

DI'S STORY

(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.

The lesson addresses the following Alaska Grade Level Expectations:

Science

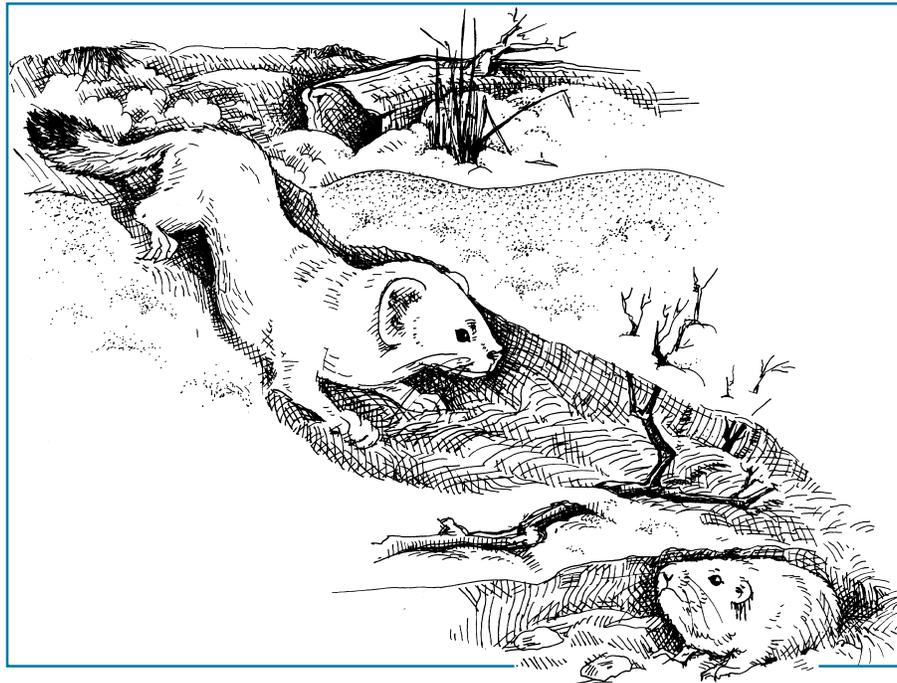
[4] SC2.2 The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms by describing the basic characteristics and requirements of living things.

Added Materials

Alaska Ecology Cards

Di's Story

1 EXTENSION *ALERT: ALASKA ECOLOGY CARDS OPTIONAL*



Section 4 TUNDRA ACTIVITIES

Grade Level: K - 6

State Standards: S A-14,
S A-15

Subjects: Language arts,
science, art

Skills: Listening, visualization, art, identification

Duration: 3-5 classes

Group Size: Individual

Setting: Indoors

Vocabulary: Adaptations,
habitat, hibernate, insulation, lemming, predator, permafrost, tundra

Objective:

Students will describe the characteristics of a tundra ecosystem and draw its elements.

Teaching Strategy:

Synthesizing what they hear in a story about lowland tundra animals, students draw pictures to illustrate the story and make a book of their illustrations.

Complementary Activity:

“Getting to Know Tundra Wildlife – Tundra Writing Adventure” in this section. Also “Snow Blanket” in Section 1, *Elements that Create Tundra*.

Materials:

Depending on grade, one to several copies of “The Story of *Dicrostonyx torquatus*” (following pages), pencils or pens, drawing paper, yarn, hole punch or staples for binding student books.

OPTIONAL: *Alaska Ecology Cards* or other pictures of tundra animals, photocopies of the class book.

Background:

See **INSIGHTS Section 4, Ecosystems**; also **INSIGHTS Section 1: “Snow Blanket” and “Permafrost”**; **Section 2: “Permafrost”**; and **Section 3, Adaptations**.

Procedure:

1. Explain that you have a story about some Alaska animals. Because it doesn't have any pictures, students will need to use their imaginations to picture the places and animals in the story. Later, they will help to illustrate the story.
2. The story is about a collared lemming scientists have named *Dicrostonyx torquatus*. (Di-KROS-te-nix Tor KWA-tus). *Scientists give all animals two-part names derived from Latin and Greek. Scientists use these names so that people all over the world, no matter what language they speak, can identify each animal.*
3. Ask one student to read the dictionary or field guide definition of a **lemming**. Show the class pictures of lemmings and their habitats. (*Lemming mounts are available in the “Tundra Kit,” on loan from the Alaska Science*



Center, Alaska Pacific University – see Teacher Resources for Section 4 in Appendix.) Also show pictures of the other animals in the story (use *Alaska Ecology Cards*).

4. Explain that this story is divided into four chapters, which correspond to the four seasons.

Chapter 1. WINTER. Di's story begins in winter when she is born in a grass nest beneath the snow. Explain that lemmings do not **hibernate** in the winter. What **adaptations** must they make to survive in the winter? Ask the class why they think lemmings live beneath the snow. Students usually easily guess the wind as an answer, but they may have trouble understanding the **insulation** value of snow (see *INSIGHTS Section 1, "Snow Blanket"*).

Chapter 2. SPRING. What happens during breakup as everything melts? How will this affect the lemming's tunnels and nests? Encourage students to think of the surprises above ground – new plants, the return of **tundra** animals, and **predators**.

Chapter 3. SUMMER. The tundra continues changing. Notice the references to the small size of the plants and the permanently frozen soil. Ask students to define **permafrost** (see *INSIGHTS Sections 1 and 2*). Di also finds her partner, her mate, in the summer. Together, they build their nest.

Chapter 4. FALL. Snow arrives in the fall, and Di welcomes its return and the warmth of the snow tunnels and nests. She encounters the weasel – a danger she recalls from last winter. As winter progresses, the story leaves Di raising her own litter of young.

5. Read the story aloud to the class. You may wish to give each student a copy of the story and take turns reading aloud.

6. Pause at the end of each chapter and discuss how the season affected Di – for example, where she lived (her **habitat**) and the dangers she encountered. What are the signs of the seasons? List the clues or settings on four pieces of butcher paper.

7. Divide the class into four cooperative learning groups. Assign each group a chapter (*a season*).

8. Give the group a copy of the chapter, writing and art supplies, and the appropriate piece of butcher paper on which you have listed the setting. Depending on their grade levels, students may rewrite the story in their own words or illustrate the setting and events.

