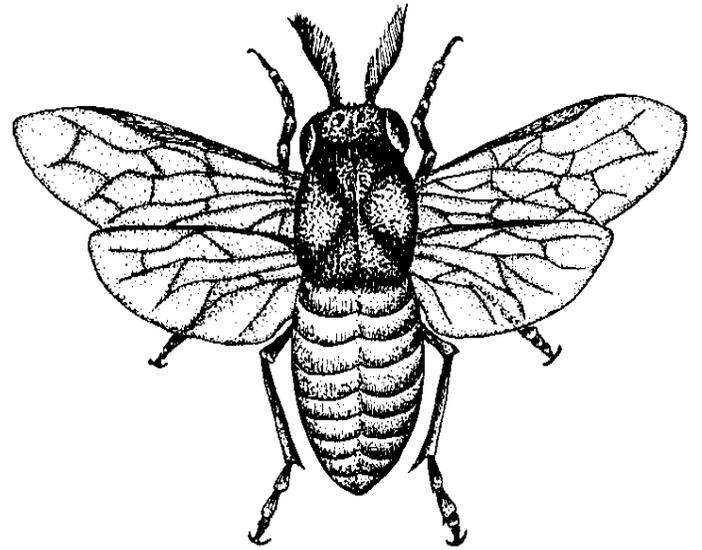
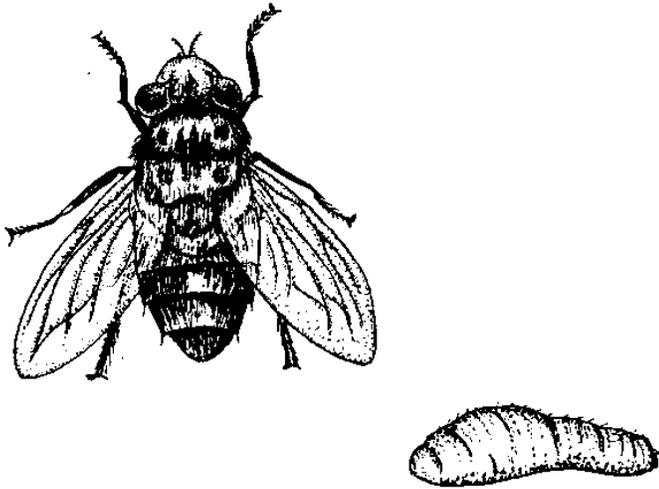
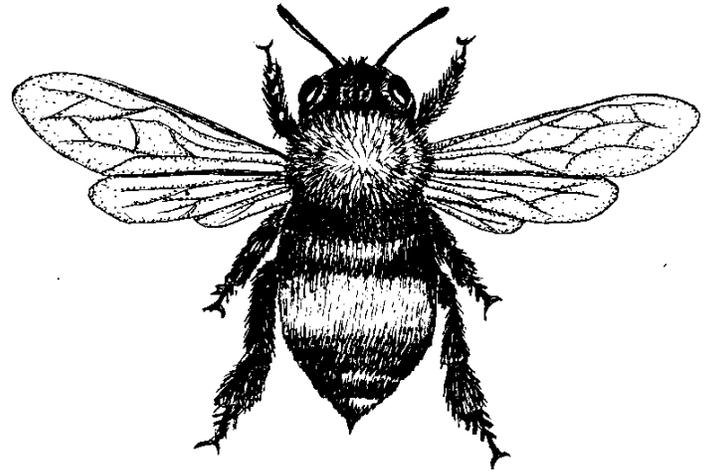
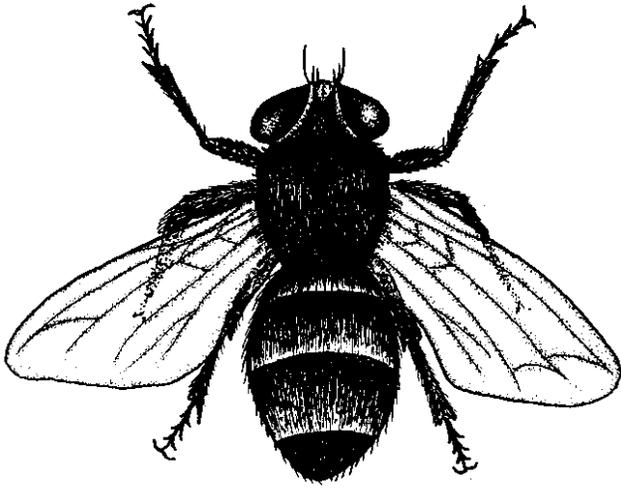
**Traits:** Adult black flies have six legs and are dark colored with two broad wings and short legs. Larvae are wormlike.

**Habitat:** Adults live around water. Larvae live underwater, attached to rocks and plants.

**Foods:** Adult males feed on flower nectar. Adult females suck blood from birds and mammals. Larvae filter detritus (decaying matter).

**Eaten by:** Adults are eaten by swallows and some insects. Larvae eaten by fishes, such as blackfish, and dippers.

**Do You Know?** Female black flies are vicious biters. Males don't bite.



### 130. BUMBLE BEE

F,T,W

**Traits:** Insects with four wings; hind wings much smaller than front ones; hairy, black bodies covered with yellow markings

**Habitat:** Any habitat with a variety of nectar-producing flowers, including pioneer, tall shrub, and old-growth forest; nests in the ground

**Foods:** Nectar and pollen of flowering plants

**Eaten by:** Flycatchers, swallows, warblers

**Do You Know?** Bees are among the most important plant pollinators. Some species eat the nectar and pollen and pollinate only one species of plant.

### 127. BLOW FLY

F,T,W

**Traits:** Insects with two clear wings and two small knobs (called halteres), large eyes, metallic blue or green backs; invertebrate animal

**Habitat:** Soil and dead animals

**Foods:** Liquids from decaying plants and animals, animal wastes, blood

**Eaten by:** Warblers, flycatchers, chickadees, thrushes, shrews, carrion beetles, dragonflies, hornets, centipedes

**Do You Know?** Some blow flies are important as plant pollinators. Many flies transport microscopic organisms that cause diseases in animals. Flies taste with their feet.

### 131. SAW FLY

F,T

**Traits:** Insects with four clear wings; hind wings smaller than forewings; long antennae, broad abdomens

**Habitat:** Adults use a variety of habitats, but larvae usually live only on certain plants.

**Foods:** Leaves of conifers, certain broadleaf trees, other plants; some larvae are leaf miners. Some species eat nectar or pollen.

**Eaten by:** Flycatchers, swallows, certain wasps

**Do You Know?** These insects look scary because of their well-developed ovipositors (egg-layer), which look like a stingers, but they do not sting or bite.

### 128. BOT AND WARBLE FLY

F,T

**Traits:** Beelike, hairy flies; invertebrate animal

**Habitat:** Larvae develop inside a host animal.

**Foods:** Larvae eat body fluids or tissues of their hosts (hares, squirrels, caribou, marmots, and other mammals). Foods of the adults are unknown.

**Eaten by:** Insect-eating birds

**Do You Know?** Bot flies lay their eggs on their host's skin. The larvae burrow under the skin and feed on tissues or body fluids of the host, then emerge and drop to the ground where they develop into adults who will continue the cycle.

### 132. ICHNEUMON

F,T,W

**Traits:** Insects with long, narrow bodies and four clear wings; antennae are at least half as long as the body. Some have a long, narrow tail-like structure for egg-laying.

**Habitat:** Any habitat where there are host insects

**Foods:** Adults lay their eggs inside larval sawflies, horntails, butterflies, moths, and spiders. When the eggs hatch, the larvae eat the host.

**Eaten by:** Flycatchers, swallows, thrushes, warblers, chickadees

**Do You Know?** These wasplike insects are important parasites of immature insects.

### 129. FUNGUS GNAT

F,T,W

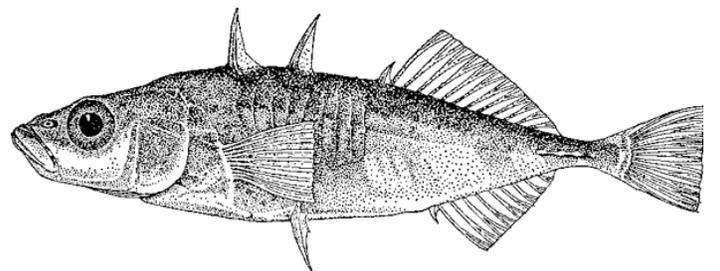
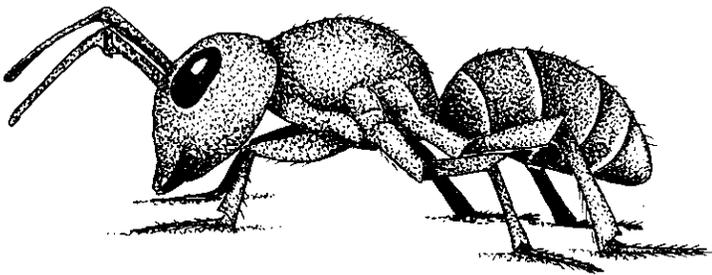
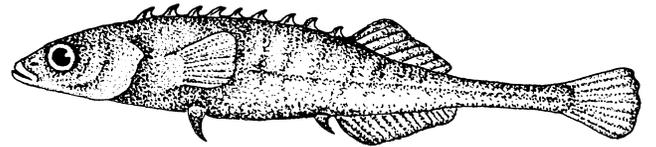
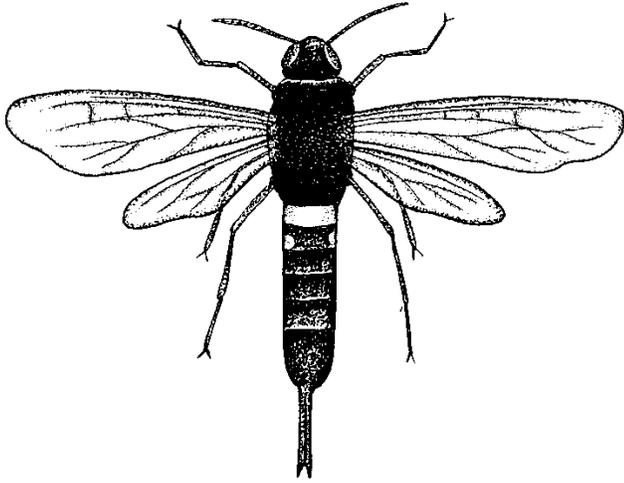
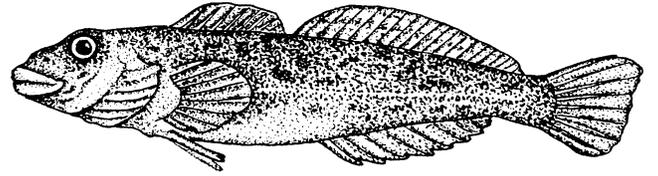
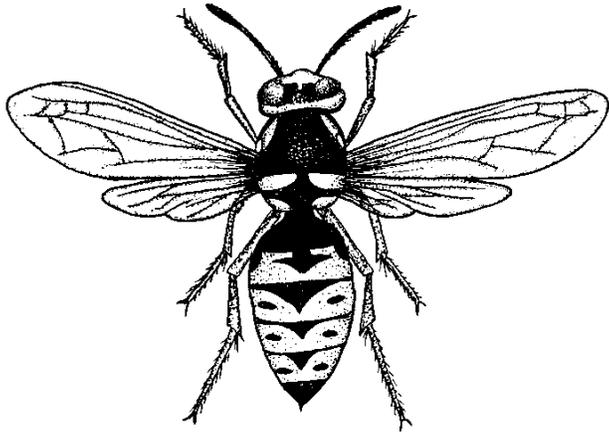
**Traits:** A slender, mosquito-like insect with long legs and long antennae; invertebrate animal

**Habitat:** Decaying vegetation, fungi, moist soil

**Foods:** Fungi, decaying plants, roots of live plants

**Eaten by:** Ground beetles, spiders, insect-eating birds

**Do You Know?** There are more than 600 species of fungus gnats in North America.



### 136. SLIMY SCULPIN

F,T,W

**Traits:** Small fish (animal) with a large head, short lateral line ending below the second dorsal fin

**Habitat:** Lakes and fast-moving streams; adults move to shallow water to spawn.

**Foods:** Larvae of flies, mayflies, caddisflies, dragonflies, amphipods; also some eggs and young fish

**Eaten By:** Grebes, loons, mergansers, other fish

**Do You Know?** Male builds nest and defends eggs against predators. The color of its skin makes it nearly invisible when motionless on river and lake bottoms.

### 133. YELLOWJACKET AND HORNET

F,T,W

**Traits:** Insects with bright black and yellow or white markings; the tip of the abdomen is pointed and has a stinger; invertebrate

**Habitat:** Variety of types

**Foods:** Adults eat flower nectar, ripe fruit, other insects; larvae eat caterpillars, flies, meat from dead animals, nectar.

**Eaten by:** Insect-eating birds such as flycatchers and swallows

**Do You Know?** These wasps build paper nests in the ground and in a protected site above ground.

### 137. NINE-SPINE STICKLEBACK

F,T,W

**Traits:** Fish with nine spines on its dorsal (back) fin; animal (vertebrate).

**Habitat:** Lakes and rivers; spends the winter in deep water, then migrates to shallow water and tributaries to spawn

**Foods:** Midges, water fleas, copepods, crustaceans, aquatic insects

**Eaten by:** Arctic char, lake trout, grayling, loons, grebes, terns, gulls, mink, river otters, humans

**Do You Know?** Sticklebacks can lock their spines upright to prevent predators from swallowing them.

### 134. HORNTAIL

F

**Traits:** Insects (invertebrate animal) with four clear wings, hind wings smaller than forewings; long cylinder-shaped abdomen with a spinelike part at the tail end, which is used for egg-laying; this insect does not sting.

**Habitat:** Forests; larvae live in wood of living or dead trees.

**Foods:** Wood

**Eaten by:** Woodpeckers, creepers, nuthatches, ichneumons

**Do You Know?** Some horntails are parasitized by ichneumons.

### 138. THREE-SPINE STICKLEBACK

F,T,W

**Traits:** Fish with three sharp spines on its back; animal (vertebrate)

**Habitat:** Fresh and salt water

**Foods:** Copepods, water fleas, midges, rotifers, seed shrimp, aquatic worms, mollusks, amphipods, leeches, flatworms, water mites

**Eaten by:** Salmon, Dolly Varden, loons, grebes, mergansers, adult sticklebacks will eat young sticklebacks.

**Do You Know?** Sticklebacks have a high tolerance to low oxygen levels in shallow, frozen lakes. They can survive where other fish cannot.

### 135. ANT

F,T,W

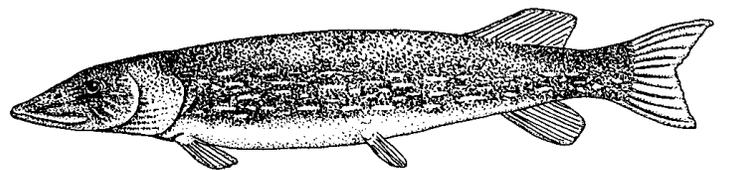
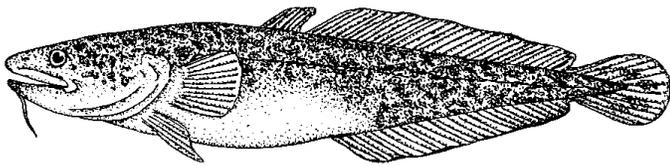
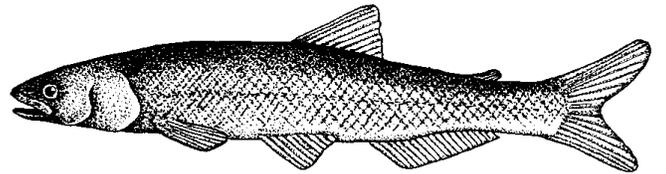
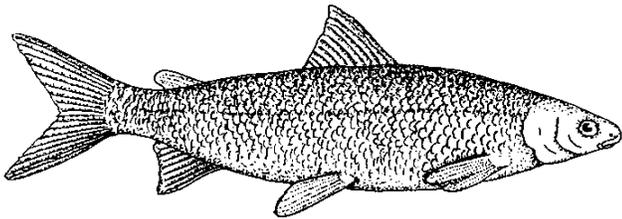
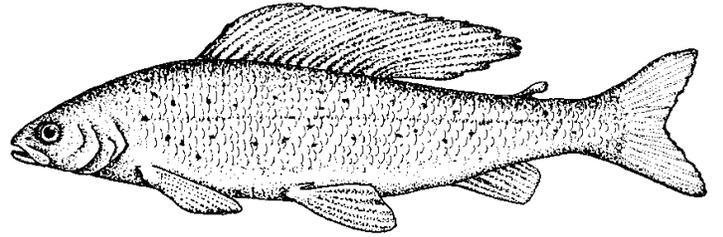
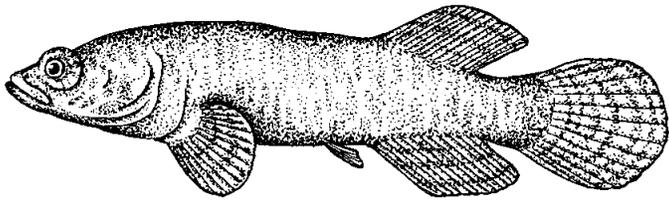
**Traits:** Body clearly divided into three segments by narrow constrictions, last segment forming a pointed end; many secrete formic acid as a defense. Only certain kinds of adults have wings.

**Habitat:** In colonies in the ground or in wood

**Foods:** Varies by species; flower nectar, plant juices, or aphid honeydew; seeds, leaves, or dead organisms; some are predators on other insects.

**Eaten by:** Flickers, wrens, thrushes, sparrows

**Do You Know?** Some ants protect aphids from predators, then feed on the sugary secretion (honeydew) the aphids produce.



## 142. ARCTIC GRAYLING

T, W

**Traits:** Fish with a large sail-like dorsal fin and small mouth; dorsal fin dotted with large iridescent red or purple spots; animal

**Habitat:** Cold, clear streams, lakes, ponds; spawn in streams with sandy gravel bottoms.

**Foods:** Mayflies, stoneflies, caddisflies, salmon eggs and smolt; also voles or shrews that fall into the water

**Eaten by:** Larger fish, loons, grebes, mergansers, humans

**Do You Know?** Grayling migrate from deep, fresh water holes upstream to spawn in smaller streams and headwaters.

## 139. BLACKFISH

F,T,W

**Traits:** Fish with a broad, flat head; large dorsal and anal fins placed far back on body; rounded tail, three rays in pelvic fin; animal (vertebrate).

**Habitat:** Heavily vegetated lowland ponds and streams

**Foods:** Copepods, water fleas, insect larvae, mollusks, segmented worms, algae

**Eaten by:** River otters, mink, loons, grebes, terns, humans

**Do You Know?** The antifreeze in blackfish blood allows them to tolerate icy cold water and survive partial freezing.

## 143. EULACHON

W

**Traits:** Fish has circular grooves on gill covers; narrow body, forked tail; animal

**Habitat:** Adults live at sea but return to fresh water streams with sandy gravel bottoms to spawn. The fry are swept out to sea and live in estuaries and near-shore waters.

**Foods:** Copepods, phytoplankton, mysid shrimp, barnacle larvae, water fleas, worm larvae

**Eaten by:** Salmon, seals, sea lions, beluga whales, humans

**Do You Know?** Eulachon is an oily fish, also known as the "candlefish" because of its traditional use as a candle when dried and fitted with a wick.

## 140. WHITEFISH

F,T,W

**Traits:** Fish with slender, rounded bodies; forked tails; small mouths with upper jaw overlapping the lower jaw; animal (invertebrate)

**Habitat:** Lakes, streams, estuaries

**Foods:** Mainly insects, including larval mayflies, stoneflies, midges, dragonflies, mosquitoes; also eggs and larvae of other fish

**Eaten by:** Lake trout, burbot, arctic char, humans; fry are eaten by fish-eating birds, such as mergansers and grebes.

**Do You Know?** Most whitefish migrate long distances between feeding and spawning grounds. Some migrate to salt water feeding areas, but spawn and overwinter in fresh water.

## 144. NORTHERN PIKE

W

**Traits:** A fish with a long, flat snout; rear placement of dorsal and anal fins; large mouth with many sharp teeth; elongated body and head; animal (invertebrate)

**Habitat:** Deep, fresh water lakes and rivers in winter; shallow, near-shore waters in summer

**Foods:** Adults eat fish, waterfowl, frogs, water shrews, and insects. Young eat copepods, water fleas, and insects.

**Eaten by:** Bigger pike, blackfish, humans

**Do You Know?** A 12-pound pike was found with a 4-pound pike in its stomach.

## 141. BURBOT

F,T,W

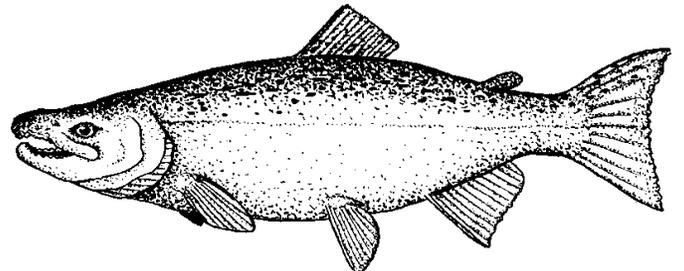
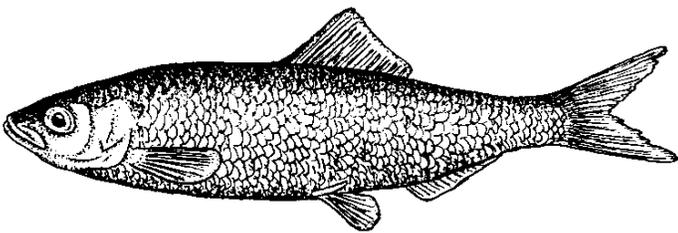
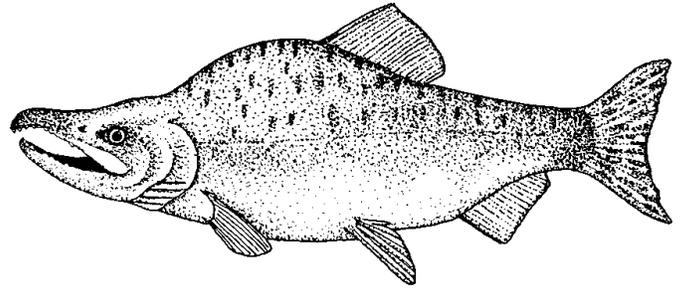
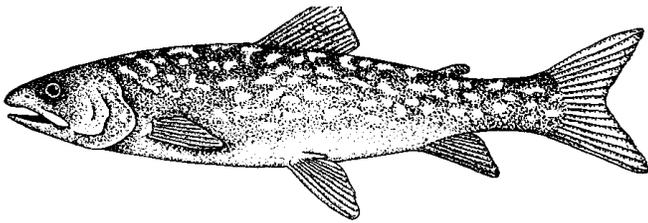
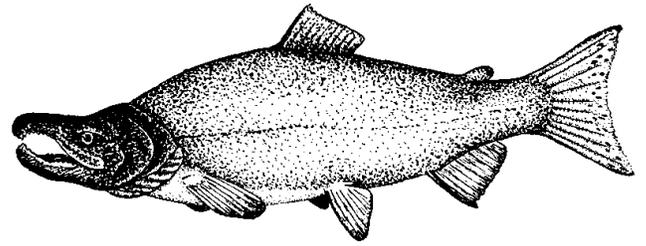
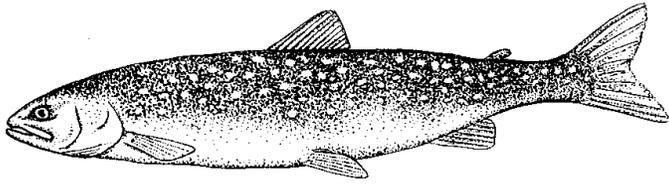
**Traits:** Fish with a large head, wide gill openings, two dorsal fins (second one long), small barbel on chin; rounded tail, no spines on fins; animal

**Habitat:** Deep waters of lakes and rivers; spawn in moderately deep water with gravel and sandy bottoms

**Foods:** Adults: mainly fish, some insect larvae, mollusks, copepods, fish eggs, shrews; young: stonefly and mayfly larvae, other insects, small fish

**Eaten by:** Young eaten by other fishes, humans

**Do You Know?** A single female burbot can lay 1,000,000 eggs!



## 148. SOCKEYE SALMON

W

**Traits:** Fish with an adipose fin; lacks definite spots on back and tail; animal (vertebrate)

**Habitat:** Adults live at sea, but return to fresh-water streams to spawn.

**Foods:** Squid, copepods, crustaceans, insects, other small fish; fry eat insects and other invertebrates.

**Eaten by:** Seals, whales, larger fish, bears, bald eagles, humans

**Do You Know?** Sockeye salmon, also known as red salmon, are the most abundant salmon in Alaska.

## 145. ARCTIC CHAR

T,W

**Traits:** A medium-sized fish with an adipose fin, small scales, large pink to red spots on sides and back; animal (invertebrate)

**Habitat:** Lakes; spawns in gravel of lake margins or shallow, quiet stream pools.

**Foods:** Insects, young fish, crustaceans, mollusks

**Eaten by:** Other fishes, diving birds, humans

**Do You Know?** Adults feed on salmon smolts migrating to the sea. Arctic char eggs and young are adapted to survive near-freezing water temperatures.