9. Assemble the four chapters, and bind them together as a class book.

VARIATION FOR YOUNGER STUDENTS:

Students make a mural showing the four seasons described in the story and the various plants and animals present in each of the seasons. Divide the responsibilities between work groups. For example, one group may draw the spring background, while another group cuts out spring animals to paste on the mural. Use the mural to discuss the tundra environment and its seasons.

Evaluation:

1. Students list at least three characteristics of tundra ecosystems.

2. Students work individually or in teams of 2 to 4 to write a story similar to Di's story using their own imaginary animal.

EXTENSION:

Create a play. Using Di's story as a base, students create a play and perform for the community or another class. Different students play Di in the different seasons of her life.

Curriculum Connections:

(See appendix for full citations)

Books:

A is for Arctic (Lynch)

Above the Treeline (Cooper)

One Day in the Alpine Tundra (George)

Tundra (Kaplan)

What is a Lemming? (Souza)

Teacher Resources:

(See appendix)



The Story of *Dicrostonyx Torquatus*, The Collared Lemming

by Susan E. Quinlan

CHAPTER 1

WINTER – A WORLD TO DISCOVER

Dicrostonyx torquatus, or Di for short, was a collared lemming. She lived on the tundra in northwestern Alaska. On the day she was born, the temperature was 30 degrees below zero, and the tundra was frozen under a blanket of snow. Icy winds howled through the dark winter air.

Tiny Di and her litter mates (brothers and sisters) were born with their eyes still closed and with no hair. They would have frozen in the cold air. Instead, they were warm inside a nest of grasses that their parents had built beneath the snow.

The tiny lemmings slept and drank milk from their mother. Slowly, they grew soft fur and opened their eyes.

One day *Dicrostonyx* was awakened by a pinch on the back of her neck. She squirmed and twisted only to find that she was hanging from her mother's mouth. A terrible smell filled the air of the nest. That horrible smell and her mother's strange actions made Di feel very afraid. She hung limply as her mother carried her out of the warm nest.

Her mother then ran down a long, dark tunnel. Di's back end and feet felt icy cold when they brushed against the sides of the tunnel. Di sensed that her mother was alarmed.

Her mother hurried through one tunnel, then another. Finally she dropped Di inside a new grassy nest and then left. Di fluffed her fur out and curled into a ball to keep warm.

Di's mother returned in a few minutes. She dropped another litter mate she was carrying, then stopped. She listened carefully and sniffed the air. Di did the same. She heard the wind overhead. Wssshhhhhh, Wshhhhhhhh, it whistled. She smelled the grasses of the new nest, her parents, and her litter mates.

And, very faintly, she smelled that terrible odor that she had noticed in the old nest. Di now knew that the awful smell meant danger. For now, though, she was safe in the new nest with her parents.

Di and her litter mates grew larger over the next few days. Soon there was not enough milk to feed all the growing young. Di felt hungry and the nest felt too crowded. So she left the nest. It was colder outside of the nest, but Di stayed warm because by now she had grown long fur. She slowly walked down the snow tunnel away from the nest.

She looked at, listened to, and smelled all the new things she found. Soon she smelled something that made her remember she was hungry. She dug through the snow without thinking. Two shovel-like claws on her front paws helped Di scrape and dig through the hard snow. She found a small willow plant. Di filled her stomach with the twigs and buds of this plant. Then she began exploring again.

Di scurried from one tunnel to another for the next several weeks. She slept in nests she found along the way. She ate whatever smelled good. Di could not find very much to eat, so she had to move farther and farther away from the place where she was born.

One day she found a tunnel that ended above the snow. Di cautiously peeked out into the open air.

Ice crystals blown by a strong wind blasted into her face. The wind bit the tip of her nose, and her breath turned to white fog. Di was still curious. She poked her head out further and saw a small hill. The hill was only two feet tall but to Di it looked very large. She scampered up it to find out what was on top.

She found a patch of ground without any snow. The frozen soil was bare and brown. Di saw only a few small plants. The dead leaves and stems of these two-inch-tall plants spread over the ground like mats. Di



ate a few buds that she found hidden under these dead leaves. Then she looked around.

Flat, snow-covered ground stretched out as far as she could see. There were no trees or mountains to block the view. The sun was just above the southern horizon. It lit the sky with a reddish light.

Just then Di heard a noise. Crunch, crunch! Di dove back into her snow tunnel. Then she turned around and looked out carefully. She saw six giant beasts moving towards her.

The crusty snow squeaked and snapped beneath their feet as they walked. Their short legs were almost hidden by long, woolly fur. Each one had horns that looped down either side of its shaggy face. They stopped to paw the ground as they moved nearer to Di.

They nibbled at some plants, then stopped to chew. They did not seem to notice the bitter cold and wind. But Di suddenly felt cold. She turned and ran back down her tunnel to a warmer spot beneath a large drift of snow.

Di dug her own tunnels to find food during the next few months. She learned that it was warm beneath soft, deep snow and cold under the crusty snow. She also found many new things. One day she found a beetle that was frozen. Another day she found frozen berries. She ate these. She also nibbled on the frozen buds of willow and gnawed on the stems of grasses.

Di soon learned to recognize the sounds of other animals. She knew the sounds that other lemmings made as they gnawed on twigs. She knew the sound of muskoxen crunching through the snow.

She also learned to recognize the sniffing and pat, pit, pat of a hunting arctic fox. Di knew she must fear this sound. Whenever she heard it, she sat very, very still.

Each day in the snow tunnels was just like the last. Di dug tunnels through the snow. She looked for food and found it. She listened to the sounds around her

and always hid when she heard a fox. The arctic tundra provided Di with food, shelter, and places to hide from her predators. She could not have had a better home.

CHAPTER 2

SPRING – CHANGES IN THE AIR

Di often dug tunnels to the surface of the snow just to see the world above the snow. Once when she dug a tunnel to the surface she saw another tunnel in the snow just a few feet away. She saw nothing around except white snow, so she decided to have a closer look at it.

She noticed that the sky was brightly lit out in the open. The wind was still, and the air seemed warmer than ever before. Di began to explore the white world around her. She looked, listened, and sat on her haunches to sniff the cold air.

She did not see the large white bird that sailed quietly over the snow toward her.

Its large black claws stretched out toward her back. Suddenly Di noticed a large shadow moving towards her. She rushed into the nearest tunnel, barely escaping the owl. This time the snowy owl would have to search for some other lemming to eat for its dinner.

Di's tunnels through shallow snow were light almost all of the time now. They had been dark all the time when she had first begun living on her own. Now it was almost too bright to see outside as the snow glistened and flashed in the sunlight.

Di, curious as ever, still regularly visited the snow surface. But after her encounter with the snowy owl, she was much more careful.

One day, as she gnawed on a willow branch, Di heard a new sound. It was a beautiful, melodic whistle. She hurried up to the surface to see what was making the pretty sound. The wind was howling outside the tunnel. It was hard to see through the blowing snow.



When she heard the beautiful sound again, Di spotted the singer. A small bird with striking black and white feathers and a small, cone-shaped bill was perched on top of a small snow bank near the entrance to one of Di's tunnels. A snow bunting.

After that day, Di noticed many changes in her world. The snow changed to ice in some places. Di could not dig through the ice. In other places, the ends of Di's tunnels simply disappeared. The tunnels in deep snow that were once warm, became wet and icy. Some filled up with water. Di got very cold when her fur got wet. She began to avoid the tunnels in the deep snow and started spending more time on top of the snow.

Her fur was now brown, so that she was camouflaged when she hid among the brown leaves of the tundra plants. None of the plants was more than a few inches tall. Di had to be very still when she wanted to hide.

This was a dangerous place and time for a lemming. Di saw, heard, or smelled an arctic fox almost once every week. Twice she smelled the horrid odor that she remembered from her days with her mother. Once she saw an owl carry off a lemming that had been too careless.

These events made Di wary. She sniffed the air often. She always looked carefully before going above the snow. She moved slowly. And she listened, even for faint noises.

Cack, cack, cack, get-back, tobaggio, tobaggio!

Di jumped nearly three inches off the ground when that loud cackling call exploded behind her. She raced under a tussock of grass and sat with her heart pounding.

Tobaggio, tobaggio, tobaggio!

Di carefully peeked out of her hiding place. She saw a ptarmigan eating willow buds. It had a brown head, a white body, and bright red combs over its eyes.

"Tobaggio, Tobaggio, Tobaggio!" it called.

Di saw a new bird every day. Most were flying to other places. They came, and left in great flocks. Often she heard large flocks of birds flying over. Their wings whistled in the wind. And most of them called out. Honk! Honk! Quack ... quaaack, quack. Phsss, phss, phss.

She heard the sounds during the sunlit day and in the short twilight of night. Perhaps Di did not know it, but spring had arrived with the birds.

CHAPTER 3

SUMMER – A DIFFERENT WORLD

The weather changed often as spring turned into summer. One day was warm and the snow melted. Then snow fell and the winds howled the next day. Soon, however, Di could not find snow to tunnel through. She had to swim in places where she had once run through snow. She found flattened piles of wet grass in places where she once had built warm nests.

Di, like all the lemmings, was forced to move to high spots on the tundra. Water covered everything else. Di could not find many places to hide, because few plants grew on the dry spots of tundra. Usually she hid under the dry leaves of a grass tussock.

Soon, the song of the snow bunting and outbursts of ptarmigan were hard to hear, because the air was filled with the calls and songs of many kinds of birds.

Lapland longspurs flew high into the air to sing songs that sounded like ice tinkling in a crystal glass. Boom, boom, boom, the drumlike calls of pectoral sandpipers echoed across the tundra.

Dunlin sailed into the air, then dove toward the earth. "Psssssssssssssh!" they whistled.

"Ah ha leek, ah ha leek," called the oldsquaw ducks from every lake and pond. But even these were drowned out by the loud, haunting cries of loons: Hulawhoooo, Hulawhoooo.



The birds began nesting almost as soon as they arrived. Loons, geese, and eiders nested on the tiny islands in the midst of frozen tundra lakes. Sandpipers nested in the bare spots between patches of melting snow.

When another snow storm passed through, the tundra was blanketed with snow. The nests, eggs, and incubating birds were soon covered by wet snow. The birds could do nothing but wait for the snowstorm to stop. If they moved off their nests, their eggs would get too cold.

Di also waited for the snowstorm to end. The snow was too wet to tunnel through, so she hid under a grass tussock. When she felt the ground shaking, she poked her head out to look for a muskox. But she saw something else.

The long-legged animals trotting toward her were thinner than the muskox. They had short fur and thin antlers. They moved quickly, barely stopping to munch on the grasses and sedges. Di saw 20 caribou come close to her. Nearby, tens of thousands wandered over the tundra.

Di had much on her mind during these days of early summer. She had to dodge the hooves of the caribou. Jaegers, a new kind of bird predator, had appeared with the great hordes of other birds. Di had to be very careful to keep hidden from them and from owls. She listened for foxes and often sniffed the air for the smell of that other, mysterious danger.

Di found many new things to eat. She found green leaves and beautiful flowers on plants that had seemed dead during winter. The tundra was dotted with yellow, white, blue, and purple flowers. As Di feasted on this new variety of food, she grew large.

Many tundra animals, like the birds, were soon busy raising young. Within two weeks after the caribou arrived, almost every cow gave birth to a calf. The muskoxen had their calves in the willows down by the river.

Every day arctic foxes trotted across the tundra to carry lemmings, birds, eggs, and other prey to four young fox pups in their underground den.

Soon Di found a mate and, like the other tundra animals, began raising young. She and her mate dug a tunnel into the dry soil on the edge of a small rise in the tundra. Di discovered that just a few inches underground, the soil was still frozen solid. The frozen earth she found, called permafrost, underlies nearly all of the lowland tundra in Alaska.

Di made her nest soft and cozy with grasses, muskox fur, and ptarmigan feathers. Di and her lemming pups could not have had a warmer home.

As the days grew warmer, many kinds of insects began to appear. Bumblebees in yellow and black fur coats hatched from eggs that had been buried in the soil. They buzzed from one flower to the next. Yellow, blue, orange, white, and even black butterflies and moths came out of the chrysalises and cocoons in which, as larvae, they had slept through winter.