## 149. PINK SALMON

W

**Traits:** Fish with an adipose fin, very large spots on back, and caudal fin

**Habitat:** Adults live at sea but move into fresh water to spawn in rivers and river mouths. Young go to sea shortly after leaving spawning areas.

**Foods:** Copepods, squid, insects, amphipods, small fish

**Eaten by:** Larger fish, seals, sea lions, certain whales, bears, bald eagles, osprey, humans

**Do You Know?** Pink salmon, the smallest salmon, are also called humpbacks because the breeding males develop large humps on their backs.

## 146. LAKE TROUT

F,T,W

**Traits:** Fish with deeply forked tail, adipose fin, and irregular shaped spots on a silver-to-dark-gray background; animal (vertebrate).

**Habitat:** Throughout northern North America in cold lakes at high altitudes

**Foods:** Varies with age; young eat adult and larval insects (including midges, craneflies). Adults eat fish (sticklebacks and whitefish).

**Eaten by:** Other fish, terns, grebes, loons, humans

**Do You Know?** Lake trout are seven or eight years old when they first spawn in Alaska. Thereafter they spawn every other year.

## 150. COHO SALMON

W

(also called SILVER SALMON)

**Traits:** A large salmon with an adipose fin, small black spots on the back and upper caudal fin

**Habitat:** Adults live at sea, but return to fresh water to spawn in fast-flowing streams with gravel bottoms.

**Foods:** Herring, sandlance, crustaceans, other invertebrates; Young feed mostly on insects.

**Eaten By:** Whales, eagles, bears, other salmon, grebes, loons, humans

**Do You Know?** Young coho salmon may spend up as long as five years in fresh water before going to sea.

## 147. PACIFIC HERRING

W

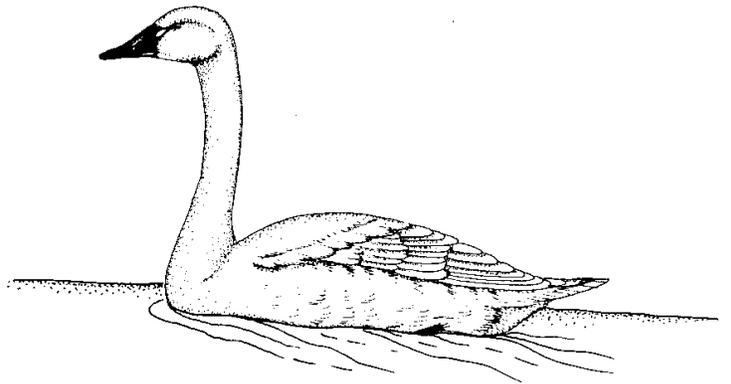
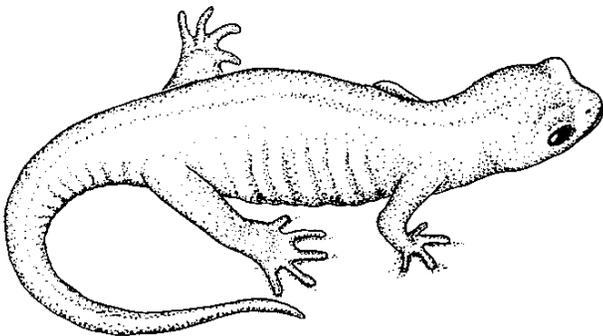
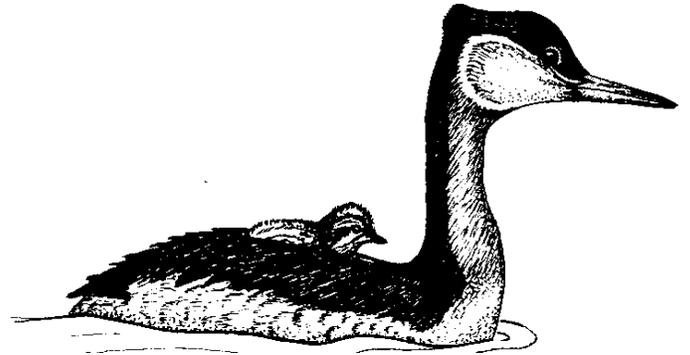
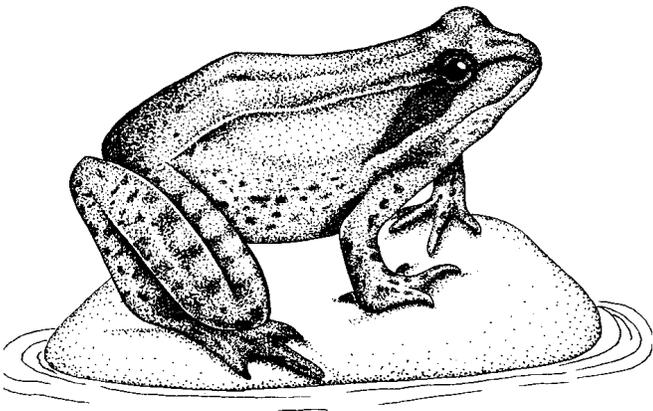
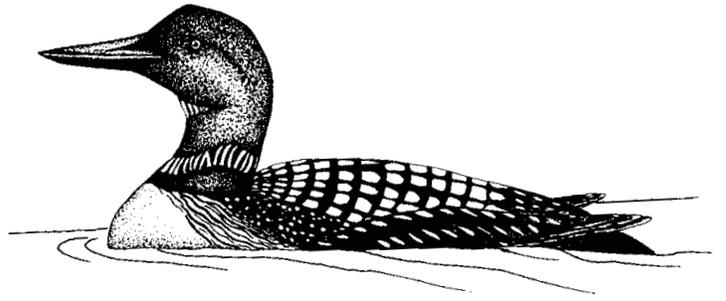
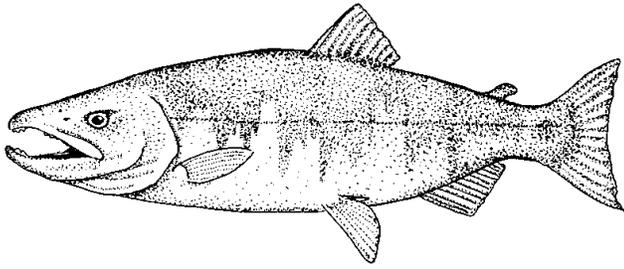
**Traits:** A medium-sized fish with no lateral line, large mouth, no teeth or jaws, no adipose fin

**Habitat:** Mainly at sea and in estuaries; spawns in shallow waters over eelgrass, kelp, or rocks. Young live in shallow bays and inlets before moving to deeper waters.

**Foods:** Adults feed on copepods, amphipods, euphausiids, mollusks, larvae, small fish. Young feed on copepods, invertebrate eggs, diatoms.

**Eaten by:** Chum salmon, loons, porpoises, beluga whales, humans

**Do You Know?** Pacific herring are a very important part of the food web!



**154. LOON****F,T,W**

**Traits:** Diving bird with a sharp, pointed bill and webbed feet; large, heavy body; unable to take flight from land; animal (vertebrate)

**Habitat:** Nests on freshwater lakes. Winters along Pacific coast to Mexico.

**Foods:** Sticklebacks, sculpins, herring, sandlance, young salmon, rockfish, flounders, codfish; also eat leeches, snails, shrimp, amphipods, aquatic insects.

**Eaten by:** Foxes, gulls, jaegers, eagles

**Do You Know?** Loons can dive to depths as great as 240 feet (73 m) and fly as fast as 60 miles (101 km) per hour.

**151. CHUM SALMON****W**

**Traits:** This salmon species has an adipose fin and an absence of spots on body and fins. All fins, except dorsal, have dark tips.

**Habitat:** Adults live at sea, but move into fast-flowing fresh-water streams to spawn.

**Foods:** Copepods, amphipods, squid, crab larvae, young herring, other fishes

**Eaten by:** Whales, eagles, bears, other fish, humans

**Do You Know?** Chum salmon swim 2,000 miles (3380 km) up the Yukon River to spawn.

**155. GREBE****F,T,W**

**Traits:** Diving bird with a sharp, pointed bill and lobed feet; rarely seen on land or in flight

**Habitat:** Nests on lakes and estuaries; winters in bays and estuaries along Pacific coast to Mexico.

**Foods:** Fish, crustaceans, insects, other invertebrates

**Eaten by:** Foxes, eagles, mink, weasels, gulls

**Do You Know?** Grebes eat their own feathers! This is thought to protect their stomachs and intestines from sharp fish bones.

**152. WOOD FROG****F,T,W**

**Traits:** Small amphibian with moist skin, no scales or claws, long hind legs, short forelegs, large mouth; animal (vertebrate)

**Habitat:** Forests, muskegs, tundra; adults live on land, but breed in water. Eggs and tadpoles live only in water.

**Foods:** Adults eat flies, true bugs, lacewings, dragonflies. Larvae eat algae and small aquatic plants.

**Eaten by:** Pike, sandhill cranes, jays, crows, grebes, loons, mink, river otters; larvae are eaten by certain insects and fish.

**Do You Know?** Wood frogs can survive temperatures as low as 21°F.

**156. TUNDRA SWAN****T,W**

**Traits:** Large aquatic bird with a six- to seven-foot (1.8-2.1 m) wingspan, all-white plumage, very long neck; bright yellow spot on black bill

**Habitat:** Lowland tundra and small islands, ponds, lakes, rivers

**Foods:** Leaves, seeds, and underground roots of horsetails, pondweed, sedges, rushes, pond lily, water milfoil

**Eaten by:** Foxes, mink, gulls

**Do You Know?** Once paired, swan mates tend to stay together for life.

**153. SALAMANDER AND NEWT****F**

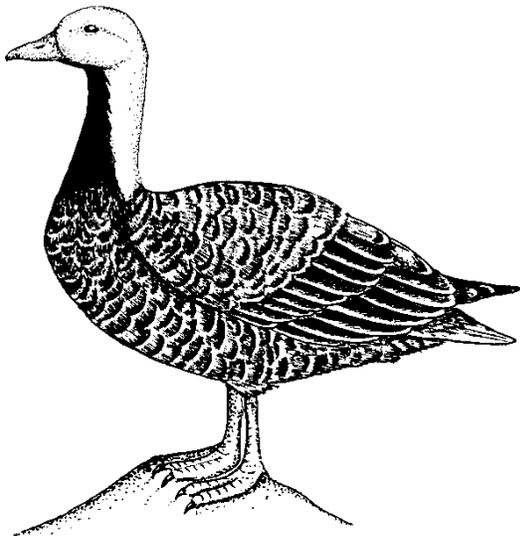
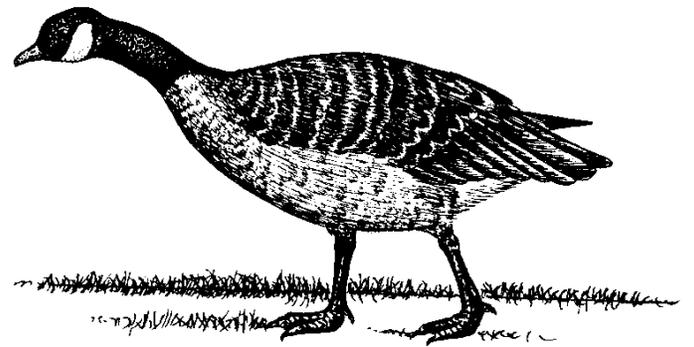
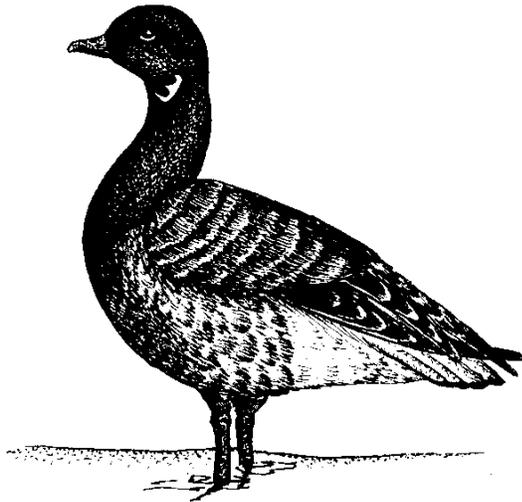
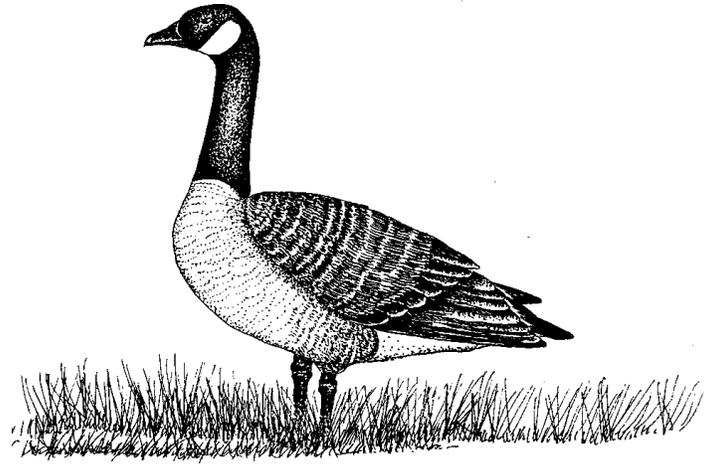
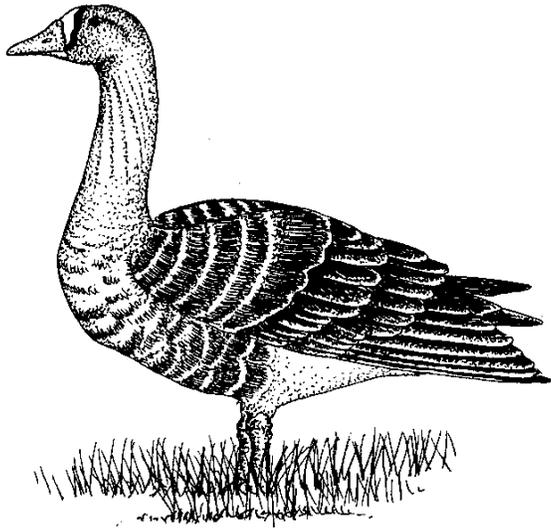
**Traits:** Small animals with moist skin, no scales or claws, short fore and hind legs, long tail

**Habitat:** Moist places in Alaska's coastal forests

**Foods:** Small insects, springtails, beetles, flies

**Eaten by:** Jays, crows, mink, shrews

**Do You Know?** Alaska's two salamanders, the northwestern salamander and the long-toed salamander, are nocturnal (active at night) and are secretive. There is one species of newt in Alaska: the rough-skinned newt.



**160. CACKLING CANADA GOOSE T,W**

**Traits:** Bird with webbed feet, black head and neck with distinctive white "chin strap"; black bills, legs, and feet; this subspecies, the size of a mallard duck, is the smallest type of Canada goose.

**Habitat:** Nests in coastal wetlands of the Yukon-Kuskokwim Delta. Winters in wetlands and agricultural areas of Oregon and California.

**Foods:** Grasses, sedges, berries, agricultural grains

**Eaten by:** Foxes, gulls, jaegers, ravens, humans

**Do You Know?** The call of this goose is a short, high-pitched cackle. This is why it is called the "cackling" Canada goose.

**157. GREATER WHITE-FRONTED GOOSE T,W**

**Traits:** Medium-sized, grey-brown goose with orange legs and feet; animal (vertebrate)

**Habitat:** Nests in wetlands and tundra. Winters in wetlands and agricultural fields in central California.

**Foods:** Grasses, sedges, leaves, berries, seeds, roots of many aquatic plants in summer; seeds of rice, water grass, milo, barley, marsh plants (rushes and cattails) in winter.

**Eaten by:** Foxes, gulls, jaegers, ravens, humans

**Do You Know?** White fronts are also called "speckle-bellies" because of the dark brown bars on their undersides.

**161. DUSKY CANADA GOOSE W**

**Traits:** A medium-sized goose with black head and neck marked with white "chin strap" from ear to ear; dark breast

**Habitat:** Nests in sedge marshes of the Copper River Delta; winters in Oregon along the Willamette River Valley.

**Foods:** Shoots, roots, and seeds of grasses and sedges, bulbs, grains, berries, insects, crustaceans, mollusks

**Eaten by:** Gulls, jaegers, bald eagles, brown bears, coyotes, mink

**Do You Know?** Nests only on the Copper River Delta and winters only in Oregon.

**158. BRANT T,W**

**Traits:** Small, dark goose with black head and neck and whitish patches on upper neck

**Habitat:** Nests on islands in salt bays, estuaries, coastal tundra lakes and ponds.

**Foods:** In spring and summer, short annual grasses, sedges, algae, larval insects, small crustaceans; eel grass in migration and winter

**Eaten by:** Foxes, gulls, jaegers, ravens, humans

**Do You Know?** All brant gather in fall at Izembek Lagoon, on the Alaska Peninsula. They fly nonstop to the Lower 48 in 48-60 hours.

**162. NORTHERN PINTAIL T,W**

**Traits:** A large, slender duck; male has white breast and brown head with a long, pointed tail

**Habitat:** Tundra, lakes, ponds, marshes; winters in coastal freshwater wetlands.

**Foods:** Ninety percent plant foods, including seeds of sedges, grasses, pondweeds, smartweeds, grain; will eat aquatic invertebrates and insects.

**Eaten by:** Foxes, eagles, minks; young eaten by gulls, jaegers, humans

**Do You Know?** Pintails are the most widely distributed duck in North America.

**159. EMPEROR GOOSE W**

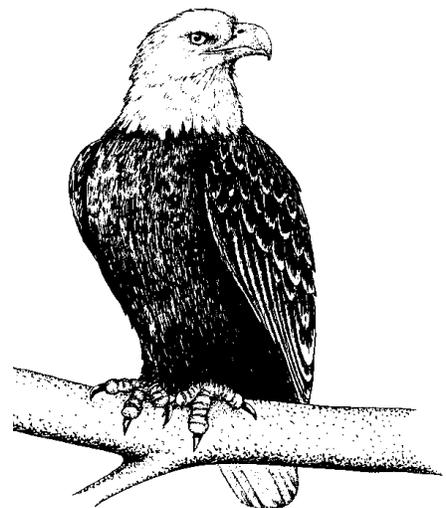
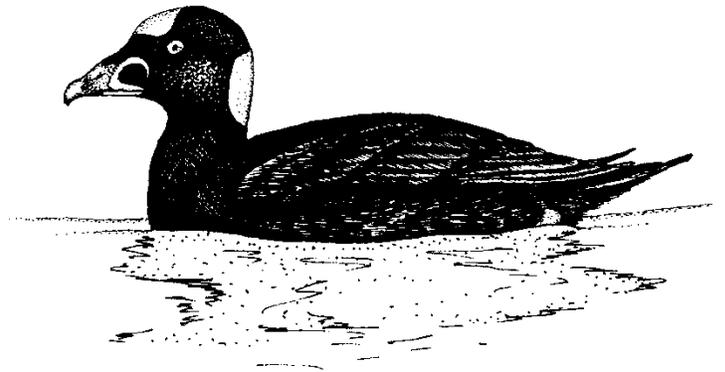
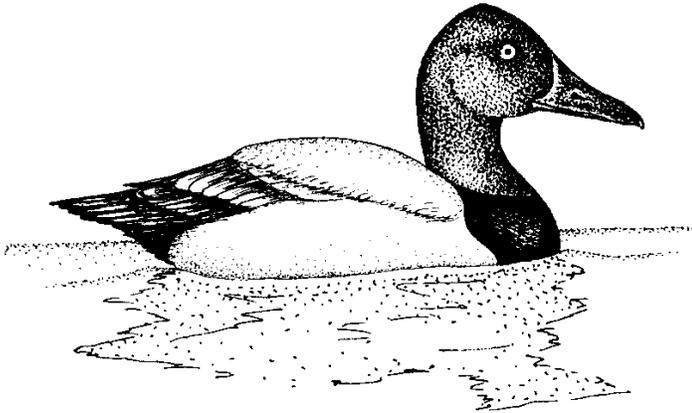
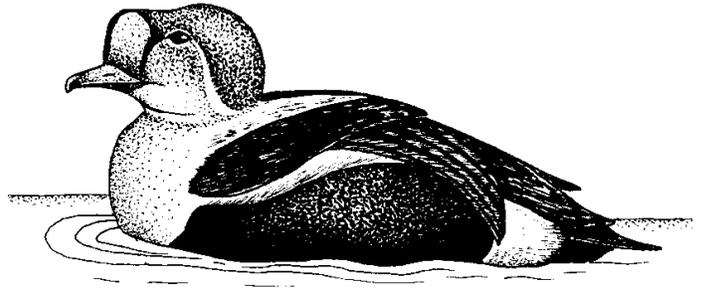
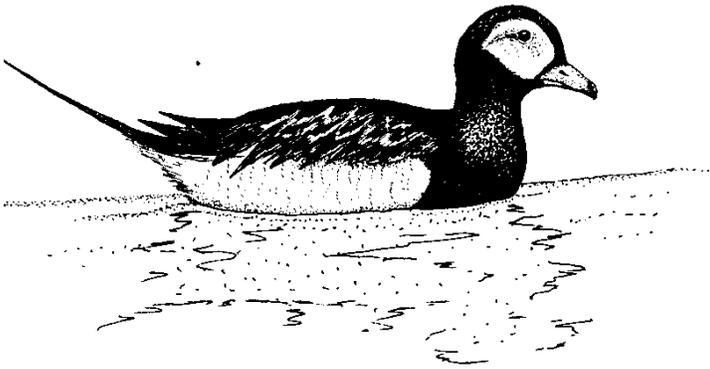
**Traits:** Blue-gray goose with round body, rounded head, and short, thick neck; the head and back of neck are white.

**Habitat:** Nests in wetlands within 5-15 miles (8-24 km) of the Bering Sea coast; they winter in the near-shore waters and intertidal areas of the Aleutian Islands.

**Foods:** Grasses, sedges, aquatic vegetation in summer and fall; small invertebrates, eelgrass, algae in winter

**Eaten by:** Foxes, gulls, jaegers, ravens, humans

**Do You Know?** Emperor geese spend their entire life in Alaska.



**166. EIDER****T,W**

**Traits:** Large, bulky diving ducks with dense down feathers that help insulate them from the cold northern oceans

**Habitat:** Nest near lowland tundra lakes or on barrier islands; winter on the ocean.

**Foods:** In fresh water, eiders feed on aquatic insects and some plants, but at sea they feed on a variety of invertebrate animals (mussels, clams, whelks, seastars, sea urchins, and various crustaceans).