Flies and mosquitoes hatched from the eggs that had survived winter. They soon filled the air with a constant hum: *Bzzzzzzz Bzzzzzzzz Bzzzz*. Di heard their *bzzzz* whenever she was out of her burrow. She twitched her nose when one landed on it.

Every warm-blooded creature, from caribou to lemming and goose to longspur, knew the annoying sounds and bites of the mosquito hordes. Caribou often ran wildly across the tundra to try to escape these and other insects.

Di's summer season passed quickly. One day, the caribou herd headed inland on another part of their endless migration.

The eggs in hidden shorebird nests turned into long-legged, downy chicks, taller than Di. Soon after hatching, these chicks hurried after their parents in search of insects to eat.



Broods of ducklings followed their mothers around the edges of the tundra ponds. Meanwhile, flocks of male birds, and female birds whose nests eggs were eaten by predators, headed back south. Di watched long, single-file flocks of eiders fly past in a mirror image of their northward rush just two months earlier.

Areas that were flooded with water early in summer dried as the water slowly evaporated. Soon, white tufts of cotton topped the sedges and blanketed the tundra like patches of snow. Di found plenty to eat as the tundra's other flowers turned to seed pods.

In August, the temperature stayed below freezing for several days. Ice formed on the small tundra ponds, and frost covered the plants. Di listened, and she could hear no hum of insects. Summer had come to its end.

CHAPTER 4 FALL – A MYSTERY SOLVED

Di had to be very careful as summer turned to fall. More predators were looking for lemmings than ever before.

Not only were the adult foxes hunting, but their pups were out of the den and had begun hunting on their own. The jaegers' chicks were now large and needed more food than before. Both adult jaegers were busy hunting almost 24 hours a day in search of enough food for their demanding young.

The pair of snowy owls had raised five young, and all of them were out of the nest. Di often spotted their yellow eyes peering at her. Di was also careful because she sometimes smelled the terrible scent which she knew meant danger.

Each day the temperatures grew colder. The wind stung as it lashed across the land. Frost covered the tundra plants each morning. Small flurries of white snow swirled across the tundra. Di spent most of her time hiding amidst the cotton grass and eating the sweet berries that the frosts had ripened.

She also spent some time grooming her fur. Her short brown summer coat was falling out and a long white winter fur was growing in. Arctic foxes, tundra hares, and ptarmigan were beginning to turn white just like Di.

Di noticed that a period of darkness occurred and seemed to grow longer with each passing day. The tundra was quieter than it had been earlier. Not only were the insects silent, but the birds were too busy feeding to sing or call.

Each bird needed to put on a layer of fat. The fat would give it the energy needed for the long, long journey south. As each bird gained the needed weight, it lifted off and headed south. Di often heard the honking of a flock of geese that sailed overhead. "Honk, honk, honk!" they called as they left.

One day, Di awoke from a nap and felt that her world was somehow different. She ran to the entrance of her underground tunnel. It was covered by snow.

Di pushed her nose through the soft powder to try to find the outside world. She could tell from the dim reddish light that the short, sunlit part of the day was almost over. All around her the tundra was white. Snow was everywhere. It covered the yellowed leaves of the willows, the brown leaves of the sedges, the red of the bearberry, and even the brown patches of earth.

The wind was blowing again. The wind grew colder. More snow fell. The tundra lakes froze over. And the sun shone for a shorter and shorter length of time each day.

Di felt at home in this cold world. She tunneled one way and then the other through the snow. This was the world she had known as a young pup. She liked the warmth of the snow blanket and the darkness of her tunnels.

Di started building a warm nest of grasses in a spot she recognized as one she had used last winter. She also dug a tunnel to the surface of the snow so that she could occasionally go and look out.



On one of her visits to the surface, she saw a strange white animal she had never seen before. Its long body, short legs, and long tail tipped in black gave it an odd look. It moved by bringing its hind legs up near its front ones, then moving its front legs out. It looked a little like a very large and very fast caterpillar.

Always cautious, Di watched it carefully and sniffed the air. The animal was downwind of her, so she could not smell it. But she noticed that it was also sniffing the air, and it seemed to be moving right towards her. She backed further into her snow tunnel, but continued watching.

It was coming towards her even more quickly now. Something about its approach reminded Di of a hunting fox, so she decided to run away. She slipped down her snow tunnel away from the animal. Then she took a side tunnel that would lead to a spot downwind of the animal. Perhaps if she could sniff its scent, she would know what it was.

Di stopped and sniffed as she neared the end of the downwind tunnel.

She trembled when she recognized the odor that she had always feared. It was the smell of danger that she remembered from her earliest days in the nest with her mother. And now it was here – coming towards her!

She knew she must hide. But she had not had time to dig many tunnels in the snow. She peeked out the tunnel she was in and saw the tip of the weasel's tail disappearing down the entrance to the tunnel she had just been in. The animal's long narrow shape was just right for traveling in lemming tunnels.

Di suddenly knew that the weasel was hunting her. If she ran back down her tunnel she would run right into it.

Di decided to run over the snow surface instead. Scampering across the snow, she ran one way, then the other. The wind had formed a crust on the snow, so it was easy to run across it.

Di did not look back to see if the weasel was following. She just kept running as fast as she could.

The winds had blown the snow into drifts. Di had to run up and down, up and down over these. In her rush, Di did not see the drop-off near the edge of a frozen lake. She tumbled head over heels down the drop-off.

Down, down, down she went. When she finally landed in a snow bank, she lay stunned for an instant. Then she dove into the snow bank.

She dug as fast as she could and kicked snow to fill the tunnel behind her. At last she was too tired to dig further, so she stopped. Her heart was racing so fast she could hardly hear. But she listened carefully and sniffed the air. She heard nothing and could not smell anything.

Still she lay quietly. She did not want to make any noise that would help the weasel find her. She soon fell asleep.

Di jumped when she awoke. She calmed down only after sniffing the air. It smelled fresh and clean. Di had escaped the weasel. Now it was time to find food.

Di dug tunnels through the snow of this new area. When she finally had time to peek above ground, she felt the icy blast of winter winds and the freezing chill of below-zero temperatures. She could see only darkness. The wind howled. The ice groaned. Sometimes the sound of Di's teeth gnawing on willow twigs echoed through her tunnels; otherwise, winter was a silent season.

Di lived in her snow tunnels during these months of wind, snow, and darkness. The northern lights lit the dark sky over the tundra in February. Di cared for another litter of young under the snow. They would begin their lives as she had, in the darkness of a warm grass nest beneath a blanket of snow.



Tundra Ecosystems – Community Connections

Section 4 TUNDRA INSIGHTS

Energy Transfer
Food Web
Producers
Consumers
Detritivores

Community Interactions
Competition & Symbiosis
Mutualism
Commensalism
Parasitism

Small Scale Diversity
Case Study: Population Cycles



Energy Transfer – the basics of all life

Where the next meal comes from is a constant priority in any organism's life. In the tundra, this priority is especially critical because food sources (energy) are not abundant, and the slow organism may lose not only a meal but also its life. The following pages describe how energy is transferred and recycled in the tundra environment. Recycling here is not just an option, but is critical to continued survival of the ecosystem.

FOOD WEBS – who eats whom?

[See *Alaska Ecology Cards* for species illustrations and INSIGHTS 3 for the “Five Kingdoms of Tundra Life”.]

A plant is exquisitely equipped to convert the nonliving – air, water, minerals, and sunlight – into food for itself and others. Plants and algae that make food from nonliving materials are called **producers**.

The other living things in the tundra that depend on food manufactured by producers are called **consumers**. Consumers divide into four groups: **herbivores** (animals that eat plants), **carnivores** (animals that eat other animals), **omnivores** (animals that eat both other animals and plants), and **detritivores** (animals and other organisms that eat dead or decaying material).

The pathway of **energy** and **minerals** from the nonliving environment, through producers, to consumers, and back again through detritivores creates a **food chain**. All the food chains of a tundra

are connected into a **food web – the energy circulatory system of an ecosystem**.

Energy Lost and Found: At each intersection in the web, some energy is returned to the nonliving environment as heat. That energy is not passed on and cannot be reused by living things. The lost energy is replaced during photosynthesis by the capture of energy from the sun.

Mineral Recycling: Minerals are always passed along at each web intersection until the detritivores return them to the environment in their original form, where producers can use them to make new food.

Producers Convert Raw Materials

Using the process of **photosynthesis**, producers combine energy from sunlight



with carbon dioxide from the air and minerals from water, soil, and rocks to produce the sugars and oxygen that help all other living things survive. Plants, algae, and lichens are important producers in tundra ecosystems and are the first life forms in food chains.

Unique in the World: Tundra producers are unique among producers in the world. Because lack of light (from darkness or snow cover), cold temperatures, and lack of moisture, they can only function for a few months each year. Ironically, this means that tundra producers are also tundra inhibitors – slowing and limiting the flow of energy and minerals through the ecosystem. [Detritivores are another limiting factor; see below.]

Scientists measure this flow of energy and minerals by determining the weight of carbon that is “fixed” or changed into living material by producers each year. Basically, the measurement is the dry weight of all new growth – leaves, roots, flowers, seeds – produced each year.

Low Productivity in Tundra: On average, all tundra producers together make only one-tenth to one-third as much food each year as producers in forest ecosystems. As a result, tundra consumers are limited by a shortage of food unless they migrate elsewhere for part of the year (see “Migration” in INSIGHTS Section 3).

Herbivores Eat Producers

Some of the largest and smallest tundra wildlife are herbivores. Caribou and lemmings receive all their nutrition from plants. A caribou, however, must roam great areas of lowland tundra and migrate to obtain enough food to sustain its body mass.

Geese, also migrants, are tundra herbivores in the summer when plants are at their peak production.

Compared with forest ecosystems, relatively few plant-eating invertebrates occur in either alpine or lowland tundra environments. The tundra has herbivorous bumblebees, moths, butterflies, and a few sawflies, but these consume much less green vegetation than do vertebrate herbivores.



In alpine tundra, voles, pikas, marmots, Dall sheep, and mountain goats are the main plant consumers.

Carnivores Eat Herbivores – and Each Other



Tundra herbivores are prey of tundra carnivores such as wolves, wolverines, arctic foxes, weasels, jaegers, snowy and short-eared owls, gyrfalcons, and golden eagles. All will eat each other if the opportunity arises.

Birds Seek Insects: Flocks of small, insect-eating shorebirds that migrate to the tundra to nest are major carnivores in the ecosystem despite the relative scarcity of insect herbivores. Goslings and ducklings also rely on insects for a protein boost during their first few weeks of life while the parent geese and ducks eat plants and algae.

The insect-eating invertebrates in tundra ecosystems include some predatory crane flies, spiders, and ground and rove beetles.

Predator – Prey Dependency: Carnivores cannot survive without adequate populations of prey. Thus, the numbers and kinds of herbivores on the tundra determine, in part, the presence and abundance of carnivores.

Carnivores also influence the numbers and kinds of herbivores on the tundra. If a population of herbivores grows too large, the animals may eat all their food supply and starve. Maintaining healthy populations of carnivores reduce the chance of such herbivore population explosions and crashes. When a population explosion does occur, carnivores lessen the impact on plants.

Opportunistic Omnivores

Food on the tundra is often scarce; therefore, consumers that eat a variety of foods have a better chance of survival. Arctic ground squirrels, normally herbivores, sometimes eat bird eggs. Caribou, too, have been observed eating bird eggs and even lemmings.



Brown Bears Say Yes to Everything: Few tundra animals, however, are true omnivores, requiring both producers and other consumers for food. Brown bears are good example of omnivores. They eat plant roots and berries as well as ground squirrels, caribou calves, muskox calves, and carrion.

Mosquitoes Need Blood, Nectar: Mosquitoes are infamous for their abundance in lowland tundra where their hordes can torment humans and animals. Both male and female mosquitoes sip plant nectar as herbivores, but the female is omnivorous. She needs a blood meal from a warm-blooded animal to produce the eggs she will lay on the surface of any nearby water.



Detritivores Reuse and Recycle

The greatest number and variety of consumers in any ecosystem are the detritivores that eat dead things and waste materials. They are very important to the tundra because they return all the minerals stored in the food chains to the soil for reuse by tundra plants. Without detritivores, producers would soon run out of the minerals they need to make food.