**Eaten by:** Foxes, bears; eggs are eaten by jaegers and gulls.

**Do You Know?** Eiders line their nests with their down feathers, thus providing superb insulation for their eggs.

**163. OLDSQUAW****T,W**

**Traits:** Stocky, diving duck with black, brown, and white plumage; males have long tail feathers.

**Habitat:** Ponds and lakes of lowland and alpine tundra in summer. Ocean in winter.

**Foods:** Mussels, clams, snails, and crustaceans are their main foods. In fresh water, they also eat larvae of midges, crane flies, caddisflies, other insects.

**Eaten by:** Foxes, weasels, gulls, jaegers, ravens

**Do You Know?** Oldsquaws may dive deeper than any other duck. They have been recorded at depths of 72-240 feet (22-73 m).

**167. SCOTER****F,T,W**

**Traits:** Stocky, short-necked, diving ducks; males are black with colorful bills. Females are brown.

**Habitat:** Alpine and lowland tundra lakes; coastal wetlands in winter

**Foods:** Insects (caddisflies, damselflies, dragonflies, beetles, water boatmen); at sea: mussels, clams, some crustaceans

**Eaten by:** Jaegers, weasels, foxes

**Do You Know?** Most species breed in the far north and migrate in large, compact flocks to and from their coastal wintering grounds.

**164. CANVASBACK****W**

**Traits:** A large-sized duck with sloping forehead and long black bill; male has dark reddish head and neck. Females are light brown.

**Habitat:** Marshes, sloughs, and lakes with shoreline plants; winters in lakes, rivers, and saltwater bays.

**Foods:** Pondweeds, seeds of sedges and burr reeds, aquatic invertebrates (especially small clams).

**Eaten by:** Foxes, falcons, eagles, weasels, gulls, humans

**Do You Know?** Their legs are located far back on the body and wide apart, which is good for diving, but poor for walking.

**168. BALD EAGLE****F,W**

**Traits:** Large, brown bird with rounded tail and wings; hooked yellow bill; long, curved talons; adults have white heads and tails.

**Habitat:** Forested areas along coasts, lakes, rivers; also some treeless coastal regions

**Foods:** Waterfowl, small mammals, salmon, herring, dead and dying fish, mammals or birds washed up along shorelines

**Eaten by:** Young occasionally eaten by ravens and magpies

**Do You Know?:** Bald eagles are almost five years old when their heads and tails become all white.

**165. MERGANSER****T,W**

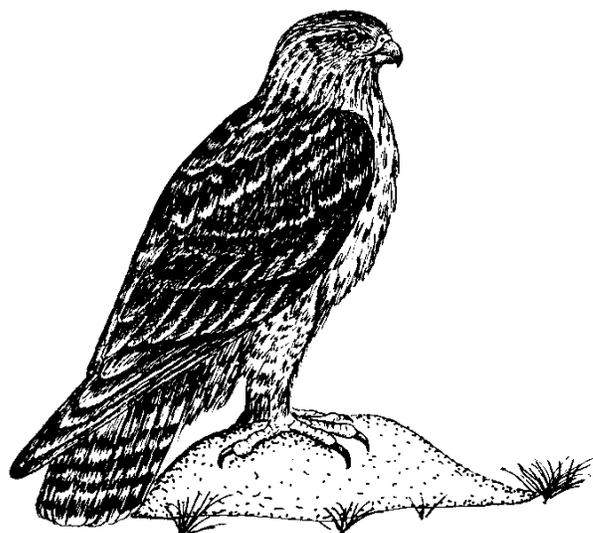
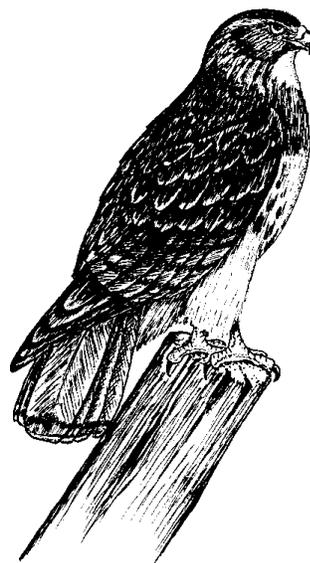
**Traits:** Long bill with saw-tooth edges and a hooked tip; most have a crest on head; unable to take off from land

**Habitat:** Nests in cavities on the ground or in a tree near rivers, lakes, or estuaries. Winters along the coast and on large inland lakes and rivers of the Lower 48.

**Foods:** Sticklebacks, sculpins, eels, eulachon, herring, blackfish, frogs, crustaceans, snails, insects, leeches

**Eaten by:** Foxes, weasels, gulls

**Do You Know?** Mother mergansers will sometimes carry young in her bill from nest to water.



**172. RED-TAILED HAWK** **F,W**

**Traits:** Large, brown bird with rounded tail and wings; reddish tail; hooked bill; talons  
**Habitat:** Nests in old trees, sometimes on cliffs. Hunts in open areas, including early successional forests, muskegs, and along rivers.  
**Foods:** Voles, mice, snowshoe hares, squirrels, shrews, weasels, other small mammals  
**Eaten by:** Great horned owls; eggs may be taken by ravens.

**Do You Know?** Often soars in wide circles above trees or mountain ridges and perches on dead limbs or atop branches of tall trees.

**169. NORTHERN HARRIER** **T,W**

**Traits:** Hawk with large eyes; sharply hooked bill, talons; long tail; long wings; white rump patch  
**Habitat:** Open areas, particularly coastal and fresh-water wetlands; nests throughout Alaska and winters in the Lower 48 south to northern South America.  
**Foods:** Voles, lemmings, dragonflies, sparrows, sandpipers  
**Eaten by:** Great horned owls; ravens will take eggs.

**Do You Know?** The harrier often locates prey by sound, using its curved, sound-reflecting facial ruff. The male drops prey items over the nest, and the incubating female flies up to catch them in mid-air.

**173. ROUGH-LEGGED HAWK** **T**

**Traits:** Large bird with long, white tail with dark bands; long, rounded wings; wide band of black across lower breast and belly  
**Habitat:** Alpine and dry lowland tundra near cliffs or river bluffs where it nests; winters in open habitats throughout the Lower 48.  
**Foods:** Lemmings, voles, hares, shrews, ground squirrels, some small birds and insects  
**Eaten by:** Foxes and ravens will eat eggs.

**Do You Know?** Rough-legs may migrate in loose flocks, but are otherwise generally seen singly or in pairs.

**170. SHARP-SHINNED HAWK** **F**

**Traits:** Medium-sized bird with a long tail and rounded wings; long, curved talons; hooked bill  
**Habitat:** Mature broadleaf-conifer forests  
**Foods:** Small birds, including chickadees, warblers, sparrows, thrushes, woodpeckers  
**Eaten by:** Eggs and young may be taken by squirrels and ravens.

**Do You Know?** When hunting, this hawk flies low through the leaves, darting under branches and across small openings. It can turn abruptly in flight to grasp small birds from the ground or capture them in mid-air with its sharp talons.

**174. GOLDEN EAGLE** **T**

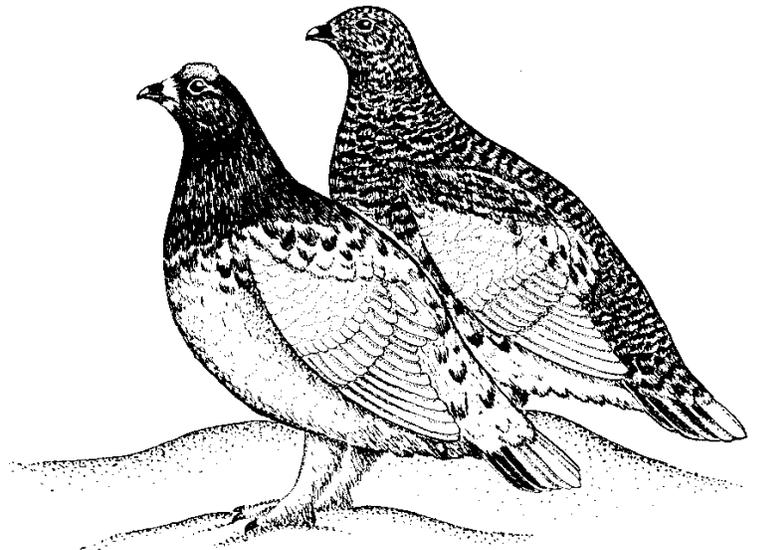
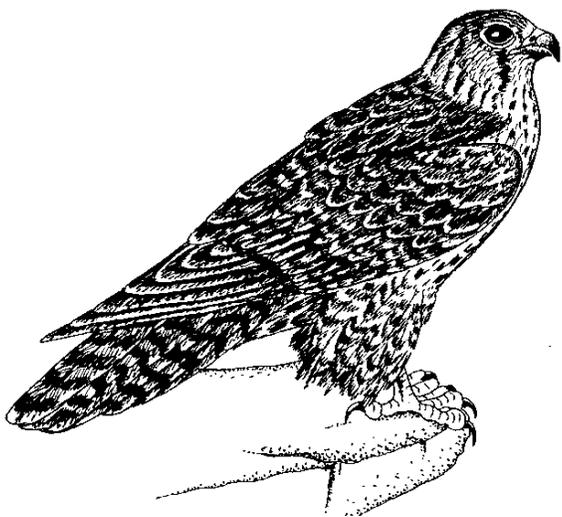
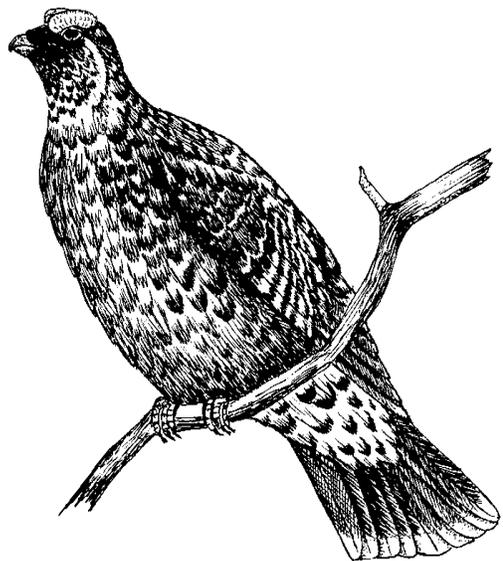
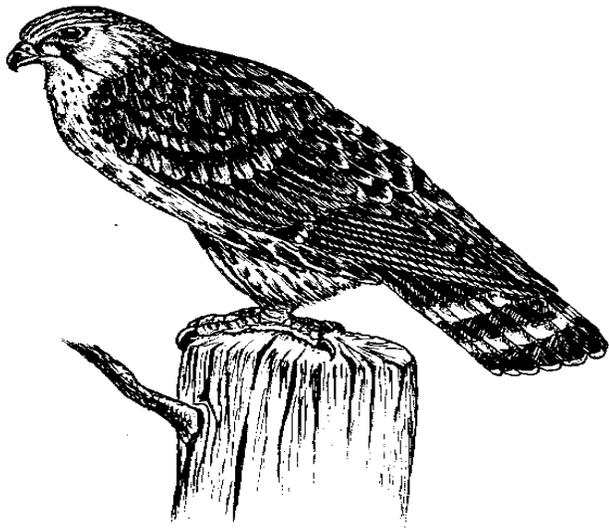
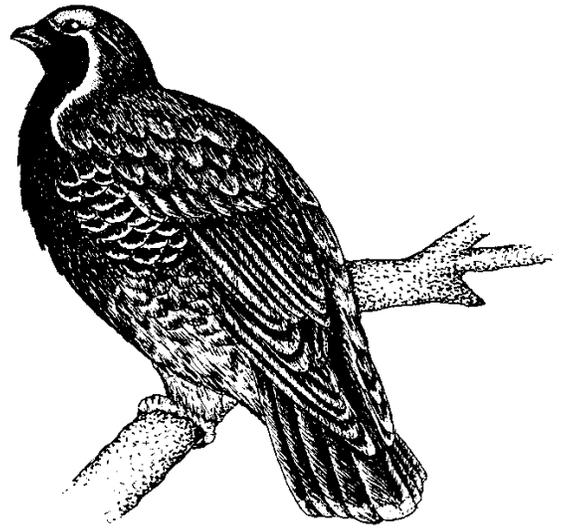
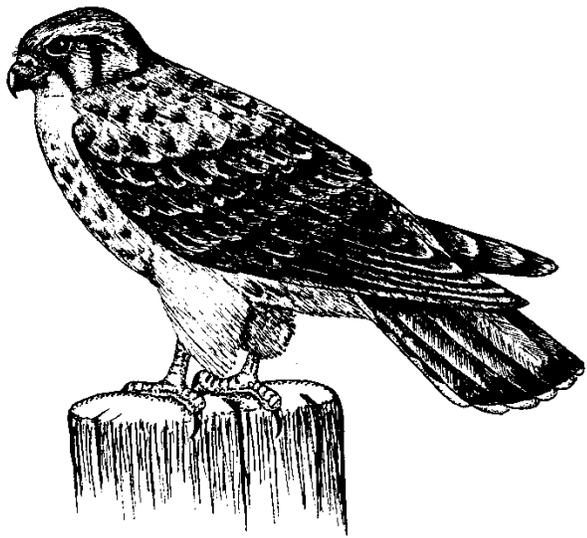
**Traits:** Large, brown bird with golden wash over back of head and neck; dark bill; tail faintly banded  
**Habitat:** Alpine tundra  
**Foods:** Arctic hares, marmots, ground squirrels, ptarmigan, carrion (dead animals)  
**Eaten by:** No known predators

**Do You Know?** Eagles are sometimes electrocuted from high-voltage power lines or caught in leg-hold traps. These injured birds can sometimes be rehabilitated and placed in zoos or released into the wild.

**171. NORTHERN GOSHAWK** **F**

**Traits:** Large gray bird with a long tail and rounded wings; long, curved talons; hooked bill  
**Habitat:** Mixed broadleaf-conifer forests with large, old trees for nest sites  
**Foods:** Squirrels, grouse, ptarmigan, snowshoe hares, large songbirds, woodpeckers, weasels  
**Eaten by:** Great horned owls; eggs and young eaten by foxes, ravens, gulls.

**Do You Know?** Goshawks aggressively defend nest sites, and they will not hesitate to strike people who stray too close to a nest.



**178. SPRUCE GROUSE****F**

**Traits:** Chickenlike bird with rusty band at the tip of dark tail

**Habitat:** Conifer and spruce-broadleaf forests; seeks shelter in forest, but feeds in forest openings. Requires a source of grit and gravel in the fall.

**Foods:** Insects, leaves, shoots, seeds, berries of ground cover plants; conifer needles in winter

**Eaten by:** Goshawks, great horned owls, great gray owls, foxes, lynx, coyotes, humans

**Do You Know?** In courtship display, male spreads his tail, erects red combs above eyes, and struts in his territory.

**179. BLUE GROUSE****F**

**Traits:** Chickenlike bird with long, black tail tipped in gray; female brown, male gray

**Habitat:** Coastal rain forests, muskegs, and alpine areas during summer

**Foods:** Leaves and shoots of ground-cover plants (including herbs and ferns) seeds, berries; some insects (beetles, ants and caterpillars)

**Eaten by:** Great horned owls, goshawks, foxes, humans; weasels and ravens eat eggs and young.

**Do You Know?** Courting males stand on a high spot and inflate their neck sacs to amplify their hooting.

**180. PTARMIGAN****T**

**Traits:** Chickenlike bird with feathered legs and feet; molts feathers three times a year from snow white to mottled brown to match its habitat.

**Habitat:** Alpine and dry lowland tundra

**Foods:** Buds and twigs of willow, dwarf birch, and other shrubs; also seeds, some insects

**Eaten by:** Foxes, lynx, gyrfalcons, golden eagles, humans

**Do You Know?** The feathered feet provide insulation and "snowshoes" that allow ptarmigan to walk on the snow surface. On cold winter nights, ptarmigan bury themselves in the snow to roost.

**175. AMERICAN KESTREL****F**

**Traits:** Medium-sized, reddish-brown bird with a long tail; pointed wings; sharply hooked bill; talons

**Habitat:** Forest edges and openings and early successional stages that include large, dead trees with holes for nesting

**Foods:** Large flying insects (grasshoppers and dragonflies), small mammals and birds (voles, mice, sparrows, chickadees)

**Eaten by:** Great horned owls, other falcons

**Do You Know?** The kestrel is the smallest falcon, and uses abandoned woodpecker cavities for nesting.

**176. MERLIN****F**

**Traits:** Medium-sized falcon with a long tail and sharply pointed wings; hooked bill; talons

**Habitat:** Open coastal and boreal forests; uses stick nests in spruce trees or (less commonly) nests on the ground.

**Foods:** Thrushes, juncos, swallows, waxwings, sparrows, woodpeckers, warblers

**Eaten by:** Squirrels, ravens, and marten may eat eggs.

**Do You Know?** When hunting, the merlin often flies low over ground, frequently rising and falling in flight. It overtakes prey by plucking it out of the air with its sharp talons.

**177. GYRFALCON****T**

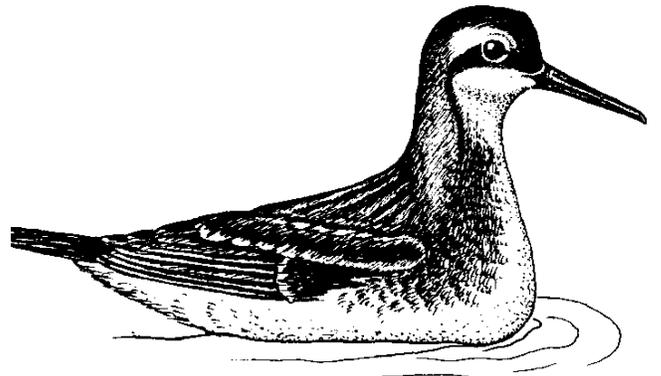
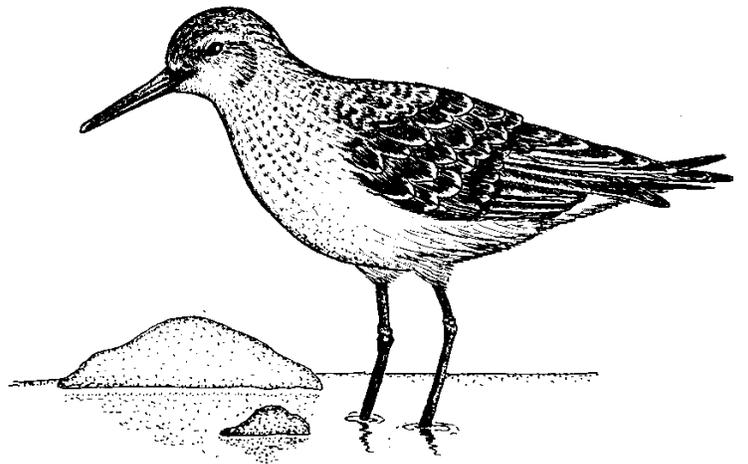
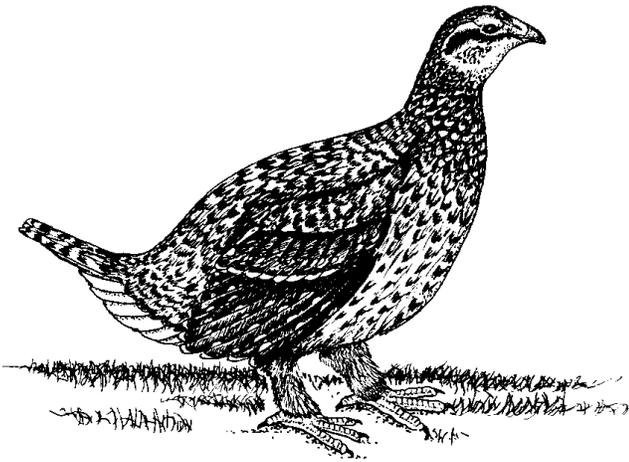
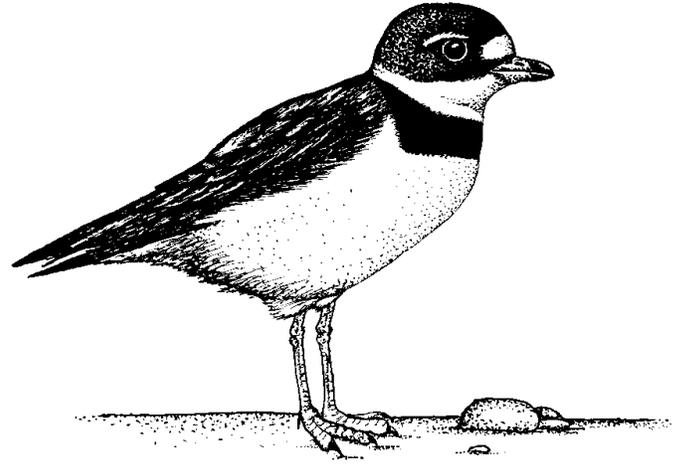
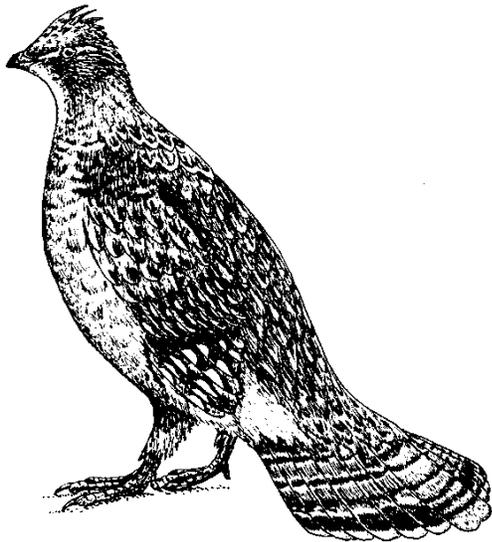
**Traits:** Large falcon with heavy body; pointed wings; narrow tail

**Habitat:** Alpine tundra near rocky outcrops and cliffs

**Foods:** Ptarmigan, other birds (gulls, jaegers, sandpipers, plovers, snow buntings, longspurs), some small mammals (lemmings, ground squirrels, hares)

**Eaten by:** Great horned owls, golden eagles; eggs and young taken by foxes, ravens.

**Do You Know?** Gyrfalcons remain in Alaska throughout the year because their prey, ptarmigan, also stay.



## 184. PLOVER

T,W

**Traits:** Shorebirds with short tails and long pointed wings; short, stout beak; brown or gray feathers

**Habitat:** Alpine and lowland tundra; in winter, coastal wetlands and prairies

**Foods:** Caterpillars, flies, mosquitoes, beetles, grasshoppers, mollusks, crustaceans, marine worms, some berries

**Eaten by:** Jaegers, ravens, falcons, arctic foxes, weasels

**Do You Know?** Other shorebirds nesting near plovers gain an advantage from the watchful plovers' warning cries when predators approach.

## 181. RUFFED GROUSE

F

**Traits:** Chickenlike bird with a ruff of black feathers on sides of neck; dark band at edge of gray tail

**Habitat:** Broadleaf forests; thickets of willow and alder

**Foods:** Insects, leaves, shoots, seeds and berries of trees and plants; in winter eats aspen catkins

**Eaten by:** Goshawks, great horned owls, great gray owls, foxes, lynx, humans

**Do You Know?** In courtship display, the male stands on a log or stump, erects the ruff on his neck, and rapidly beats his wings, creating a "drumming" sound.