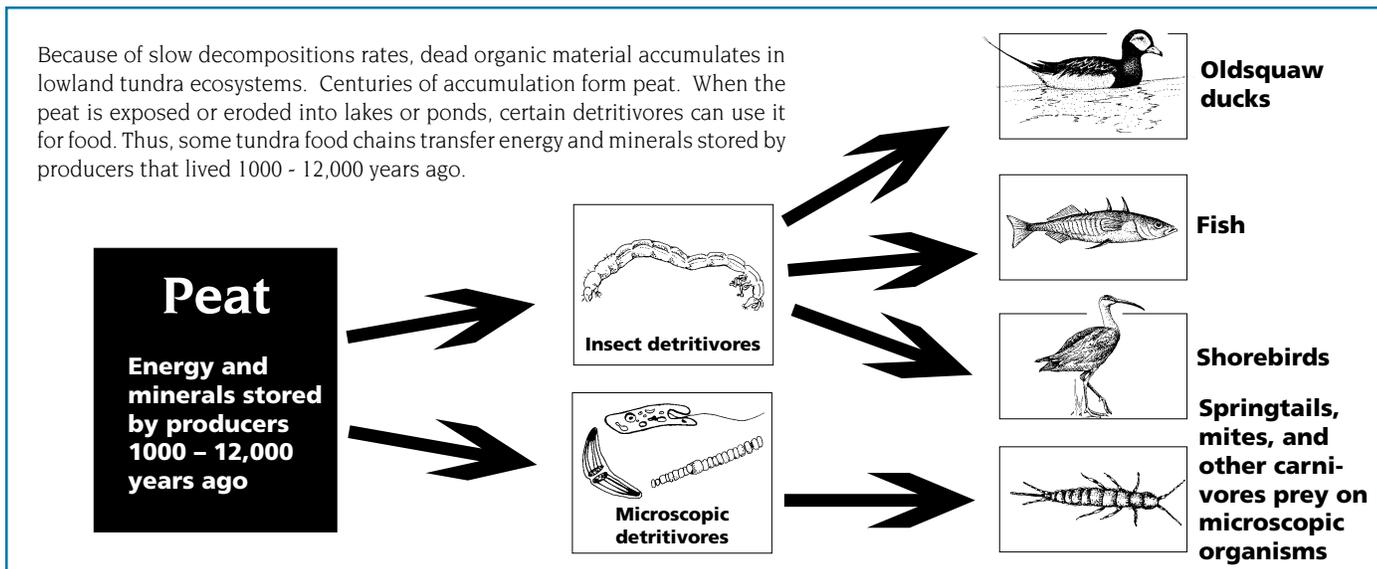
Big and Small: Some well-known animals such as ravens are detritivores. But the most important detritivores are tiny, extremely numerous – and ignored. The most visible detritivores are tiny animals

without backbones (invertebrates) – **enchytraeid worms, springtails, mites**, the **larvae** of many kinds of flies, and **nematodes**.

Soil Teems with Life: Near Barrow, Alaska, scientists found the following invertebrates in an area of 1.09 square yards (1 square meter):
 50,000 to 5 million nematodes
 10,000 to 100,000 enchytraeid worms
 10,000 to 80,000 mites
 24,000 to one half million springtails
 40,000 rotifers
 15,000 tardigrades
 700 fungus gnat larvae
 smaller numbers of other insect larvae
 Nearly all of these lived within 2 inches (5 centimeters) of the soil surface.

Too Much to Consume: These small animals eat much of the food produced by tundra plants. Despite their numbers, they cannot keep up with task of digesting all the organic material, especially under the rugged climatic conditions of the tundra.

More Detritivores: Completing the digestive team are **fungi, monerans**, and **protists** (see INSIGHTS Section 3 for descriptions in “Five Kingdoms of Tundra Life”), non-animal detritivores. In tundra, fungi are more important and more prolific decomposers than are the microscopic bacteria of the monerans and protists.



Fungi are well adapted to acidic soils. The majority of monerans and protists are detritivores and, although not as active under tundra conditions, play a role in creating soil.

Tundra Dilemma – too cold to rot

All the work of tundra detritivores is limited by the climate and the environmental conditions. Living in the top 2 inches (5 centimeters) of soil or on the surface, they are chilled from below by the permafrost and can be active only during the few short summer months.

Tundra detritivores do not break down all the new material produced each year. This slows the flow of energy and minerals through the ecosystem and limits tundra productivity. Much of the nitrogen, phosphorus, and calcium that could be returned to the soil for use by producers remains in accumulated detritus. This impoverishes the soil and, in turn, limits the growth of many tundra producers.

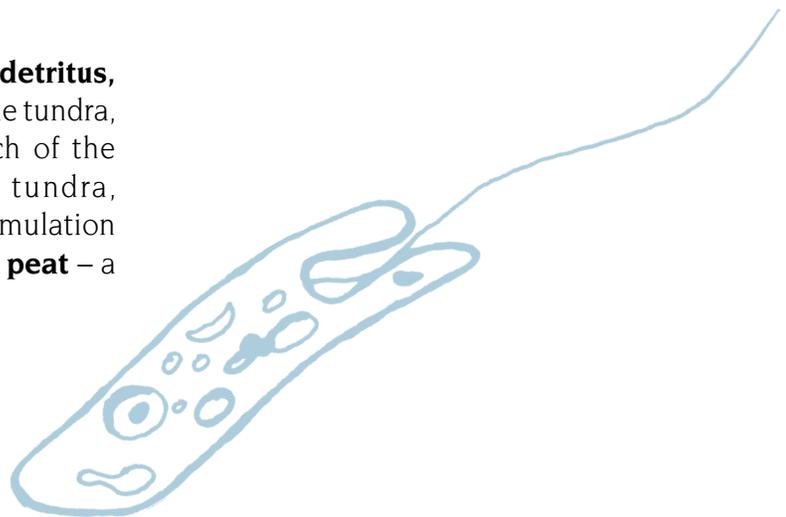
Detritus Food Chains

Dead, partially decayed material, called **detritus**, accumulates in tundra ecosystems. In alpine tundra, wind and water erosion carry away much of the excess. But in flat areas of lowland tundra, particularly in the Arctic, centuries of accumulation have created thick layers of detritus called **peat** – a storehouse of energy and minerals.

Many tundra food chains are based on dead organic material in ponds, lakes, and exposed peat.

Although detritivores break down waste materials and return energy and minerals to the nonliving surroundings, they incorporate some of the food (energy and minerals) they consume into their bodies. Many carnivores, including certain insects, ducks, shorebirds, and fish, get the energy and minerals they need by feeding on detritivores.

Essentially, these consumers are living off energy and minerals stored by tundra producers in the past. If peat layers have been exposed or eroded into lakes, the consumers in peat-based food chains are actually supported by producers that lived 1000 to 12,000 years ago!



Community Interactions – competition and symbioses

The tundra food web previously described portrays life and death relationships in the tundra ecosystem, but there are other equally influential relationships that do not involve eating the next in line. **Competitive relationships** occur within and between species. The term **symbiotic relationships** (literally “*living together*”) describes three forms of tundra neighborliness: **mutualism**, **commensalism**, and **parasitism**.

COMPETITION – I can grow faster

Competition occurs when the supplies of food, water, shelter, and space are limited. Any plant or animal that can get more water, more minerals, more energy, more space, or better shelter than its neighbors will grow healthier and leave more offspring.

Competition in All Sizes:

All living things compete with similar organisms to one degree or another. Herbivores such as caribou or lemmings eat the same kinds of plants and compete with one another for available food. Birds (such as geese) need safe nesting sites and compete with one another for the best. Competition is a constant interaction.



Complementary Traits: Lichens are actually a combination of two organisms: a fungus and an alga, or cyanobacteria. The alga, capable of photosynthesis, manufactures food for itself and for the fungus. The fungus stores water and provides a shell that protects the alga from drying in the wind. In some cases, the fungus may also help the alga obtain nutrients from rocks, soil, or rain water by excreting acidic fluids that break down the rock surfaces.

Pollinators: Although the wind helps to pollinate some tundra plants (sedges and cotton grass, for example), plants that are less common or grow only in specific sites rely on insects to ensure successful pollen exchange. About 90 percent of alpine and more than 60 percent of arctic tundra flowers are insect-pollinated, mainly by bumblebees, butterflies, moths, mosquitoes, and other flies.

Seed Carriers: Berry-producing plants have a mutual relationship with berry-eating animals that carry their seeds.

Fungi Aid Plants in Mineral Absorption

Fungi called **mycorrhizae** seek out the roots of plants and then grow around or even into the plant's fine root hairs. At one time, scientists thought these fungi were harming the plants. Instead, they actually help plants obtain minerals from the soil.

The fungi benefit from the association when the plants pump sugar made in their leaves down to their root hairs. This provides energy for the fungi. More than 90 percent of the plants in Alaska, including all our trees and berry-producing plants, could not grow without these mycorrhizal fungi. Many of the mushrooms we see are the fruiting bodies of mycorrhizal fungi.

MUTUALISM – the friendly symbiosis

Species or organisms benefit from the symbiosis of mutualism. In the tundra ecosystem, lichens provide an excellent example of two species benefiting from their association.





Moneran Bacteria Help Release Nitrogen

Another important mutualistic association occurs between certain plants and monerans. Plants must have nitrogen in order to grow, but they are only able to use nitrogen that is in the soil. Most of the nitrogen on earth is in the air, making it useless to plants.

Microscopic bacteria known as “nitrogen fixers” take nitrogen from the air and convert it to a form that is usable to the plant. In exchange, the plant provides the bacteria with the sugars it needs. This symbiosis allows the plant to grow on poor soil where most other plants cannot survive. And the plant-bacteria combination improves soil conditions for future plant growth.

COMMENSALISM – no harm done

In commensalism, another form of symbiotic association, one species benefits while the other is neither helped nor harmed.

Looking for Scraps: Arctic foxes scavenge food from the kills of wolves, brown bears, and polar bears. Although the larger predators are unaffected (they don’t miss the scraps), the foxes benefit from food that they could not obtain on their own.

Nest Guardians: Golden and black-bellied plovers nest on high spots on the tundra – frost boils, pingos, and ridges. Both the male and female plovers guard their nest and keep sharp watch for predators. Whenever they spot a danger, plovers whistle loudly to warn the nesting mate.



Scientists have observed that other smaller shorebirds nest near plovers and react when the plovers give an alarm call. By nesting near a plover, these birds gain a sharp-eyed guard for their own nests.

PARASITISM – a win-lose situation

In the third type of symbiosis, parasitism, the parasite benefits and the host is harmed or eventually killed. Parasites fulfill useful roles in the tundra ecosystem

by helping prevent plant and animal population explosions and by contributing to the natural cycle of life and death.

Caribou Tormentors: Caribou are hosts to a number of parasites. The warblefly lays its eggs at the base of caribou hairs. When the eggs hatch, the larvae burrow into the caribou’s skin and feed on its subcutaneous tissues. In June, when the larvae reach a certain size, they burrow out through the caribou’s skin and drop to the tundra, where the larvae pupate and metamorphose into the adult warblefly.



The warblefly larvae benefit from the food and shelter provided by the caribou, but the caribou is weakened. Many kinds of parasites occur in tundra, including fungi and insects that parasitize plant roots and microscopic organisms that cause animal and plant diseases.

Less Diversity than Other Ecosystems

The sight of hundreds of migrating caribou is awesome and gives an impression of abundance in the tundra. It is a misleading picture.

The limited number of species is the real story of the tundra. *There are fewer species in tundra than in most other ecosystems.* This means that there is *less diversity* in tundra than in other ecosystems.

Climate Limits Diversity: As a rule, the number and variety of living things decrease as the severity of the climate increases. Fewer species of living things are found on northernmost tundra than are in the subarctic maritime tundra. Fewer species are found at highest elevations in alpine tundra than are near the **tree line**.

Balance on a Smaller Scale: Tundra ecosystems are sometimes considered simple, compared with other ecosystems, because they contain relatively few species of plants, animals, and other living organisms. Yet all kingdoms are represented and the relationships among them are just as intricate and finely balanced as elsewhere in the world. Small changes can radiate through members of the tundra community via food webs and symbiotic and competitive interrelationships.