## 185. SANDPIPER

T,W

**Traits:** Small shorebirds with black legs, long bills, reddish markings on the head

**Habitat:** Drier tundra; winters along coastal tideflats.

**Foods:** Amphipods, small clams, worms, larvae of craneflies and midges

**Eaten by:** Foxes, falcons, jaegers, gulls, falcons, owls, weasels

**Do You Know?** Some sandpipers fly as far south as Argentina and Chile to spend the winter!

## 182. SHARP-TAILED GROUSE

F

**Traits:** Chickenlike bird with narrow, stiff tail and V-shaped markings on breast

**Habitat:** Open grass areas and shrub thickets in boreal forests

**Foods:** Insects, leaves, shoots, buds, seeds and berries of shrubs and ground-cover plants, insects

**Eaten by:** Goshawks, great horned owls, great gray owls, foxes, lynx, coyotes

**Do You Know?** In the spring courtship ritual, males taxi like wind-up airplanes and follow a routine of feet-drumming and circling.

## 186. PHALAROPE

T,W

**Traits:** Small bird with a straight, thin bill and four lobed toes; the only shorebird that swims

**Habitat:** Nests amid grasses and sedges in wetlands. Winters at sea, mainly in southern hemisphere.

**Foods:** Plankton, mosquitoes, midges, black flies, craneflies, amphipods, copepods, fairy shrimp

**Eaten by:** Foxes, falcons, gulls, weasels, owls, jaegers

**Do You Know?** Their native name "Nimishuruk" means "spins in a circle," after the spinning motion that phalaropes use, while swimming, to stir up prey in water.

## 183. SANDHILL CRANE

T, W

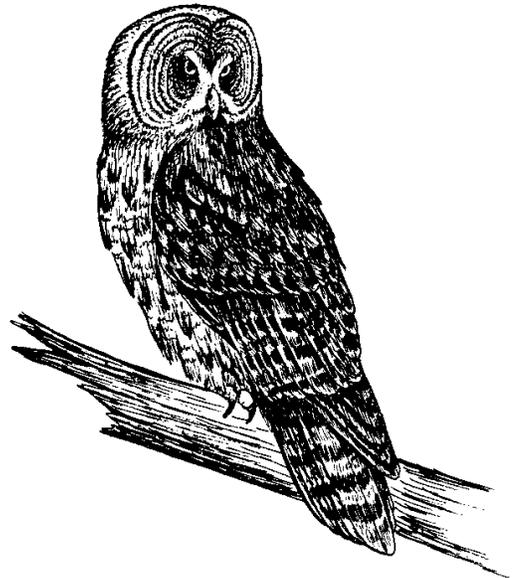
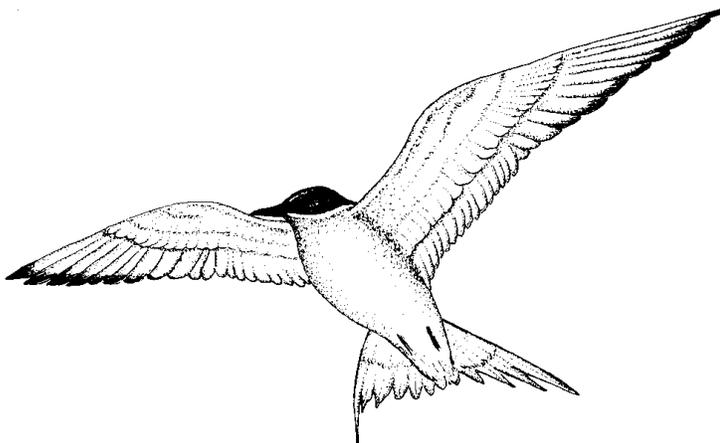
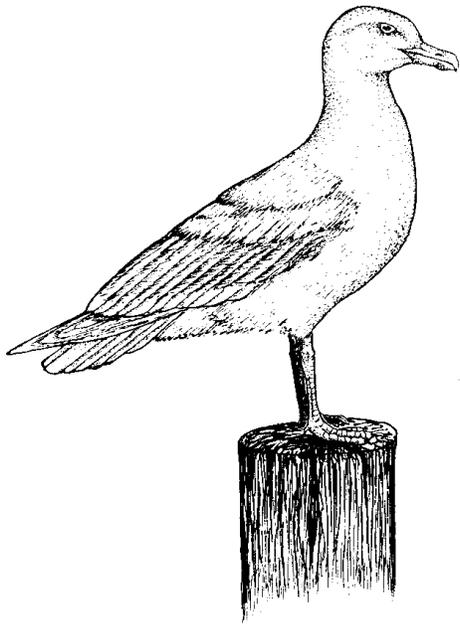
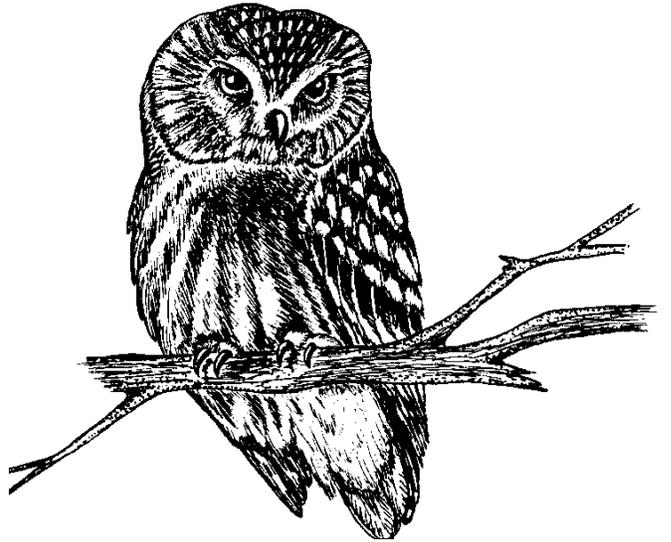
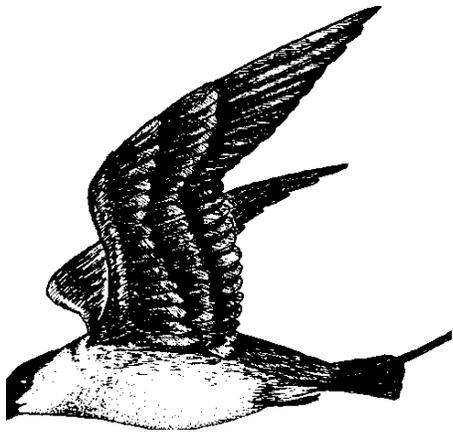
**Traits:** Large, gray bird with long neck, long legs, long beak; red skin on crown; whitish chin, cheek, and upper throat

**Habitat:** Lowland tundra, muskeg and river bottoms in summer; migrates to plains and coast of Lower 48 during winter.

**Foods:** Shoots, roots, and seeds of wetland plants; lemmings; voles; insects

**Eaten by:** Foxes, golden eagles, bald eagles, wolves, humans; eggs eaten by gulls.

**Do You Know?** Cranes migrate at great heights. Some have been observed at elevations of 13,000 feet (3,962 m)!



**190. NORTHERN SAW-WHET OWL F,W**

**Traits:** Small, brown bird with large, forward-facing eyes; long talons; hooked bill; streaked breast

**Habitat:** Coniferous or mixed forests, wooded swamps, tamarack bogs

**Foods:** Insects, voles, mice, shrews, bats, sparrows, juncos, warblers

**Eaten by:** Great-horned owls, marten

**Do You Know?** This owl depends on woodpeckers to excavate cavities in trees that it needs for nesting and roosting.

**187. PARASITIC JAEGER T,W**

**Traits:** Gull-like bird with strongly hooked bill and long, pointed wings; long central tail feathers; predator

**Habitat:** Alpine and lowland tundra throughout Alaska; in winter, ocean

**Foods:** Lemmings, small birds, fish, eggs and young of geese, ducks, shorebirds

**Eaten by:** Eggs and young may be eaten by foxes, bears, gulls, falcons, eagles, ravens.

**Do You Know?** Jaegers are pirates chasing smaller birds and forcing them to drop fish they have caught or swallowed.

**191. GREAT HORNED OWL F**

**Traits:** Large, brown bird with large, forward-facing eyes; feathers stick up on its head and look like horns; sharp talons, hooked bill

**Habitat:** Mature and old-growth forests throughout Alaska

**Foods:** Hares, squirrels, voles, mice, weasels, mink, porcupines, grouse, waterfowl

**Eaten by:** Other great horned owls

**Do You Know?** This owl often uses the abandoned nests of hawks, eagles, and ravens. It is very aggressive and will attack humans in defense of its nest.

**188. GLAUCOUS GULL T,W**

**Traits:** Large bird with pale gray wings and back; light can be seen through the white wing tips.

**Habitat:** Wetlands in tundra and marine coastal bluffs

**Foods:** Scavenges on dead animals; also eggs and young of other birds, crustaceans, insects, fish

**Eaten by:** Young bears; eggs eaten by jaegers, ravens, foxes

**Do You Know?** Gulls can stand on ice and still keep warm because of a special arrangement of blood vessels in their legs. Cold blood returning from the feet is warmed before it reaches the gull's body.

**192. GREAT GRAY OWL F**

**Traits:** Large, gray bird with forward-facing eyes; rounded head; sharp talons; hooked bill

**Habitat:** Boreal forests; nests in old trees but feeds in open areas, including early successional stages, muskegs, and along rivers

**Foods:** Voles

**Eaten by:** Great horned owls

**Do You Know?** This owl has a very large facial disk with concentric gray circles. It is the largest owl in Alaska (because of its fluffy plumage), although not the heaviest or strongest.

**189. TERNS F,T,W**

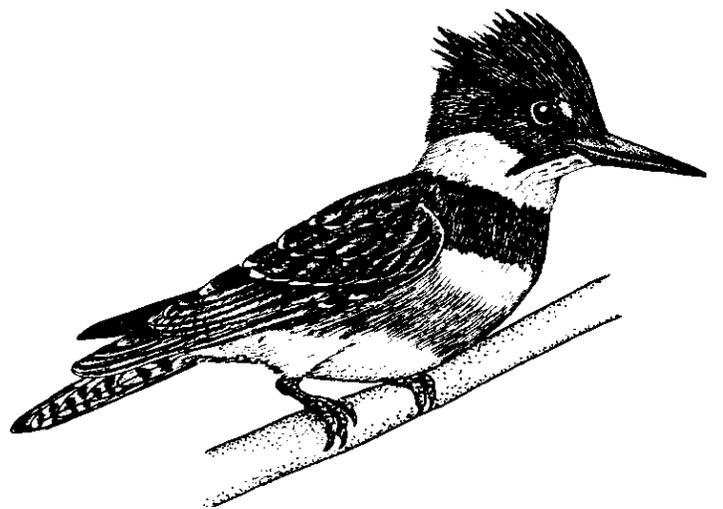
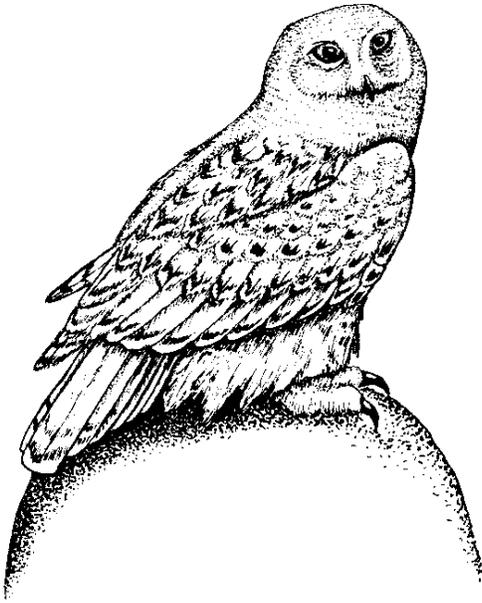
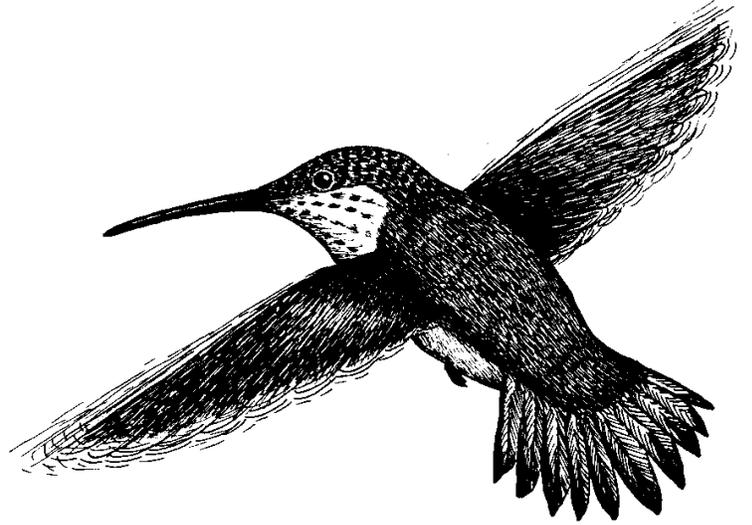
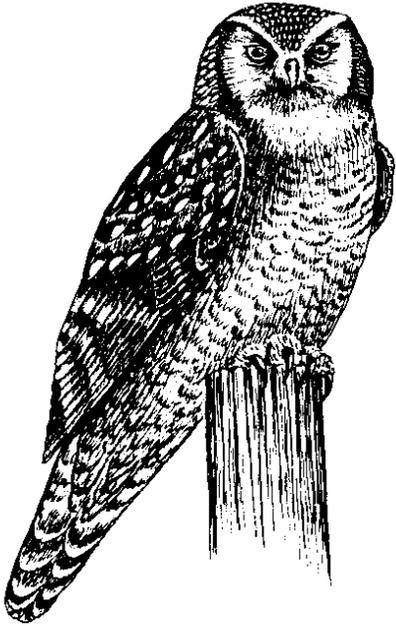
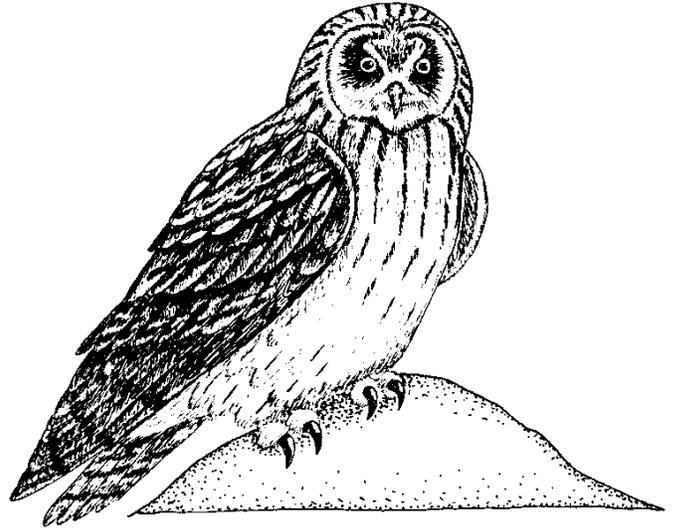
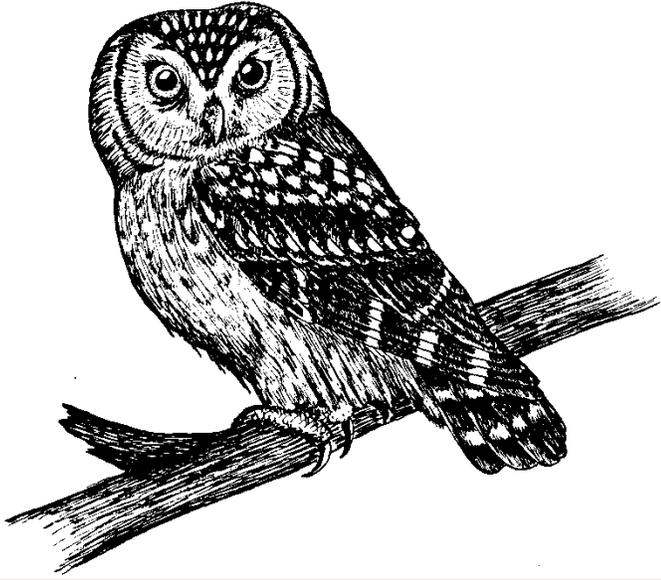
**Traits:** Birds with webbed feet, deeply forked tails, straight bills, and slender bodies.

**Habitat:** Wetlands in tundra and forested areas

**Foods:** Small fish

**Eaten by:** Falcons; eggs and young eaten by foxes, weasels, bears, gulls, jaegers, ravens

**Do You Know?** Terns attack any predators that come near their nesting colonies. Other birds nesting near tern colonies benefit from the terns' harassment of potential predators.



**196. SHORT-EARED OWL****T,W**

**Traits:** Small, buffy-brownish colored owl with boldly streaked breast; light facial disk; ear tufts barely visible

**Habitat:** Moist tundra and wetlands throughout Alaska

**Foods:** Small mammals and birds (voles, shrews, lemmings, young hares, sparrows, shorebirds)

**Eaten by:** Great horned owls; eggs and young may be eaten by foxes, bears, ravens, weasels.

**Do You Know?** Short-eared owls are highly nomadic; they appear when rodents are plentiful and move to other areas when food is scarce.

**193. BOREAL OWL****F**

**Traits:** Small, brown bird with large, forward-facing eyes; rounded head; streaked breast; short tail; curved talons

**Habitat:** Mixed spruce-broadleaf forests; nests in natural cavities in trees.

**Foods:** Voles, small birds including chickadees, warblers, thrushes

**Eaten by:** Great horned owls; eggs may be eaten by squirrels.

**Do You Know?** This owl's voice sounds like the ringing of a soft bell (also compared to the winnowing of the common snipe).

**197. RUFIOUS HUMMINGBIRD****F**

**Traits:** Very small bird; long bill with long, brush-tipped tongue; able to hover and fly backwards

**Habitat:** Coastal forest openings; nests on a conifer tree branch.

**Foods:** Flower nectar and pollen; also insects, especially spiders

**Eaten by:** Eggs or young may be eaten by squirrels, short-eared owls, sharp-shinned hawks.

**Do You Know?** The rufous hummingbird is the smallest bird in Alaska.

**194. NORTHERN HAWK OWL****F**

**Traits:** Medium-sized, gray-brown bird with large, forward-facing eyes; rounded head; barred breast; long tail

**Habitat:** Recently burned areas with large vole populations and black spruce forests; nests in tops of broken birch or spruce trees.

**Foods:** Small mammals(voles), small birds (sparrows)

**Eaten by:** Great horned owls

**Do You Know?** Unlike most owls, the northern hawk owl often hunts during daylight hours (diurnal). Watch for it sitting in a tree top.

**198. BELTED KINGFISHER****F,T,W**

**Traits:** Medium-sized, chunky body; large head with crest; long, sharply pointed bill; small legs and feet; two front toes joined together

**Habitat:** Coasts, rivers, lakes, ponds

**Foods:** Sticklebacks, sculpin, blackfish, young salmon, herring, eulachon, crustaceans, mollusks, aquatic insects

**Eaten by:** Falcons, hawks, eagles

**Do You Know?** The kingfisher digs its upslanting burrow in creek, river, lake, or pond bank for nesting. Nest is often lined with fish bones.

**195. SNOWY OWL****T,W**

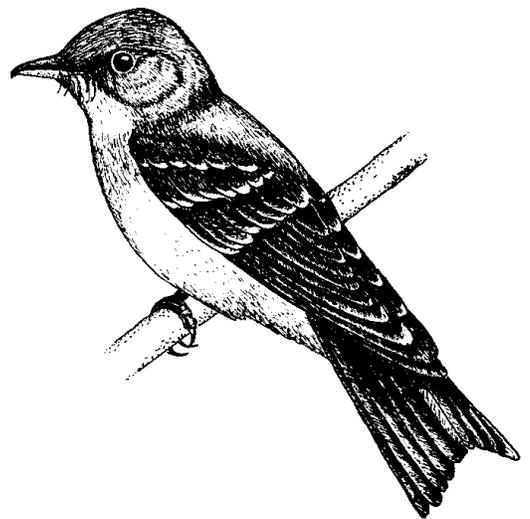
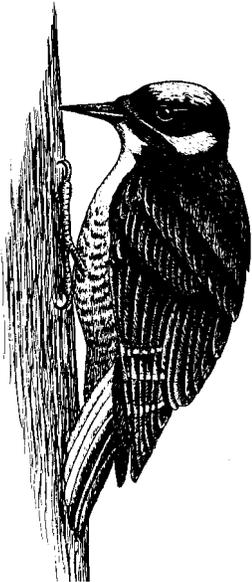
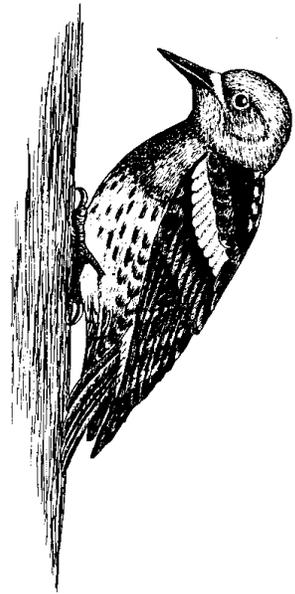
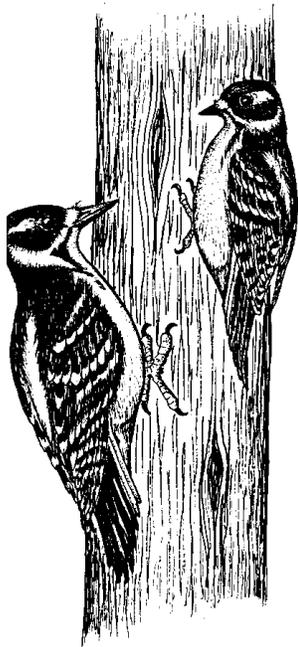
**Traits:** Large, white bird with a sharply hooked bill; talons; large forward-facing eyes; broad wings and tail; only all-white owl; they have varied amounts of black speckling. Nests on the ground.

**Habitat:** Coastal lowland tundra

**Foods:** Lemmings and other small mammals (voles, shrews, ground squirrels, hares, weasels)

**Eaten by:** Foxes eat young.

**Do You Know?** These owls have been recorded as far south as the southern United States and Bermuda.



## 202. THREE-TOED WOODPECKER F

**Traits:** Medium-sized bird with thick, pointed bill and stiff tail feathers; back is barred with black and white; males have yellow crowns

**Habitat:** Old forests and recently burned forests with many dead and dying trees (snags)

**Foods:** Insects that live beneath tree bark, (bark beetles, longhorn beetles, horntails, and others)

**Eaten by:** Hawks, falcons, owls

**Do You Know?** These birds excavate cavities in dead and diseased trees for nesting and roosting. Their holes provide homes for other cavity-nesting birds and mammals.

## 199. NORTHERN FLICKER F

**Traits:** Medium-sized bird with stout, sharp bill; long tongue; stiff tail feathers

**Habitat:** Open forests and early successional stages that contain standing dead trees (snags)

**Foods:** Insects that live beneath the bark of trees (such as bark beetles) and some that live in the ground, including ants

**Eaten by:** Hawks, falcons, owls

**Do You Know?** Two subspecies of the northern flicker occur in Alaska: the red-shafted and the yellow-shafted.

## 203. RED-BREASTED SAPSUCKER F

**Traits:** Medium-sized bird with stout, pointed bill; reddish head and breast

**Habitat:** Coastal rainforest sites that contain many large dead and dying trees (snags)

**Foods:** Insects that live beneath the bark of dying and dead trees (bark beetles, longhorn beetles, horntails, and others)

**Eaten by:** Falcons, hawks, owls

**Do You Know?** Sapsuckers are responsible for the horizontal rows of squarish holes frequently found on tree trunks. They drink sap from these holes and may also obtain insects that are attracted by the sap.

## 200. HAIRY and DOWNY WOODPECKER F

**Traits:** Birds with stout, pointed bills and stiff tails; white stripes on the backs; black and white markings on the face; red patch on the back of male's head

**Habitat:** Broadleaf or conifer forests, early successional stages that contain dying and dead trees (snags)

**Foods:** Insects that live beneath tree bark (bark and longhorn beetles, horntails and others)

**Eaten by:** Merlins, sharp-shinned hawks, falcons

**Do You Know?** These birds excavate holes in dead trees for nesting and roosting. Their holes later provide homes for other cavity-dependent birds and mammals.

## 204. FLYCATCHER F,T,W

**Traits:** Small birds with upright posture, long tails, and large mouths.

**Habitat:** Varies by species; some need tall shrub thickets, and others live only in mature boreal or coastal forests.

**Foods:** Flies, moths, butterflies, other flying insects

**Eaten by:** Falcons, hawks, small owls

**Do You Know?** Flycatchers "hawk" flying insects by sitting on an elevated perch to spot their prey, flying out, and snapping up these insects in mid-air.

## 201. BLACK-BACKED WOODPECKER F

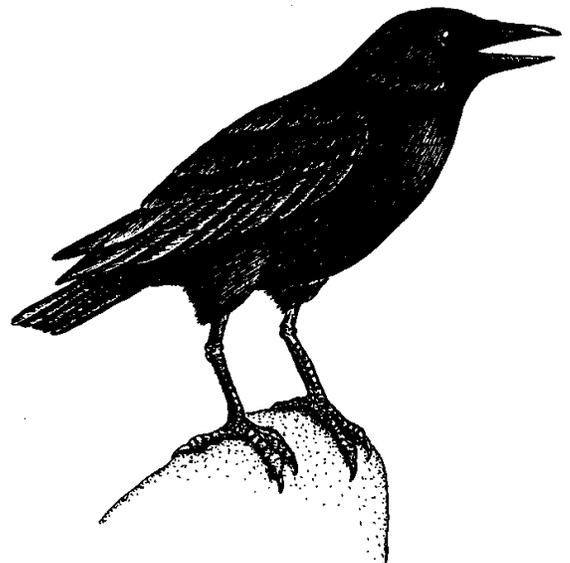
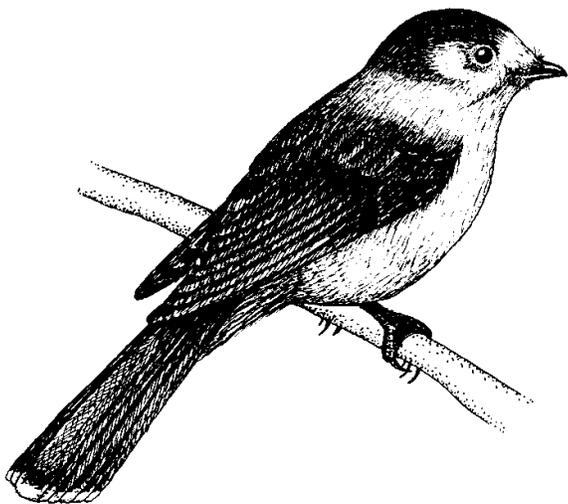
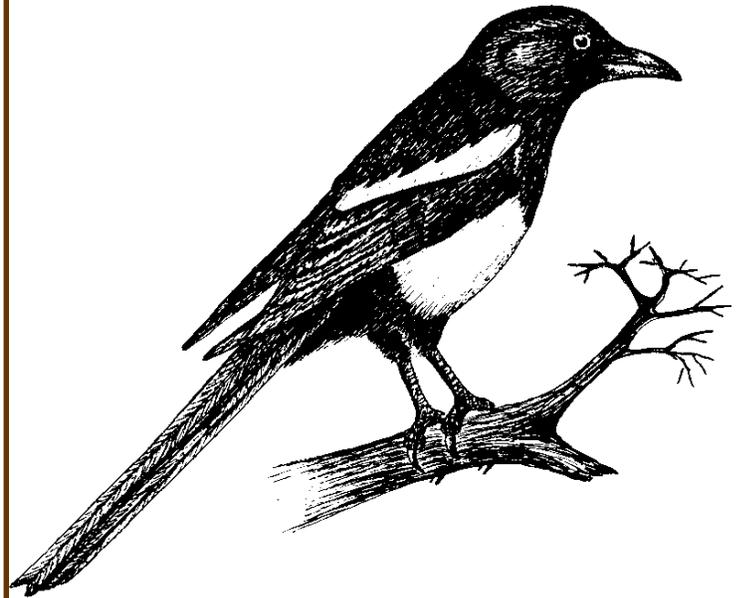
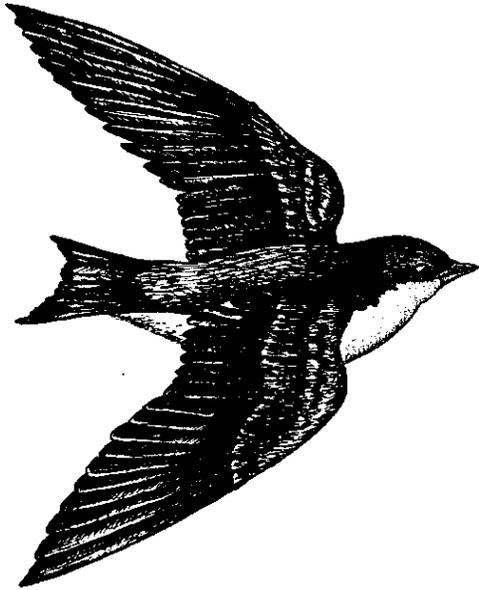
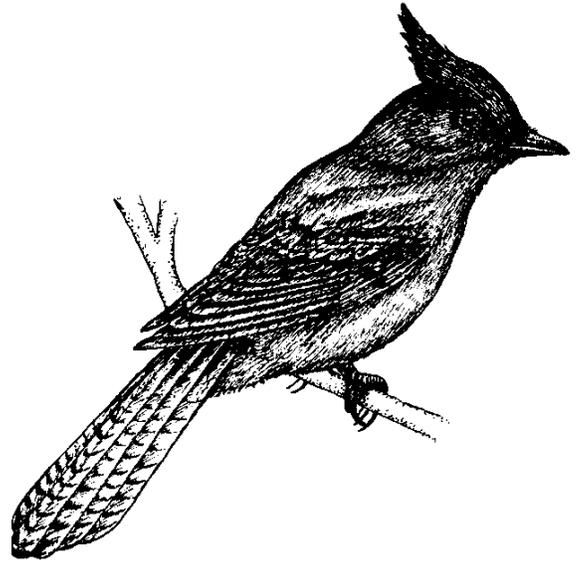
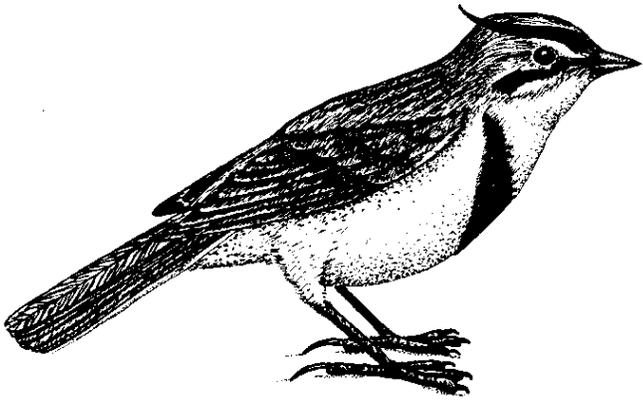
**Traits:** Medium-sized bird with a black back; thick, pointed bill; long, stout tail; yellow crown on males

**Habitat:** Recent burns and open forests with dead and dying trees (snags)

**Foods:** Insects that live beneath the bark of dead and dying trees, especially beetle larvae

**Eaten by:** Hawks, falcons, owls; marten and squirrels eat young.

**Do You Know?** This bird forages on dead conifers, chipping away large patches of bark rather than drilling into it, in search of larvae and insects. It moves into burned forests to feed on insects attacking injured trees.



**208. STELLER'S JAY****F**

**Traits:** Medium-sized, dark blue and black bird with a long tail

**Habitat:** Coastal rainforest, including openings and edges during summer

**Foods:** Seeds and berries of trees and shrubs, beetles, grasshoppers, caterpillars, moths, spiders, eggs, young birds

**Eaten by:** Hawks, falcons, owls

**Do You Know?** Jays sometimes follow predators around, or are attracted by predator activities. They then feed on the scraps left by predators.

**205. HORNED LARK****T**

**Traits:** Medium-sized bird with slender bill; black "horns"; broad black stripe under eye; black bib

**Habitat:** Alpine tundra in summer; plains of Lower 48 in winter

**Foods:** Caterpillars, ants, wasps, grasshoppers, leafhoppers, spiders, seeds of grasses and other plants

**Eaten by:** Foxes, weasels, jaegers, falcons, short-eared owls

**Do You Know?** In its courtship flight, the male horned lark climbs to heights of 800 feet (244 m) and begins its high-pitched flight song as it circles downward.

**209. BLACK-BILLED MAGPIE****F,W**

**Traits:** Large, black and white bird with glossy green and blue feathers; very long tail; large, stout bill

**Habitat:** Builds a domed stick nest in spruce or broadleaf trees; feeds in the forests and in openings

**Foods:** Small mammals, insects and other invertebrates, berries, carrion (dead animals), eggs and young of other birds

**Eaten by:** Squirrels, weasels, marten, and ravens eat eggs and young.

**Do You Know?** Abandoned nests of this bird are sometimes used by other birds, including merlins.

**206. SWALLOW****F,T,W**

**Traits:** Small bird with a slender body and long, pointed wings; tiny bill; short legs; and small feet; moderately long, forked tail

**Habitat:** Open areas around lakes, ponds, and rivers; some species nest in tree cavities.

**Foods:** Flying insects (flies and mosquitoes)

**Eaten by:** Hawks, falcons

**Do You Know?** Swallows catch almost all their food in flight, sometimes even skimming insects off the surface of ponds and lakes.

**210. NORTHWESTERN CROW****F,W**

**Traits:** Medium-sized, black bird with a square tail and heavy bill

**Habitat:** Coastal forests; nests in dense thickets of spruce or hemlock trees. Feeds along the shoreline.

**Foods:** Invertebrates (mussels and limpets), carrion (dead animals), eggs and young birds, small mammals

**Eaten by:** Great horned owls, goshawks; eggs taken by ravens, jays, squirrels

**Do You Know?** Crows open clams and mussels by carrying them aloft and dropping them on rocks below.

**207. GRAY JAY****F,T**

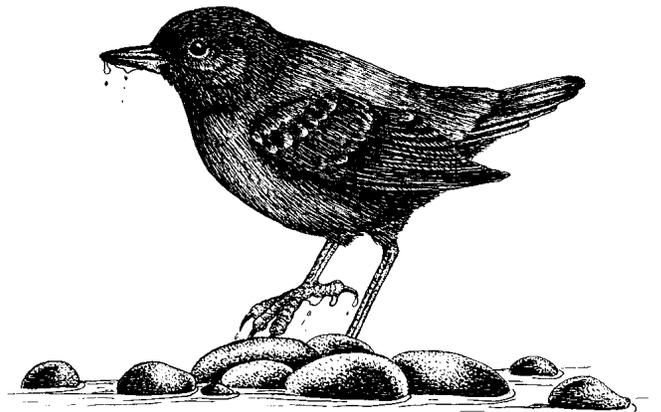
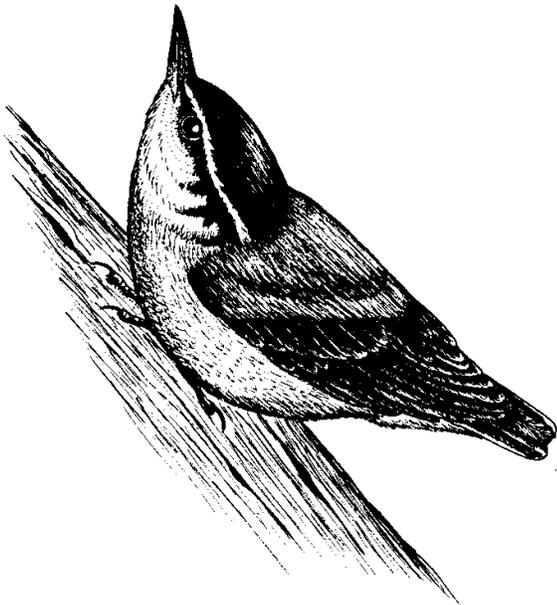
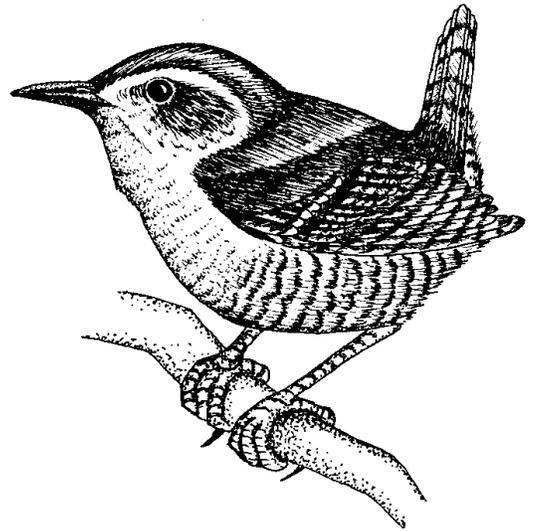
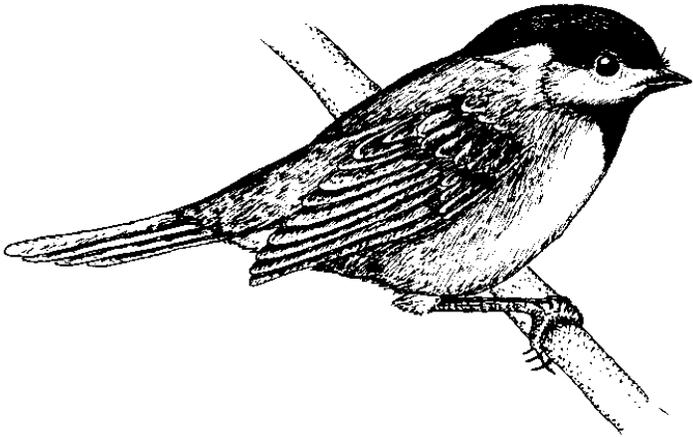
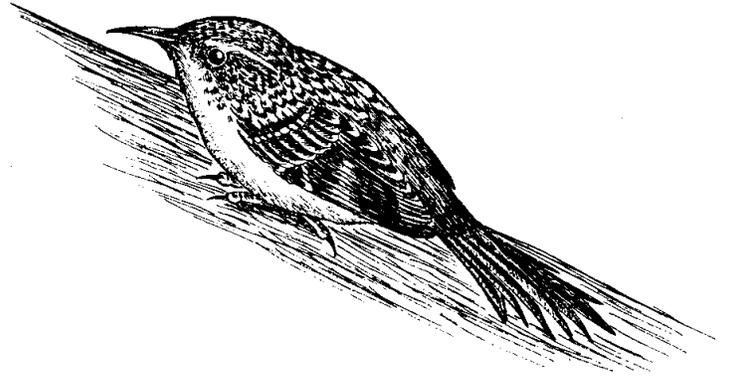
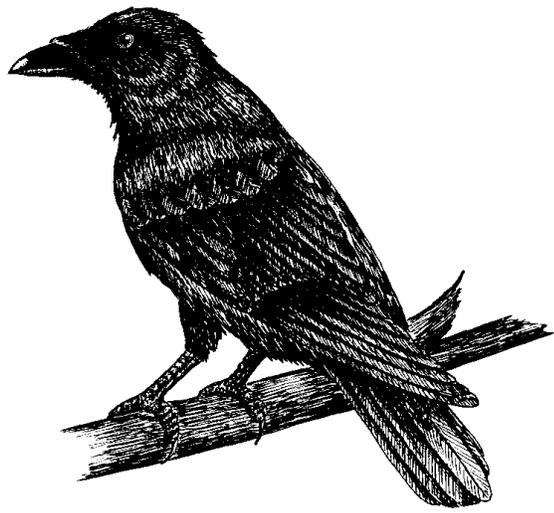
**Traits:** Medium-sized, gray bird with long tail; rounded wings, slightly hooked bill

**Habitat:** Mature forests and forest openings; more common in boreal forests

**Foods:** Variety; eggs and young of other birds, small mammals, insects and other invertebrates, berries, dead animals

**Eaten by:** Hawks, falcons, owls

**Do You Know?** When gray jays find an abundant food source, they hide small caches for later use; sticky saliva help them attach to trees and crevices.



**214. BROWN CREEPER****F**

**Traits:** Small brown bird with thin, curved bill and stiff tail feathers

**Habitat:** Old-growth forest for feeding and nesting; nests in tree cavities or behind bark that has peeled away from the trunk of a dead tree.

**Foods:** Insects that live in and under the bark of trees (beetles, moths, flies, spiders)

**Eaten by:** Sharp-shinned hawks, boreal owls

**Do You Know?** Brown creepers spiral up trees from near the base, hugging the bark closely as they search for insects.

**211. COMMON RAVEN****F,T,W**

**Traits:** Large, black bird with wedge-shaped tail; broad wings; heavy bill.

**Habitat:** Forests, shrublands, tundra, wetlands; builds a stick nest on cliffs or in trees.

**Foods:** Small mammals, birds, berries, carrion (dead animals), eggs and young of other birds

**Eaten by:** Crows, marten, jays, or other predators may take eggs.

**Do You Know?** Ravens are very intelligent. They often work cooperatively to “steal” food from large predators and pets.

**215. WINTER WREN****F**

**Traits:** Small brown bird that holds its short tail upright; thin bill

**Habitat:** Coastal forest habitats that include shrubs and ground cover plants; old-growth forests during winter

**Foods:** Beetles, sawflies, ants, caterpillars, aphids, lacewings, spiders, mites

**Eaten by:** Sharp-shinned hawks, boreal and saw-whet owls; shrews and squirrels prey on eggs and young.

**Do You Know?** The wren’s loud song and aggressive territorial defense are surprising considering its small size.

**212. CHICKADEE****F**

**Traits:** Small gray or brown bird with short, thin bill; long tail; dark cap and chin

**Habitat:** Boreal chickadees need mature boreal forests with conifer trees. Black-capped chickadees use broadleaf or mixed forests. Chestnut-backed chickadees use old-growth coastal forests.

**Foods:** Insects from leaves, bark, or branches (thrips, moths, butterflies, lacewings, flies, spiders); also seeds and berries

**Eaten by:** Small hawks, owls, shrikes

**Do You Know?** Chickadees can put on 8 percent of their body weight in fat each day. Each winter day, chickadees go through the same cycle: eat and put on fat in the short daylight, then burn up fat to keep warm through the long night.

**216. AMERICAN DIPPER****F**

**Traits:** Plump, all-gray bird with short neck, short bill, short tail, and long toes

**Habitat:** Clear, fast-moving streams primarily in conifer forests

**Foods:** Larvae of caddisflies, stoneflies, mayflies, mosquito, midges, water striders, water boatmen, diving beetles; also clams, snails, small fish, fish eggs

**Eaten by:** Hawks, mink, weasels; sometimes large fish

**Do You Know?** Dippers can walk underwater by grasping stream bottoms with their long toes and pushing forward with short wing strokes.

**213. RED-BREASTED NUTHATCH****F**

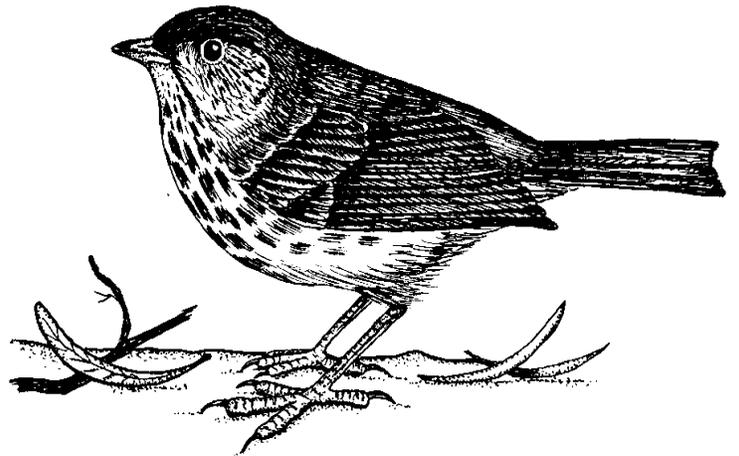
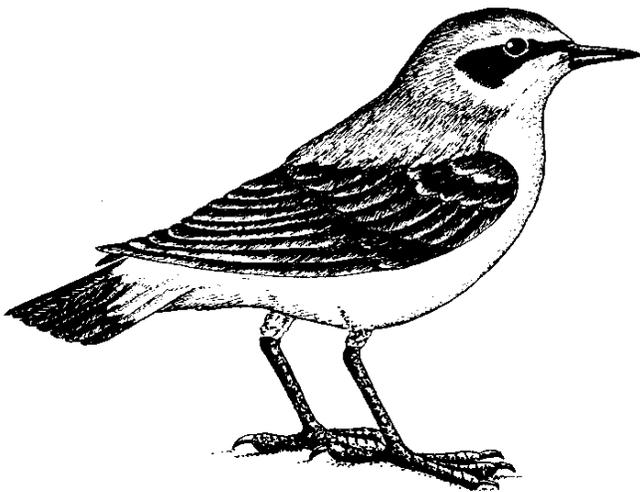
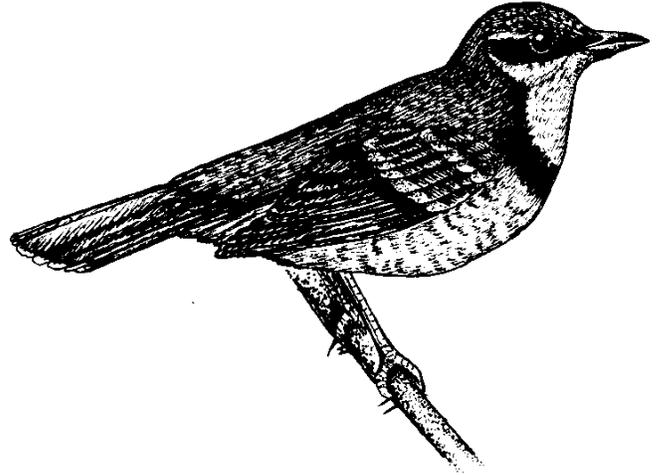
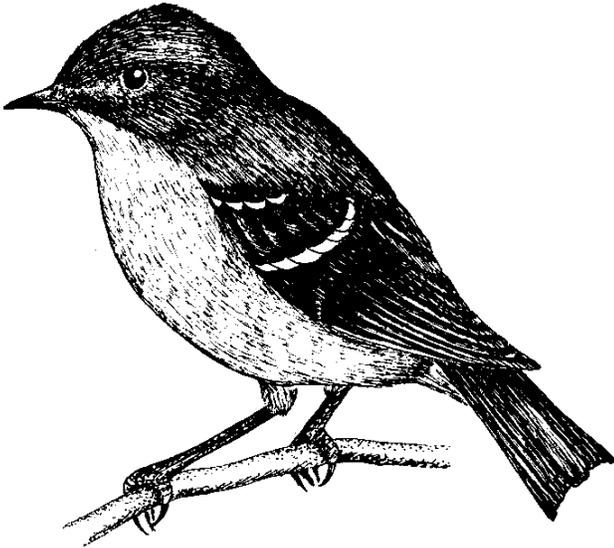
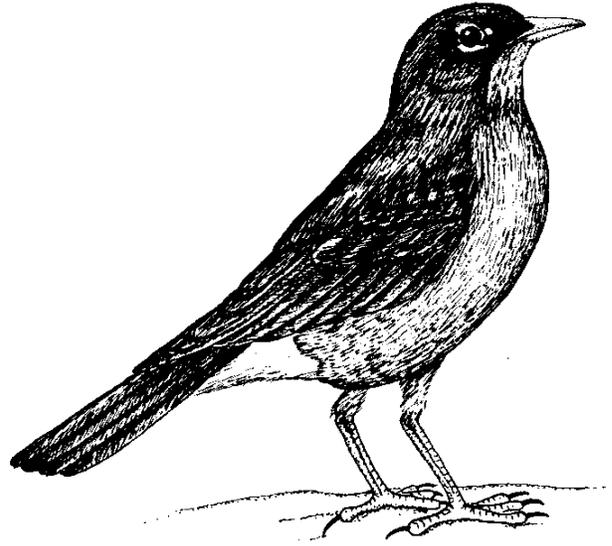
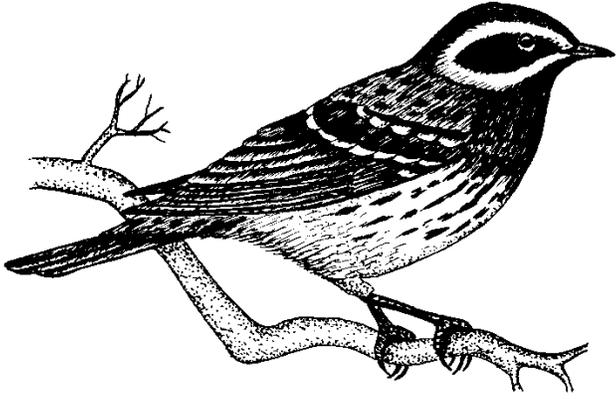
**Traits:** Small bird with a short tail and chunky body; long, chisel-like bill; dark gray on top, reddish underneath

**Habitat:** Mature forest stands with large trees having holes for nesting and roosting

**Foods:** Insects that live on the bark and leaves of trees; also seeds of conifers

**Eaten by:** Sharp-shinned hawks, boreal owls

**Do You Know?** By traveling down trunks head first, nuthatches find food in crevices that is missed by other birds (brown creepers) that move up the trunk.



## 220. AMERICAN ROBIN

F,T,W

**Traits:** Medium-sized bird with a long tail and short, thin bill; gray on back, reddish breast

**Habitat:** Open areas with many ground-cover plants as feeding areas; songposts and nest sites in tall shrubs or trees

**Foods:** Beetles, grasshoppers, ants, caterpillars, worms, berries and other fruits

**Eaten by:** Hawks, falcons, owls, cats

**Do You Know?** Robins are aggressive during the breeding season. A male will fight with his own reflection thinking it is another male robin.

## 217. WARBLER

F

**Traits:** Small birds with thin bills; many have yellow markings.

**Habitat:** Varies by species; shrub thickets, mixed and conifer forests

**Foods:** Insects that live on leaves and twigs of trees and shrubs (true bugs, leafhoppers, moth and butterfly larvae, aphids, flies, beetles, sawflies, spiders)

**Eaten by:** Merlins, sharp-shinned hawks, shrikes

**Do You Know?** Most warblers winter in Central or South America.

## 221. VARIED THRUSH

F

**Traits:** Medium-sized bird with a long tail and short, thin bill; gray on back, reddish underneath with black "V" on breast.

**Habitat:** Conifer and mixed forests; nests in trees, but feeds on the ground.

**Foods:** Beetles, ants, flies, caterpillars, grasshoppers, spiders, snails, worms, millipedes and other invertebrates; also berries

**Eaten by:** Hawks, falcons, owls; red squirrels prey on eggs.

**Do You Know?** The song of the varied thrush sounds like a telephone ringing.

## 218. KINGLET

F

**Traits:** Tiny birds with short, thin bills and short tails; males have flame-colored crowns.

**Habitat:** Mature and old-growth forests; ruby-crowned kinglets prefer mixed forests. Golden-crowned kinglets mainly use mature coastal forests.

**Foods:** Insects that live on the leaves of trees and tall shrubs (true bugs, moth and butterfly larvae, aphids, ants, beetles, spiders)

**Eaten by:** Merlins, sharp-shinned hawks, small owls

**Do You Know?** Despite being one of the smallest birds, the ruby-crowned kinglet has a song that is one of the loudest.

## 222. SMALL THRUSHE

F,T,W

**Traits:** Small birds with long tails and short, thin bills; brown backs; spots on white breast

**Habitat:** Tall shrub thickets, forest openings and edges, old conifer or broadleaf forests

**Foods:** Beetles, ants, moth and butterfly larvae, flies, treehoppers, millipedes, snails, berries

**Eaten by:** Hawks, falcons, owls; red squirrels prey on eggs.

**Do You Know?** Thrush habitat is being rapidly destroyed; we are in danger of losing these fine songsters from forests in the eastern United States.

## 219. NORTHERN WHEATEAR

T,W

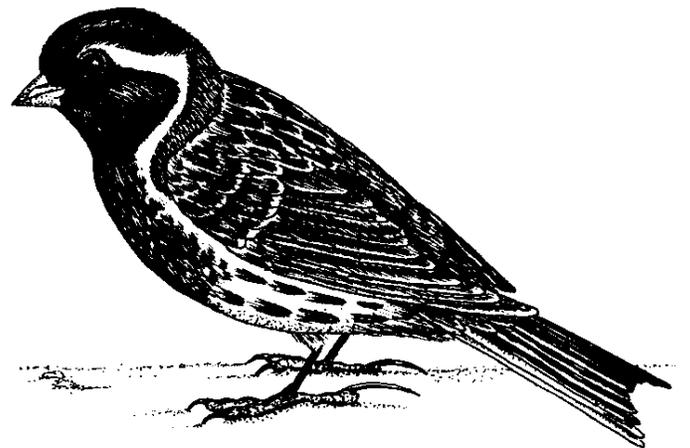
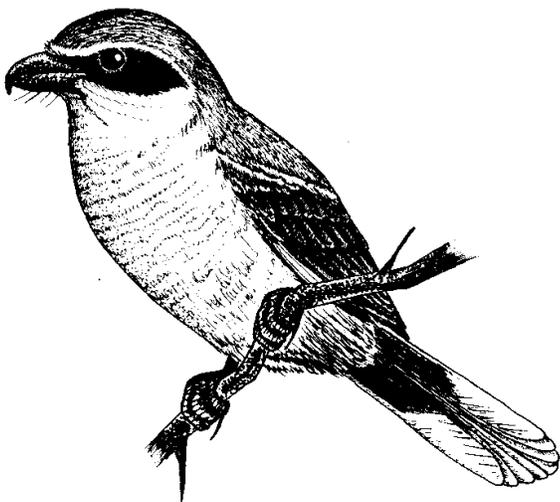
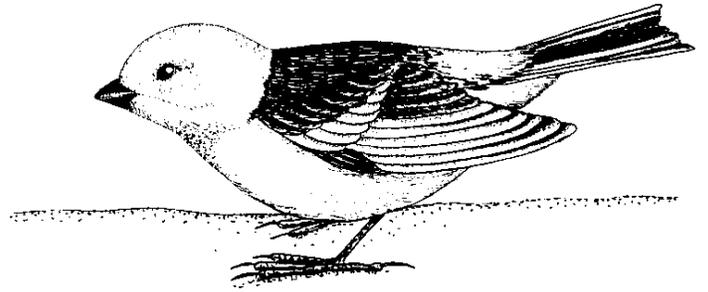
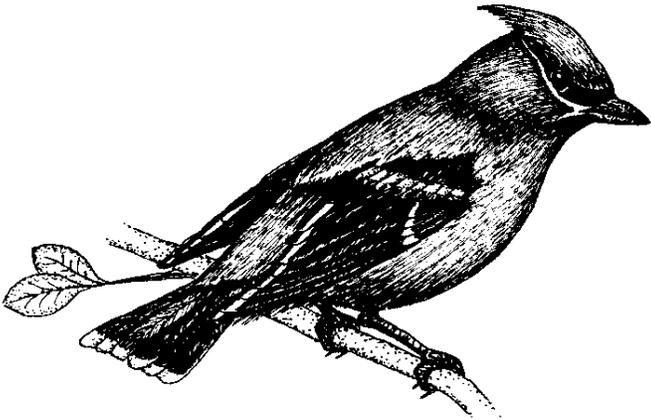
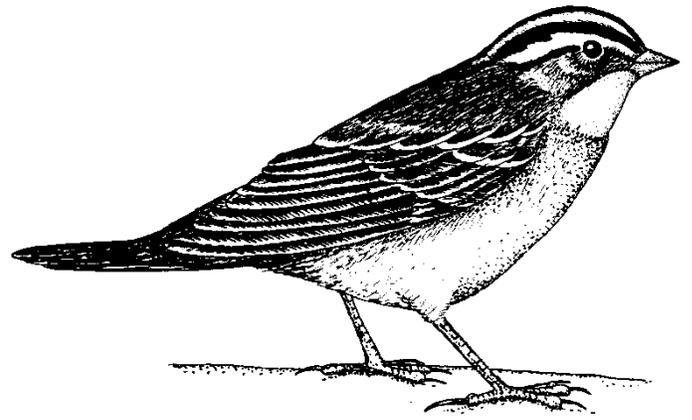
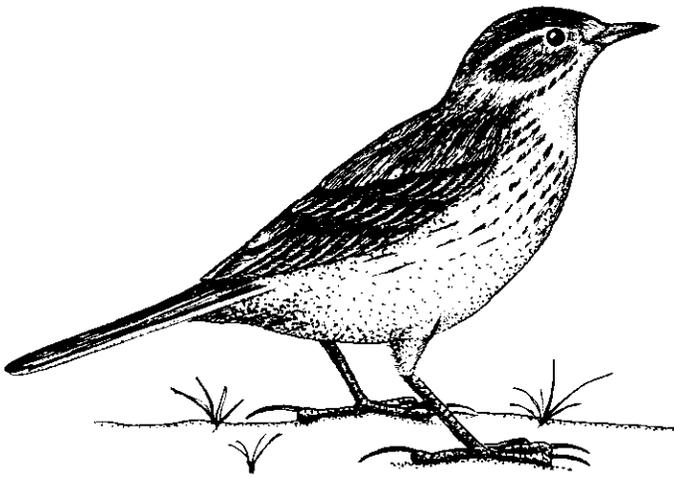
**Traits:** Small bird with white rump patch; black and white tail pattern like an upside-down "T"

**Habitat:** Alpine and dry lowland tundra in summer; coastal wetlands in winter

**Foods:** Spiders and other invertebrates

**Eaten by:** Jaegers, weasels, foxes, short-eared owls, falcons

**Do You Know?** The wheatear migrates from tundra nesting areas to winter in eastern Asia and Africa.



**226. SPARROW****F,T,W**

**Traits:** Small birds with stout, cone-shaped bills; majority are brown on the back and light underneath; many have streaks on the breast.

**Habitat:** Tall shrub thickets, forest edges, sedge lands, open tundra

**Foods:** Seeds of ground-cover plants and tall shrubs; insects during nesting season

**Eaten by:** Sharp-shinned hawks, falcons, small owls, shrikes; weasels, squirrel, ravens prey on eggs and young.

**Do You Know?** Sparrows often use hair from moose or feathers from other birds to line their nests.

**223. WATER PIPIT****F,T,W**

**Traits:** Small, ground-dwelling birds with slender bills and tails with white outer feathers

**Habitat:** Tundra, tidal flats, fields, alpine meadows, lakeshores, rivers, streams

**Foods:** Insects, small invertebrate animals

**Eaten by:** Foxes, weasels, jaegers, short-eared owls, falcons

**Do You Know?** In courtship flight, the male pipit flies 50-150 feet (15-46 m) straight up in the air while singing.

**227. SNOW BUNTING****T**

**Traits:** Small white bird with long black and white wings

**Habitat:** Alpine and lowland tundra throughout Alaska in summer; some remain along the coast throughout winter, but most migrate to central plains of the Lower 48.

**Foods:** Seeds and buds of tundra plants, amphipods, crane flies, spiders, beetles

**Eaten by:** Foxes, weasels, jaegers, short-eared owls, falcons, small hawks

**Do You Know?** Snow buntings avoid severe cold by burrowing into the snow. They often nest in buildings and boxes abandoned by humans.

**224. BOHEMIAN WAXWING****F,W**

**Traits:** Medium-sized light brown bird with crest on head; short bill; bright yellow and orange markings

**Habitat:** Nests in open black spruce forests and muskegs; feeds in all types of forests.

**Foods:** Blueberries, cranberries, and other berries; also flying insects, (flies, butterflies, dragonflies, true bugs, beetles, and others)

**Eaten by:** Hawks, falcons, small owls

**Do You Know?** The red, waxlike spots on the wings of the adult give this bird its name.

**228. LAPLAND LONGSPUR****T**

**Traits:** Small bird; breeding male has black crown, face, and breast and chestnut hind neck. Female is nondescript, like many sparrows.

**Habitat:** Alpine and dry lowland tundra; nests in side of tussocks, small clumps of sedge, or dry knolls

**Foods:** Seeds and buds of plants, crane flies, mosquitoes, spiders

**Eaten by:** Weasels, foxes, jaegers, gulls, short-eared owls, falcons, small hawks

**Do You Know?** Longspurs often line their nests with caribou hair or ptarmigan feathers.

**225. NORTHERN SHRIKE****F,T,W**

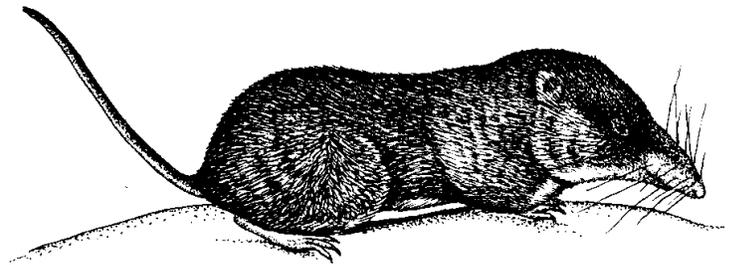
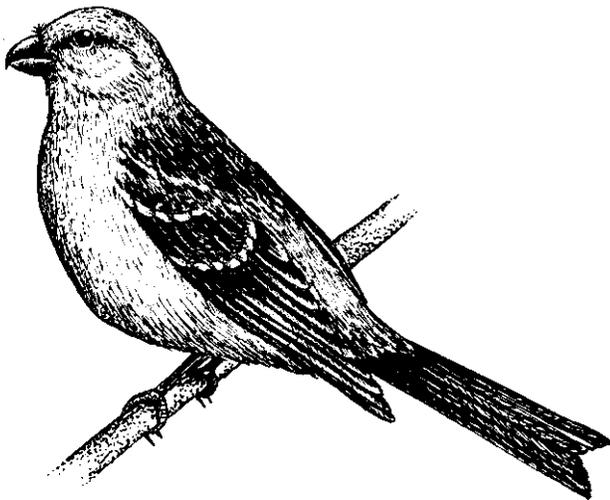
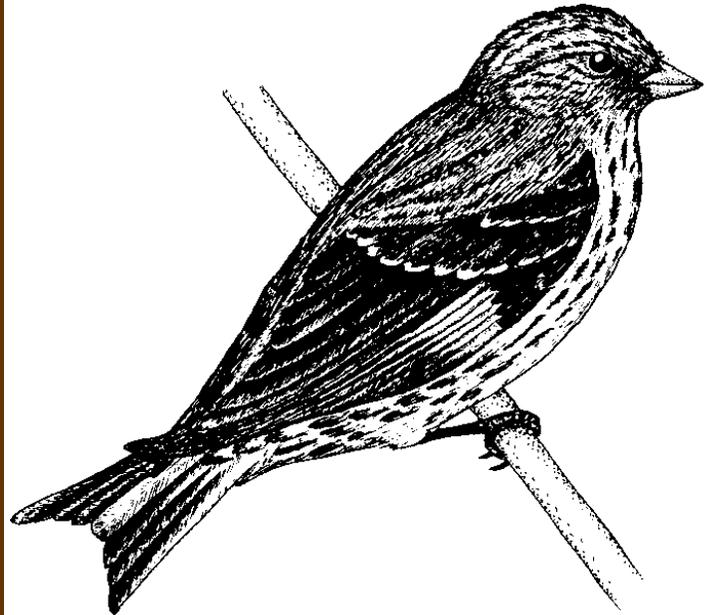
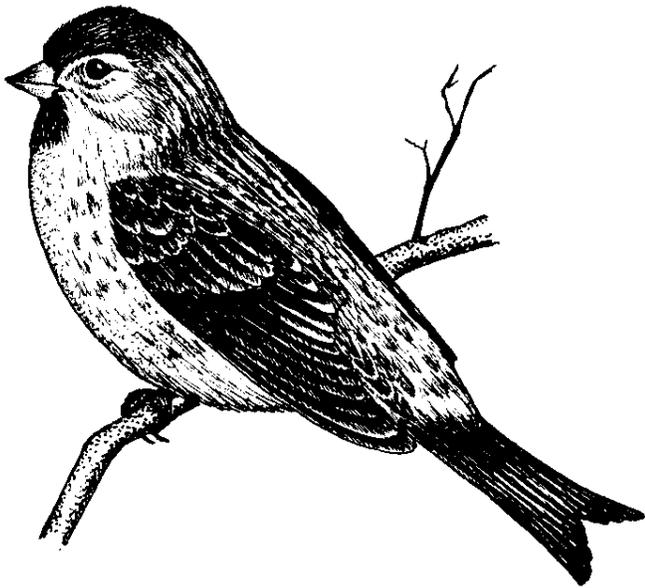
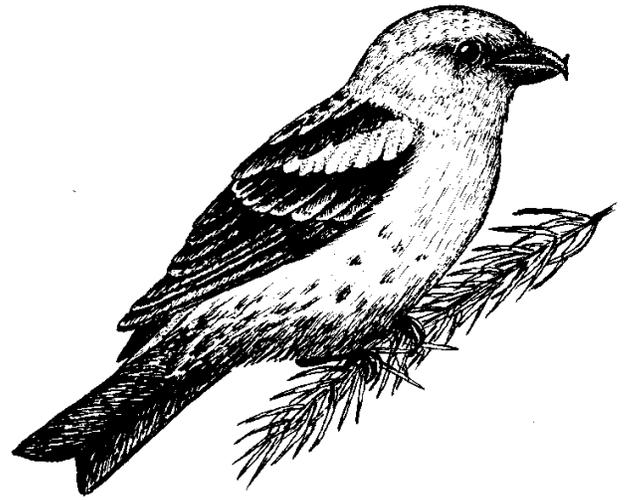
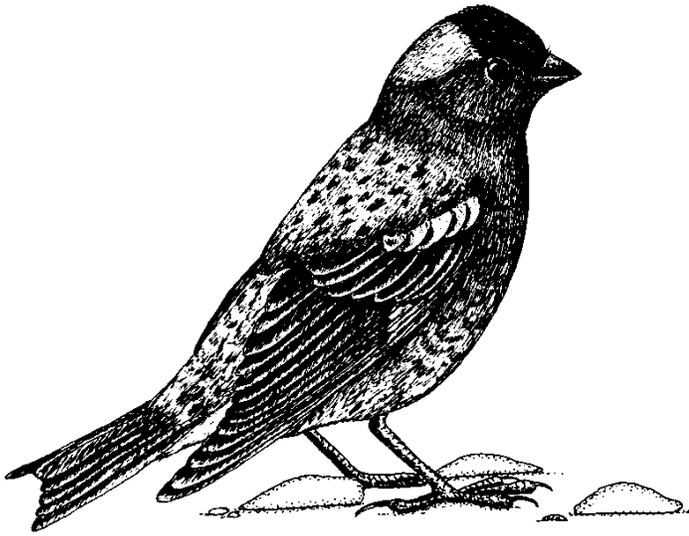
**Traits:** Medium-sized, gray bird with black mask; sharply hooked bill; long talons; predator

**Habitat:** Tall shrub thickets, forest openings and edges

**Foods:** Small birds and mammals, large insects

**Eaten by:** Merlins, sharp-shinned hawks

**Do You Know?** The shrike hangs its prey in the forks of branches. It can kill and store more prey than can be eaten at one time, earning it the name "butcher bird."



### 232. CROSSBILL

F

**Traits:** Medium-sized bird with slightly forked tail; bill crosses at tip; males are reddish, females are yellowish.

**Habitat:** Mature and old-growth conifer forests

**Foods:** Seeds of conifers, alders, birches, willows, poplars; also insects

**Eaten by:** Sharp-shinned hawks, boreal owls, saw-whet owls; squirrels may eat eggs and young.

**Do You Know?** Crossbills may nest almost any time of the year. They are nomadic.

### 229. GRAY-CROWNED ROSY FINCH

T

**Traits:** Small bird with pinkish-brown on wings and lower belly

**Habitat:** Alpine tundra

**Foods:** Seeds of alpine tundra plants, insects

**Eaten by:** Weasels, foxes, jaegers, short-eared owls, falcons

**Do You Know?** During nesting season, both sexes develop a pair of sacs in their upper throats, which are capable of carrying food.

### 233. PINE SISKIN

F

**Traits:** Small bird with stout, cone-shaped bill; yellow on the wings and at base of tail

**Habitat:** Mature conifer forests, old-growth coastal forests; nests on a branch of a conifer.

**Foods:** Seeds of conifers, alder, birch; also moth and butterfly larvae, aphids

**Eaten by:** Sharp-shinned hawks, boreal owls; squirrels take eggs.

**Do You Know?** The siskin's winter range is highly erratic; large flocks appear here one year, there the next.

### 230. COMMON REDPOLL

F,T

**Traits:** Small bird with red spot on forehead, stout body, cone-shaped bill

**Habitat:** Tall shrub thickets, mixed broadleaf-conifer forests; nests in alder or willow shrubs.

**Foods:** Seeds of birch, willow, aspen, alder and other plants; also insects in summer

**Eaten by:** Merlins, boreal and short-eared owls, sharp-shinned hawks, shrikes; weasels and squirrels may prey on eggs.

**Do You Know?** Redpolls store food in throat pouches on the back of their necks to digest during long winter nights. They are nomadic, moving from place to place.

### 234. SHREW

F,T,W

**Traits:** Very small mammals with a long, pointed nose; short legs; soft, dense fur; Alaska species have a long tail.

**Habitat:** Moist areas in forests, shrublands, wetlands, tundra

**Foods:** Springtails, beetles, fly larvae, centipedes, mites, worms, spiders, round worms, eggs and young of small ground nesting birds, young voles, carrion

**Eaten by:** Weasels, owls, kestrels, jaegers, shrikes

**Do You Know?** The shrews metabolism is so rapid that an individual shrew may eat its own weight in meat every three hours!

### 231. PINE GROSBEAK

F

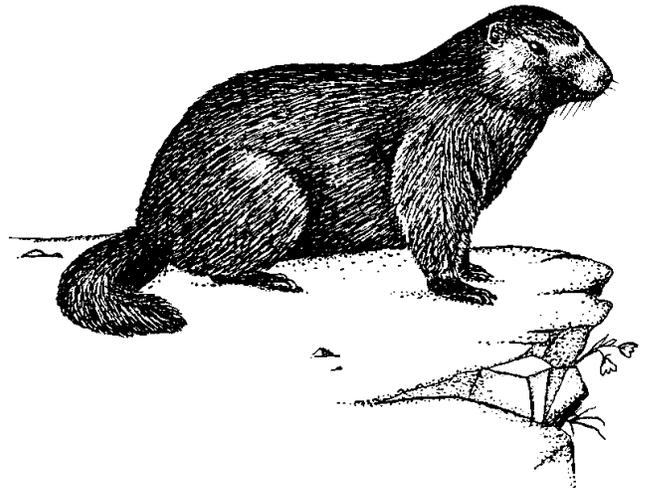
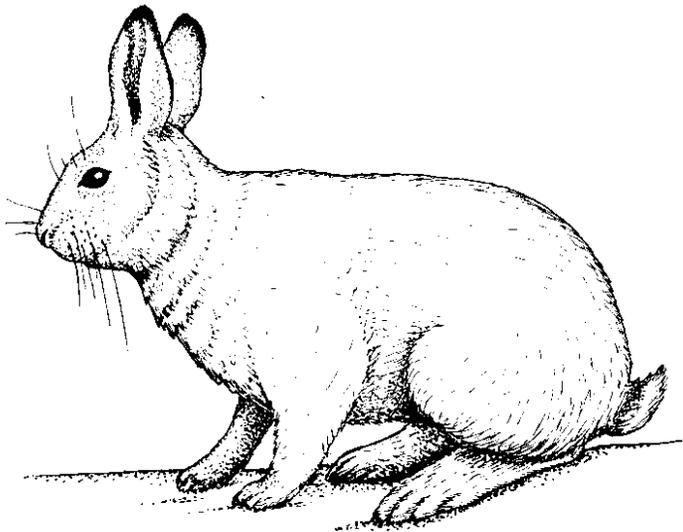
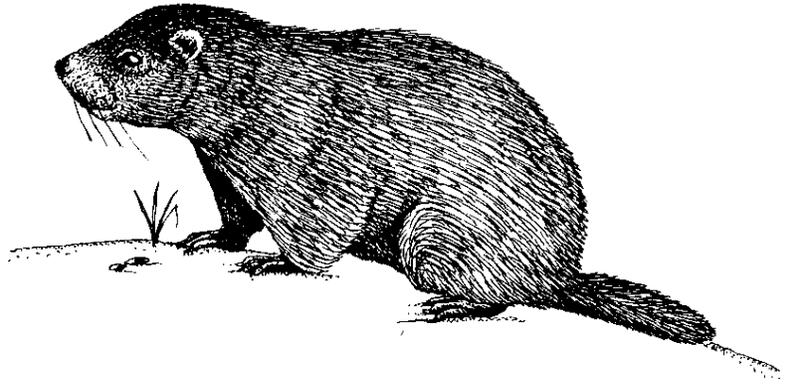
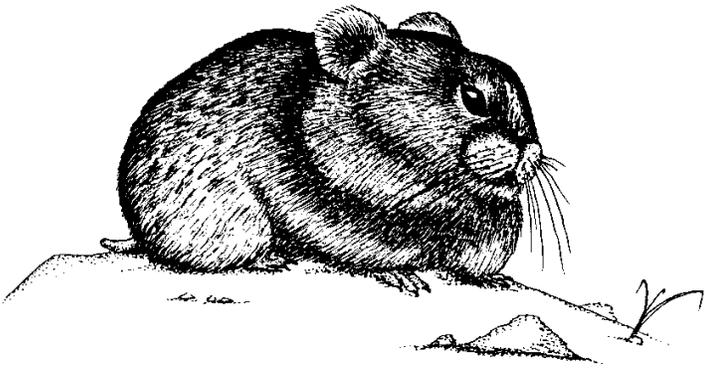
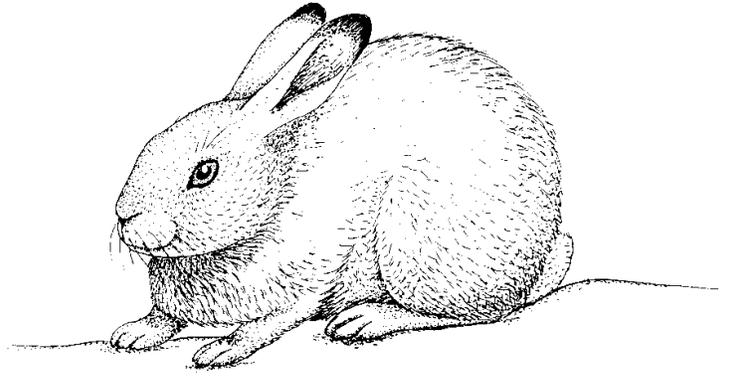
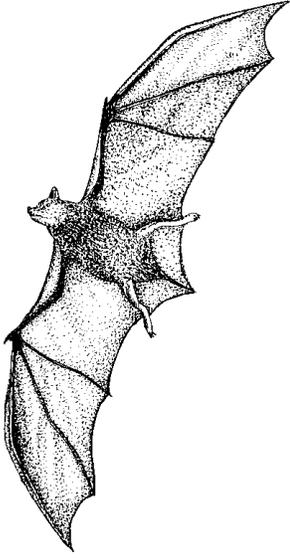
**Traits:** Medium-sized bird with a stout, cone-shaped bill; males are red; females are gray with gold markings.

**Habitat:** Young to old conifer and mixed forests; nests in conifer trees.

**Foods:** Buds, seeds, and berries of trees and shrubs; also insects

**Eaten by:** Sharp-shinned hawks, merlins, goshawks

**Do You Know?** The male pine grosbeak, like the redpoll, gets new feathers only once a year, after breeding.



**238. TUNDRA HARE****T**

**Traits:** Small mammal with dense, white winter fur

**Habitat:** Windswept rocky slopes and dry lowland tundra of western and northern Alaska

**Foods:** Willow shoots; leaves, flowers, and shoots of other tundra plants

**Eaten by:** Wolves, snowy owls, golden eagles

**Do You Know?** Newborn hares are covered with fur at birth (thus their name) and have their eyes open. True rabbits give birth to naked young whose eyes are closed.

**235. LITTLE BROWN BAT****F,W**

**Traits:** Mammal with forelegs modified to form membranous wings; keen eyesight; active at night

**Habitat:** Forested areas with a lake nearby; roost in caves, tree cavities, or buildings

**Foods:** Mosquitoes, moths, mayflies, caddisflies; usually feeds over water and in forest openings

**Eaten by:** Owls, squirrels

**Do You Know?** Bats capture flying insects by using echolocation. A single bat may eat as many as 1,000 mosquitoes in one evening.

**239. WOODCHUCK****F**

**Traits:** Small, ground-dwelling mammal with long front teeth for gnawing; short legs; long bushy tail; hibernates in winter.

**Habitat:** Forest edges in central Alaska

**Foods:** Green vegetation in spring and summer

**Eaten by:** Lynx, coyotes, wolves, red-tailed hawk

**Do You Know?** When alarmed, the woodchuck whistles sharply to warn its family.

**236. COLLARED PIKA****T**

**Traits:** Very small mammal with a stocky body; short legs; sharp, curved claws

**Habitat:** Rocky slopes of alpine tundra in eastern and central Alaska

**Foods:** Stems and leaves of grasses, sedges, and other alpine tundra plants

**Eaten by:** Foxes, weasels, rough-legged hawks, golden eagles, snowy owls

**Do You Know?** Pikas do not hibernate. Their winter survival depends on the amount of stored plant material they have gathered and dried.

**240. MARMOT****T**

**Traits:** Heavy-bodied mammals with gray or yellow fur and dark feet

**Habitat:** Well-drained or rocky slopes of alpine tundra throughout Alaska; the Alaska marmot occurs only in the Brooks Range. The hoary marmot occurs elsewhere in the state.

**Foods:** Grasses, sedges, herbs

**Eaten by:** Golden eagles, brown bears, wolves

**Do You Know?** Alaska marmots hibernate in communal dens, thus reducing heat loss by each individual marmot.

**237. SNOWSHOE HARE****F**

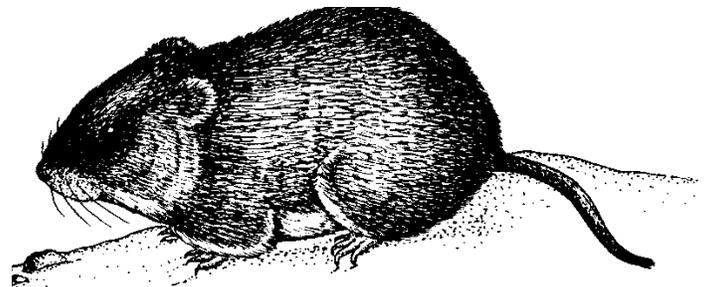
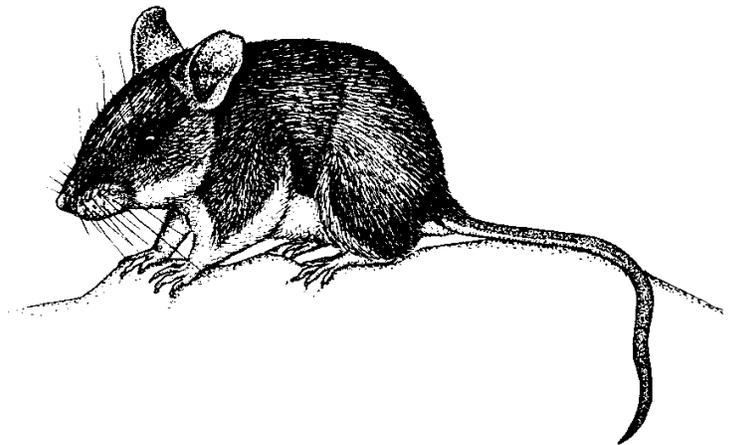
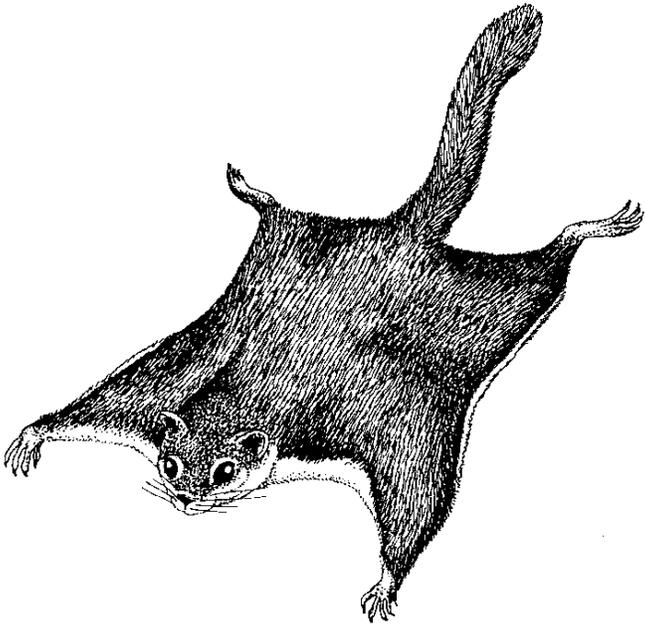
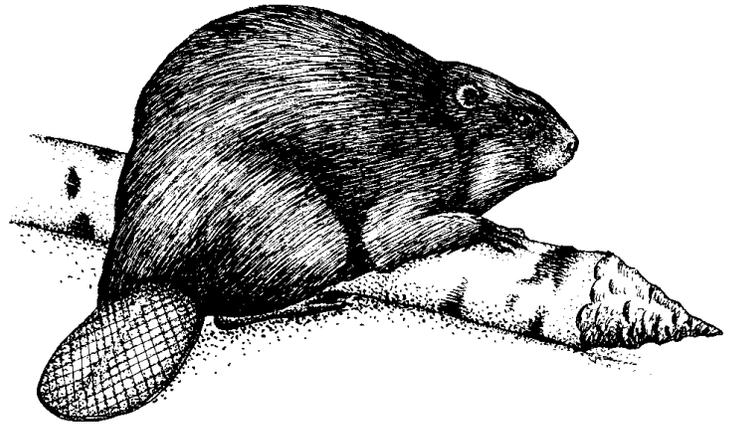
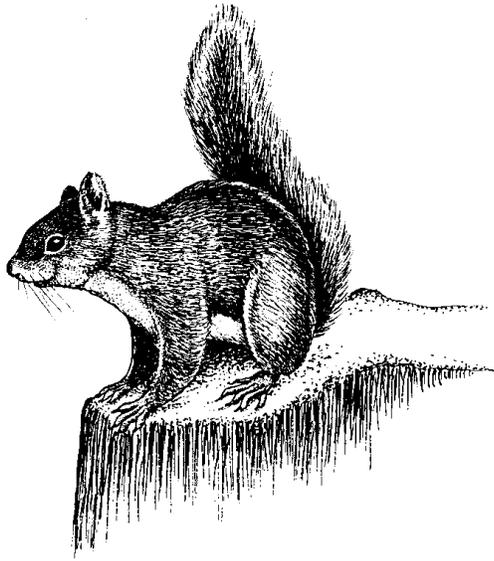
**Traits:** Small mammal with long front teeth for clipping twigs; large, long ears; short tail; long hind legs, and large hind feet; changes to white in winter.

**Habitat:** Forest mosaic that includes early successional stages where branches of willows, birch, and aspen are at heights it can reach

**Foods:** Buds and twigs of birch, willows, and aspen

**Eaten by:** Lynx, goshawks, great horned owls, red fox, coyote

**Do You Know?** Hares depend on microscopic organisms that live in their intestines to produce important vitamins.



**244. BEAVER****F,T,W**

**Traits:** Medium-sized mammal with long incisors; webbed feet; and a long, flat tail

**Habitat:** Slow-moving streams or lakes near willow, aspen, or other deciduous trees and shrubs

**Foods:** The cambium (inner bark) of willow, aspen, balsam poplar, and cottonwood trees; also shrubs; aquatic plants

**Eaten by:** Wolves, lynx, wolverines, bears, humans

**Do You Know?** Beavers change their environment to suit their needs by constructing large dams and by building lodges. Humans are the only animals that make more extensive changes in their environment.

**241. RED SQUIRREL****F**

**Traits:** Small mammal with long front teeth, short legs, large bushy tail; red-brown on back, whitish underneath

**Habitat:** Conifer forests

**Foods:** Seeds of spruce and other conifers, berries, mushrooms, some bird eggs and young

**Eaten by:** Marten, goshawks, great horned owls

**Do You Know?** When carrying and catching its food, this squirrel helps scatter seeds of spruce and berry-producing plants.

**245. DEER MOUSE****F,T**

**Traits:** Small mammal with long front teeth for gnawing, a long tail that is brown on top and white underneath, large eyes; this food-storing mammal is primarily nocturnal.

**Habitat:** Dry forest, tundra, grasslands

**Foods:** Seeds, nuts, insects, berries, mushrooms, fresh green vegetation

**Eaten by:** Foxes, weasels, marten, owls and other birds of prey

**Do You Know?** While eating and caching their foods, deer mice scatter the seeds of some plants and the spores of mycorrhizal fungi.

**242. NORTHERN FLYING SQUIRREL****F**

**Traits:** Small mammal with long front incisors; long bushy tail; short legs connected by a folded layer of loose skin used for gliding between trees

**Habitat:** Old forests with den sites in tree cavities and small forest openings

**Foods:** Mushrooms, truffles, other fungi; lichens, berries, green vegetation, seeds, buds, insects, small mammals and birds (live or dead).

**Eaten by:** Owls, goshawks, marten

**Do You Know?** Unlike most squirrels, flying squirrels are active only at night.

**246. VOLE****F,T,W**

**Traits:** Small, mouselike mammals with rounded noses, short tails and legs, and long front teeth (incisors) for gnawing

**Habitat:** Forests, shrublands, wetlands, tundra

**Foods:** Fresh green vegetation, seeds, roots, berries, mushrooms and other fungi

**Eaten by:** Coyotes, wolves, foxes, marten, weasels, hawks, owls, jaegers, sandhill cranes, ravens, gulls, and other predatory birds

**Do You Know?** The singing vole makes a high-pitched trill when danger threatens the colony.

**243. ARCTIC GROUND SQUIRREL****T**

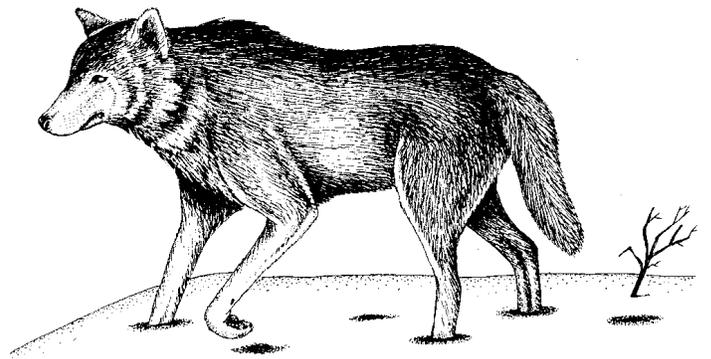
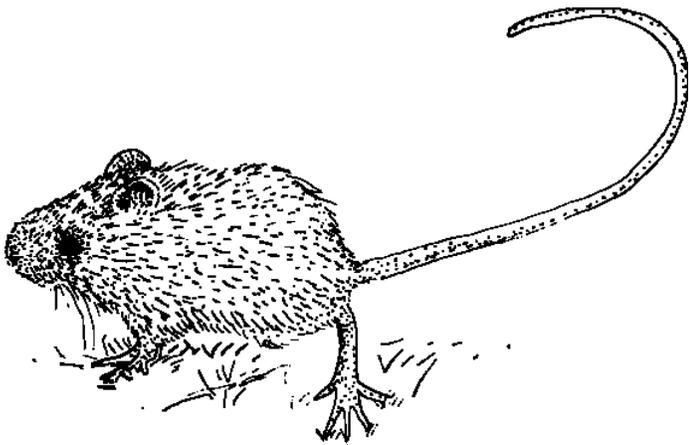
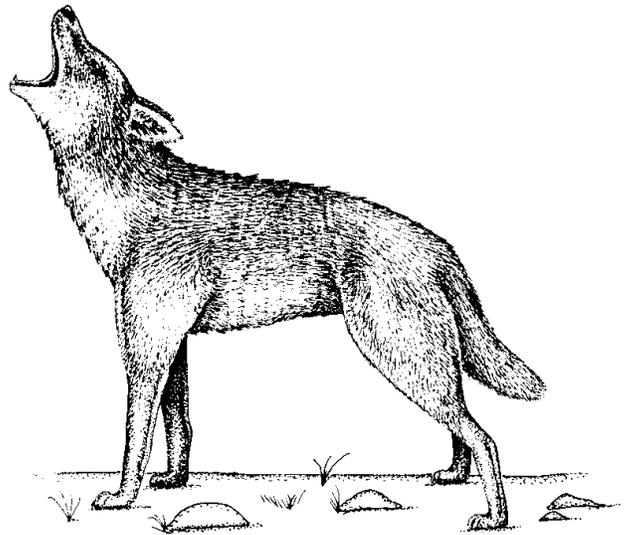
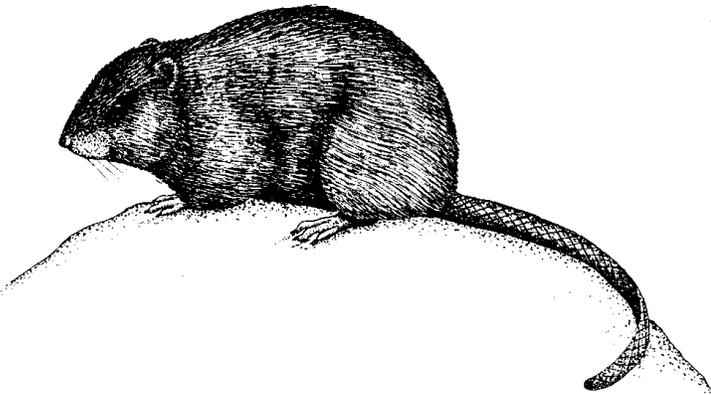
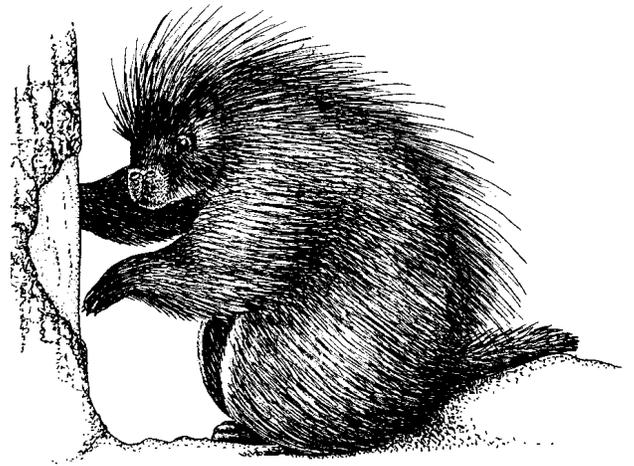
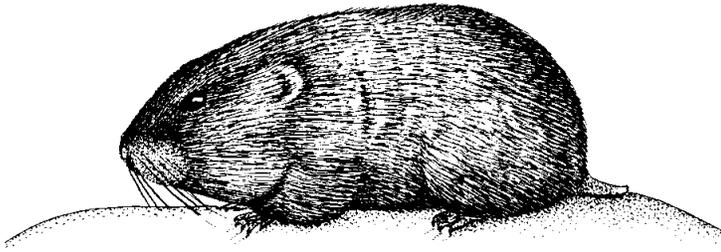
**Traits:** Large, reddish ground squirrel flecked with white; has a very small tail

**Habitat:** Well-drained soil of lowland and alpine tundra

**Foods:** Shoots and leaves of tundra plants, berries, insect larvae, bird eggs, carrion

**Eaten by:** Foxes, wolves, wolverines, brown bears, golden eagles, rough-legged hawks, snowy owls

**Do You Know?** This mammal hibernates for seven months each year.



**250. PORCUPINE****F**

**Traits:** Mammal with large front teeth for gnawing, short legs; back and tail covered with quills

**Habitat:** Conifer forests that include large hollow trees or small caves under rocks or logs for denning

**Foods:** Green vegetation in spring and summer, the inner bark (cambium) of spruce and birch trees in winter

**Eaten by:** Lynx, coyotes, wolves, wolverine, some bears

**Do You Know?** The wounds this animal inflicts on tree bark allow various microscopic parasites to enter trees.

**247. LEMMING****T,W**

**Traits:** Small mouselike mammal with a thick neck and very short tail; two gnawing teeth (incisors) on both upper and lower jaws

**Habitat:** Alpine and lowland tundra, muskegs

**Foods:** Shoots and leaves of grasses and sedges; bark, twigs, and buds of willow and dwarf birch; some insects, berries, fungi

**Eaten by:** Owls, jaegers, gulls, rough-legged hawks, arctic foxes, weasels, wolves

**Do You Know?** Collared lemmings turn white in winter and grow shovel-like claws for digging through ice and snow.

**251. COYOTE****F,T,W**

**Traits:** Doglike mammal with large, sharply pointed ears; long bushy tail; long legs; gray to brown in color

**Habitat:** Open areas, including early successional stages of boreal forest, wetlands, tundra

**Foods:** Hares, voles, lemmings, carrion (dead animals); some marmots, ground squirrels, muskrats, birds, fish, insects

**Eaten by:** Wolves, great horned owls, golden eagles, bears

**Do You Know?** Coyotes scavenge scraps from wolf and bear kills of large prey.

**248. MUSKRAT****T,W**

**Traits:** Brownish rodent; long, naked tail, flattened side to side with short hairs; hind feet webbed; two gnawing teeth (incisors) on both upper and lower jaws

**Habitat:** Ponds, lakes, marshes, estuaries

**Foods:** Aquatic plants (bulrushes, water lilies, pondweeds), some mussels, frogs, fish

**Eaten by:** Hawks, owls, foxes, coyotes, mink

**Do You Know?** During winter, muskrats spend much of their time under the ice. They maintain holes through the ice, called "pushups," for breathing and as feeding sites.

**252. WOLF****F,T,W**

**Traits:** Large, doglike mammal with sharp teeth; long bushy tail; long legs; lives and hunts in packs

**Habitat:** Forests, tundra, and wetlands wherever large herbivores (moose, deer, caribou, goats, or sheep) are available for food

**Foods:** Moose, deer, caribou, muskoxen, goats, and Dall sheep adults and young; also marmots, beaver, voles, other small mammals

**Eaten by:** Other wolves occasionally

**Do You Know?** Social hunting behavior (hunting in packs) allows wolves to prey on large animals such as moose, caribou, and muskoxen.

**249. MEADOW JUMPING MOUSE****F**

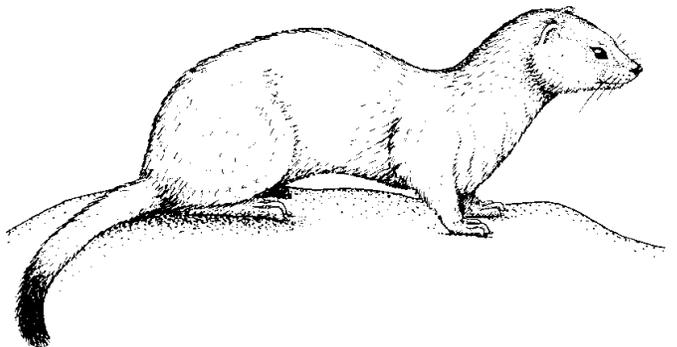
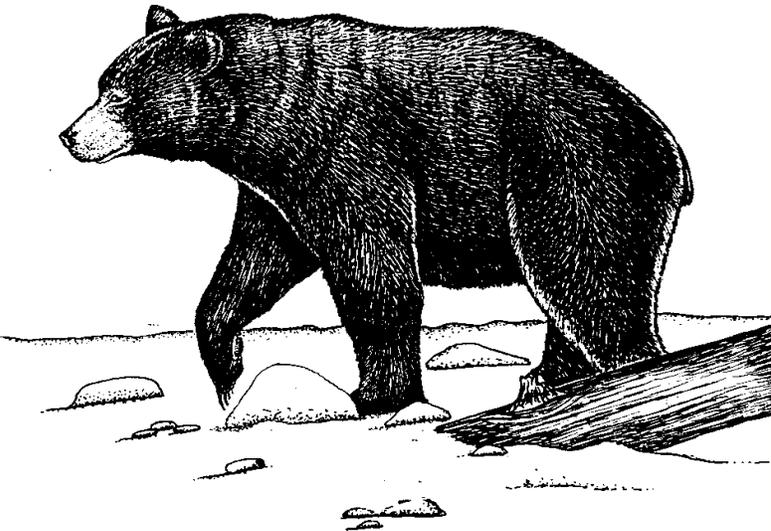
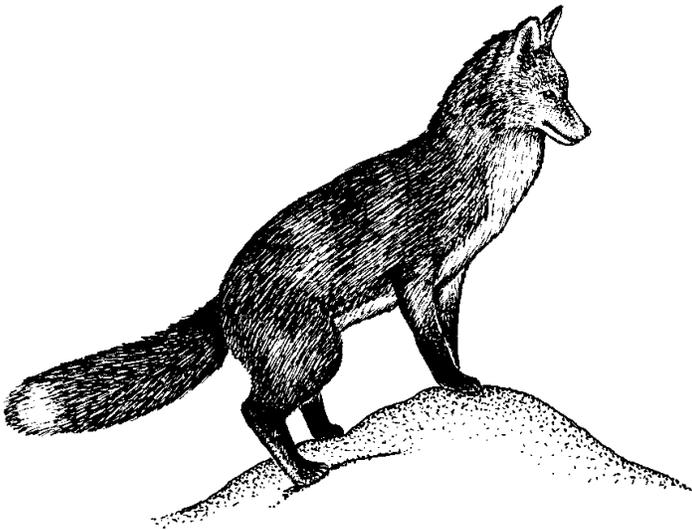
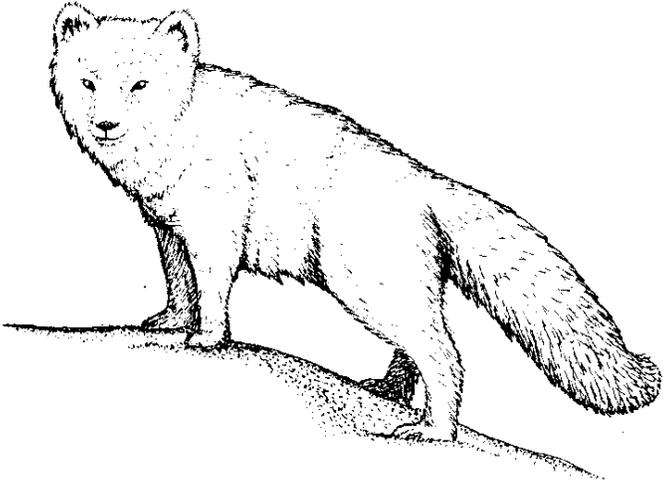
**Traits:** Small mammal with very long tail, large hind feet, small ears, and large front teeth for gnawing; hibernates during the winter and is primarily nocturnal.

**Habitat:** Forest edges and damp meadows; den sites beneath brush, logs, or stumps; well-drained sites to dig its deep winter burrow

**Foods:** Seeds, insects, fruits

**Eaten by:** Weasels, marten, owls, kestrels

**Do You Know?** The hind feet of jumping mice can propel them into six-foot (2-m) jumps.



**256. BROWN BEAR****F,T,W**

**Traits:** Heavysset mammal with short tail; long snout; large hump on shoulders; long claws on forefeet; brown fur; walks on heels rather than on toes.

**Habitat:** Tundra, forests

**Foods:** In spring, over-wintered berries, roots, fresh grasses, herbs; summer and fall berries; also small mammals, caribou, moose, salmon, carrion (dead animals)

**Eaten by:** Other brown bears, humans

**Do You Know?** Brown bears survive winter by remaining dormant in underground dens. They do not eat, drink, or defecate for the five to six months spent in the den.

**253. ARCTIC FOX****T,W**

**Traits:** Mammal with yellow-brown fur in summer, white in winter; also blue-gray variety that stays dark; short legs, ears, and muzzle

**Habitat:** Wetlands, dry tundra; pack ice in winter

**Foods:** Lemmings, voles, hares, birds and their eggs, fish, carrion from kills of larger animals

**Eaten by:** Occasionally taken by wolves, wolverines, or bears; snowy owls may take young foxes.

**Do You Know?** Arctic foxes were introduced to the Aleutian Islands by people for fur harvest and have caused declines in the populations of several seabirds and the Aleutian Canada Goose.

**257. MARTEN****F**

**Traits:** Small, furbearing mammal with sharp teeth, short legs, yellow to brown fur, long tail

**Habitat:** Conifer forests with high population of voles; mature conifer trees for cover

**Foods:** Meadow and red-backed voles, some berries, small birds, bird eggs, squirrels, and carrion (dead animals)

**Eaten by:** Coyotes, red fox, lynx, eagles, great horned owls

**Do You Know?** Martens use squirrel middens (piles of spruce cone scraps left by squirrels) for winter den sites.

**254. RED FOX****F,T,W**

**Traits:** Doglike mammal with long tail; sharp teeth; red to black fur; long legs

**Habitat:** Early successional stages of boreal forest, tundra, or wetlands where prey is abundant

**Foods:** Voles, lemmings, some muskrats, squirrels, hares, birds, eggs, insects, berries, carrion (dead animals)

**Eaten by:** Wolves, coyotes, lynx, wolverine; rarely by bears, golden eagles

**Do You Know?** Foxes store excess food when hunting is good.

**258. ERMINE (SHORT-TAILED WEASEL) F,T,W**

**Traits:** Small, furbearing mammal with sharp teeth; turns white in winter, except the tip of its long tail.

**Habitat:** Open areas (early successional stages of boreal forest, wetlands, tundra) with water for drinking

**Foods:** Voles, shrews, jumping mice, deer mice, other small mammals; some birds, insects, plants

**Eaten by:** Great horned owls, hawks, red foxes, goshawks

**Do You Know?** Ermines are chiefly nocturnal, but they also hunt during the day.

**255. BLACK BEAR****F**

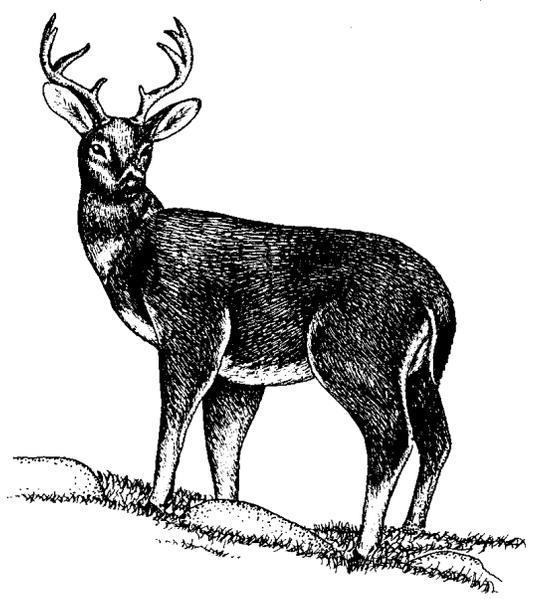
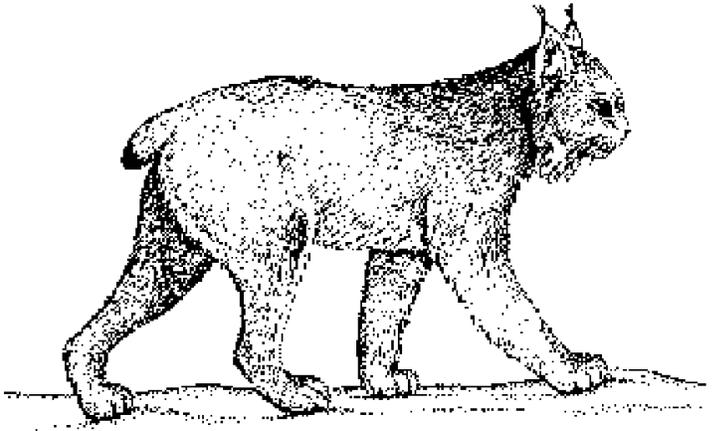
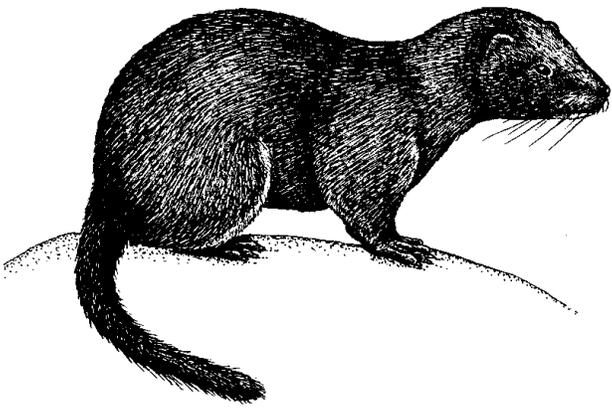
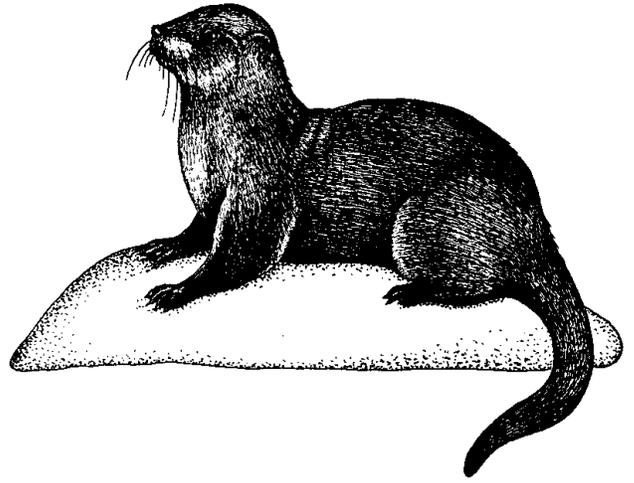
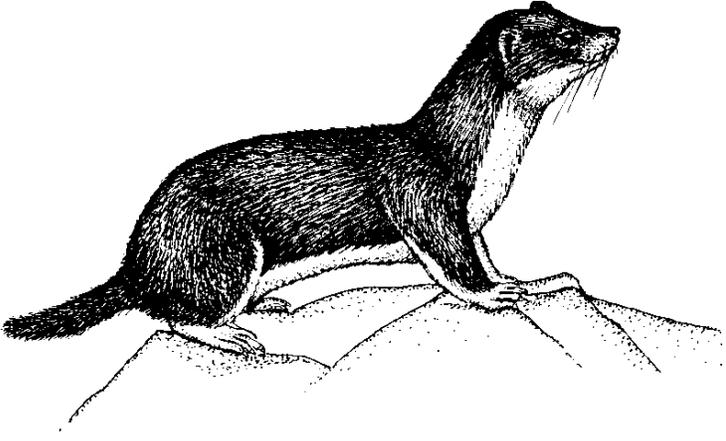
**Traits:** Large mammal with brown, black, or blue-gray fur; brown muzzle; short claws; sharp teeth

**Habitat:** Forested areas throughout Alaska

**Foods:** Varies seasonally; fresh green vegetation in spring, salmon and berries in fall; some moose calves and deer fawns; also carrion (dead animals)

**Eaten by:** Brown bears, black bears, humans

**Do You Know?** Black bears sometimes hibernate in a tree hollow created by fungi and bacteria that decayed the wood.



**262. RIVER OTTER****T,W**

**Traits:** Furbearing mammal with large canine teeth; long, slender body; short legs; webbed feet and a long tail covered with dense fur

**Habitat:** Streams, rivers, large lakes, sea coasts

**Foods:** Fish (rockfish, blackfish, sculpins, suckers) frogs, aquatic invertebrates, some birds and small mammals

**Eaten by:** Occasionally lynx, coyotes, wolves

**Do You Know?** River otters can dive 60 feet (18.3 m) and stay underwater for as long as four minutes.

**259. LEAST WEASEL****F,T**

**Traits:** Small furbearing mammal with a long tail; turns white in winter

**Habitat:** Early successional stages of boreal forest, tundra where food is abundant

**Foods:** Voles, shrews, lemmings, jumping mice, deer mice, other small mammals; some small birds, insects, plants

**Eaten by:** Great horned owls, hawks, red foxes, goshawks, ermine

**Do You Know?** Speed, ferocity, and its ability to fit into tight spaces help the weasel avoid larger predators.

**263. LYNX****F**

**Traits:** Medium-sized mammal in the cat family; large feet, short tail, sharp teeth

**Habitat:** Mosaic of old conifer and early successional stage forests where prey is abundant

**Foods:** Snowshoe hares almost exclusively; small mammals, birds when hare populations are low

**Eaten by:** Great horned owls or wolverines may eat young.

**Do You Know?** The lynx is the only cat native to Alaska.

**260. MINK****F,T,W**

**Traits:** Mammals with large canine teeth; a long, slender body; short legs; long, round tail; dense brown fur; feet not webbed

**Habitat:** Streams, lakes, marshes, inlets, estuaries

**Foods:** Muskrats, voles, lemmings; eggs and young of ducks, geese, and shorebirds; fish, frogs, mussels, aquatic insects

**Eaten by:** Hawks, owls, lynx, foxes, coyotes, wolves

**Do You Know?** Like all other weasels, mink have an anal scent gland that produces a strong odor.

**264. SITKA BLACK-TAILED DEER****F**

**Traits:** Small, hoofed mammal with long legs; reddish brown fur; black tail; antlers on male in fall

**Habitat:** Coastal hemlock-spruce forest; old-growth forest is critical for winter survival.

**Foods:** Herbs and shrubs (bunchberry and trailing bramble); blueberry, hemlock, arboreal lichens in winter

**Eaten by:** Wolves, brown bears, humans

**Do You Know?** This deer is native to Southeast Alaska, but humans moved some to Yakutat and to Kodiak and Afognak islands.

**261. WOLVERINE****F,T**

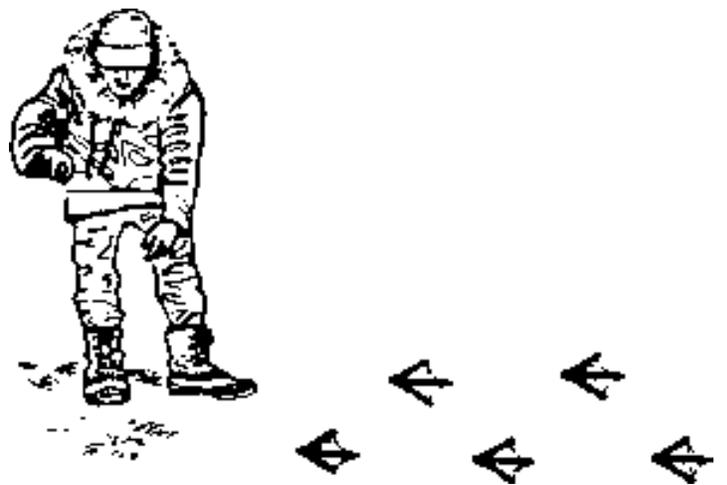
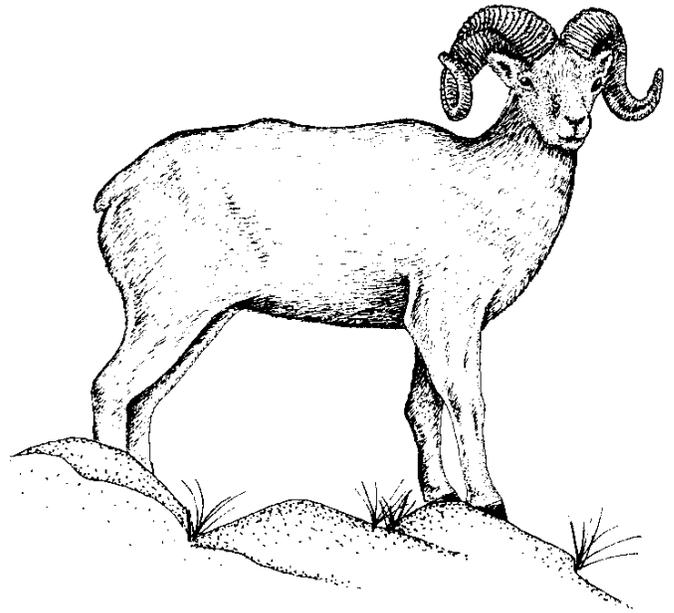
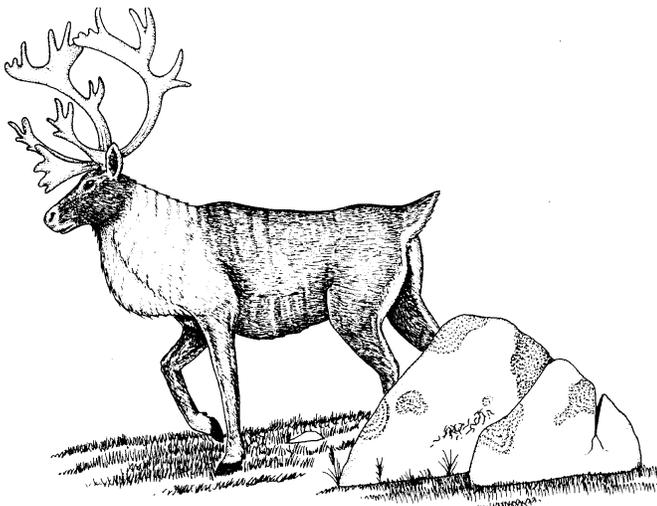
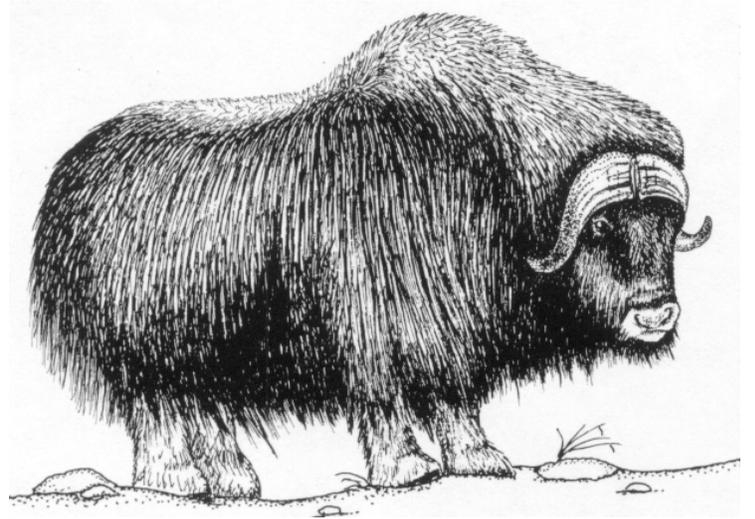
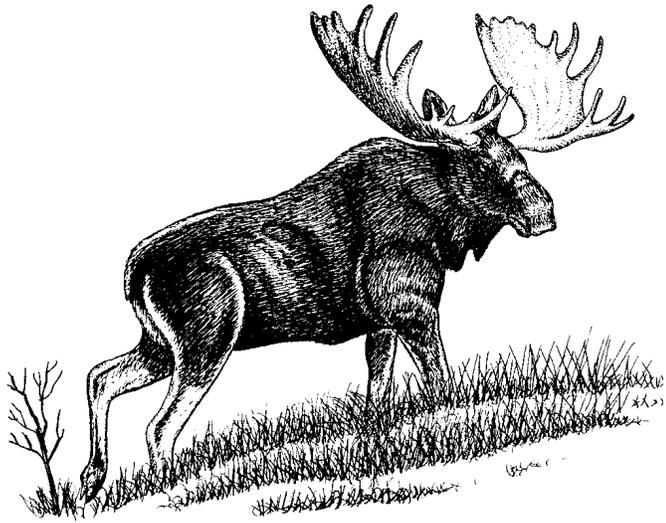
**Traits:** Furbearing mammal; brown with white stripes on sides; strong, well-developed teeth

**Habitat:** Coastal and boreal forests, tundra

**Foods:** Carrion (dead animals), marmots, voles; some bird eggs, berries, calves of moose and caribou

**Eaten by:** Occasionally killed by wolves or bears

**Do You Know?** Spinelike hairs on the pads of their feet help wolverines walk on snow and ice. Wolverines are fierce and solitary predators.



## 268. MUSKOX

T

**Traits:** Large, stocky mammal with long, dense fur; short legs and tail

**Habitat:** Lowland tundra of northern and western Alaska; prefers floodplains and river bottoms in summer; windblown, snow-free areas in winter

**Foods:** Grasses, sedges, herbs, woody plants (willows)

**Eaten by:** Wolves, brown bears, humans

**Do You Know?** The muskox is called "oomingmak" in Inupiaq, meaning "the animal with skin like a beard."

## 265. MOOSE

F,W

**Traits:** Large, hoofed mammal with long legs and long, drooping nose; large, palmate antlers on males in fall

**Habitat:** Tall shrub thickets along rivers; shelter in forests

**Foods:** Woody vegetation (willow, birch, aspen), grasses, sedges, horsetails, aquatic plants

**Eaten by:** Wolves, brown bears, humans

**Do You Know?** The moose is the largest member of the deer family in the world, and the Alaska race is the largest of all the moose.

## 269. DALL SHEEP

T

**Traits:** Mammal with dense, white fur and sharp hooves specially designed for climbing

**Habitat:** Separate summer and winter ranges of alpine tundra; cliffs for escape cover; windblown ridges where food is available during winter

**Foods:** Alpine grasses and sedges; also flowering herbs, willows, mosses

**Eaten by:** Wolves, wolverines, bears, humans; golden eagles will eat lambs.

**Do You Know?** These high-country animals are seldom found below timberline in Alaska.

## 266. CARIBOU

F,T

**Traits:** Moderately sized, hoofed mammal with short ears and tail; mane on neck; antlers large and variable with forward-projecting brow tines

**Habitat:** Lowland and alpine tundra, boreal forest; cool windblown sites or snow fields in summer to escape insects

**Foods:** Grasses, sedges, lichens, leaves of willow and birch, herbs

**Eaten by:** Wolves, bears, wolverine, humans

**Do You Know?** Caribou are the only member of the deer family in which both sexes grow antlers.

## 270. HUMANS

F,T,W

**Traits:** Large mammals that walk erect on two legs and have forelimbs with opposable thumbs

**Habitat:** Adaptable; variety of environments around the world

**Foods:** Moose, caribou, salmon, geese, many plants, domesticated animals

**Eaten by:** Wild animals kill people rarely; humans have no true predators.

**Do You Know?** The Alaska population prior to European contact was estimated at 84,750 people. In 2000, the population of Alaska was 629,932.

## 267. MOUNTAIN GOAT

T

**Traits:** Hoofed mammal with long, white hair on body and legs; short, black horns; long hair on chin

**Habitat:** Steep hillsides and cliffs of alpine tundra in Southeastern and Southcentral Alaska

**Foods:** Grass, herbs, low-growing shrubs in summer; hemlock, willow, other woody plants in winter

**Eaten by:** Wolves, coyotes, humans; golden eagles will kill kids (young goats).

**Do You Know?** Mountain goats are both grazing and browsing animals, depending on the particular habitat and season of the year.