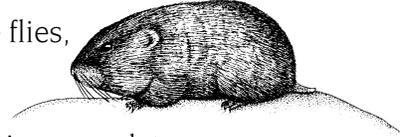


POPULATION CYCLES

Quick Facts

Definition – Population Cycles: Striking changes in animal numbers that occur repeatedly and, in some cases, on a fairly regular schedule

Tundra Examples: Lemmings, voles, ptarmigan, crane flies, certain sandpipers, and perhaps caribou



Why? Scientists don't know! Plant-herbivore interactions, predator-prey interactions, and soil nutrient (mineral) recycling may be involved.

WHAT HAPPENS TO BROWN LEMMINGS?

Brown lemmings usually occur at low densities (one lemming per 125 acres [51 hectares]). Some summers, however, they become much more abundant (8 per acre). The population explosion happens in just one to two years, and the crash occurs in just one summer. Near Barrow, lemmings cycle every three to six years.

Fat Predator Hypothesis: Scientists first thought that lemming populations cycled as a result of predators. During the years when lemmings are abundant, predators such as weasels, foxes, snowy owls, and jaegers can raise more young, feeding them on all those lemmings. When lemmings are scarce, the owls and jaegers don't nest or fail to raise young. Other factors such as shallow snow cover make it easier for predators to kill more lemmings in some winters than in others.

Scientists have discovered, however, that all the predators and their young could not eat enough lemmings to account for the sudden crash in lemming numbers. **Predation is not the main cause of lemming population fluctuations.**

Mineral Starvation Hypothesis: Another hypothesis still being examined is the relationship between lemmings and the minerals available for plants. In the thin tundra soil,

growing plants soon deplete the minerals to less than they require. Most tundra plants adapt to this scarcity and conserve their minerals. They store minerals in their roots during winter and pump them, along with newly absorbed minerals from the soil, into new leaves in spring.

Abundant, hungry lemmings upset that delicate conservation balance by removing more minerals (eating so many roots and leaves) than can be seasonally replenished. Short on minerals, the plants produce less nutritious leaves. Lemmings need a stable supply of calcium, phosphorus, and nitrogen to reproduce. **If the plants they eat contain few of these minerals, lemmings cannot produce many young.**

Lethal Combination: Low reproduction, combined with intense predation, could cause a rapid population decline for lemmings. After the crash, plants can rebuild their mineral reserves, eventually growing nutritious leaves and roots for the remaining lemmings. These lemmings produce more young and the population expands once again.

Debate Continues: Scientists still debate the relative importance of these and other variables. The answer, they agree, is in the link between lemmings and their environment.







Alpine Tundra



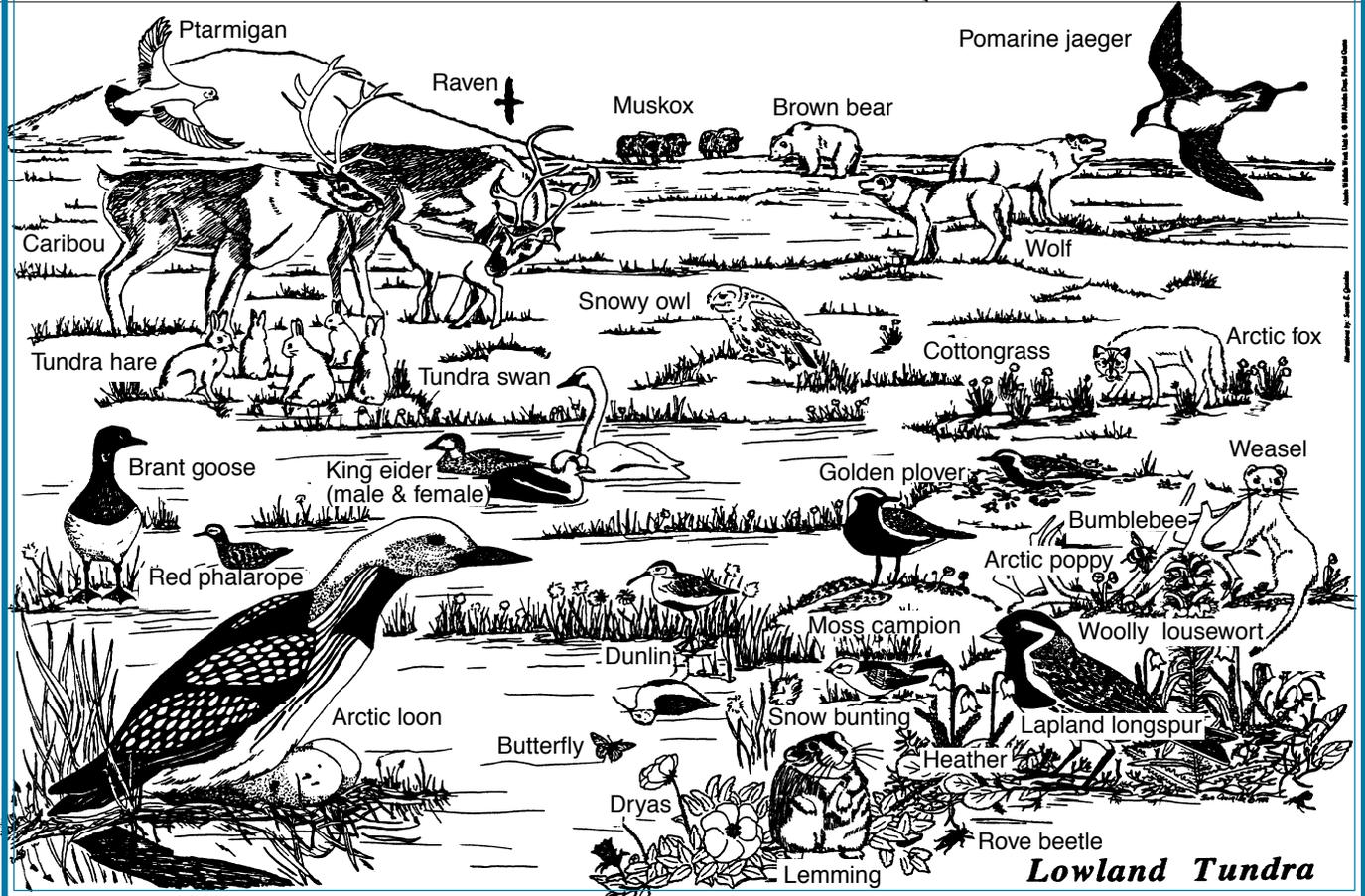
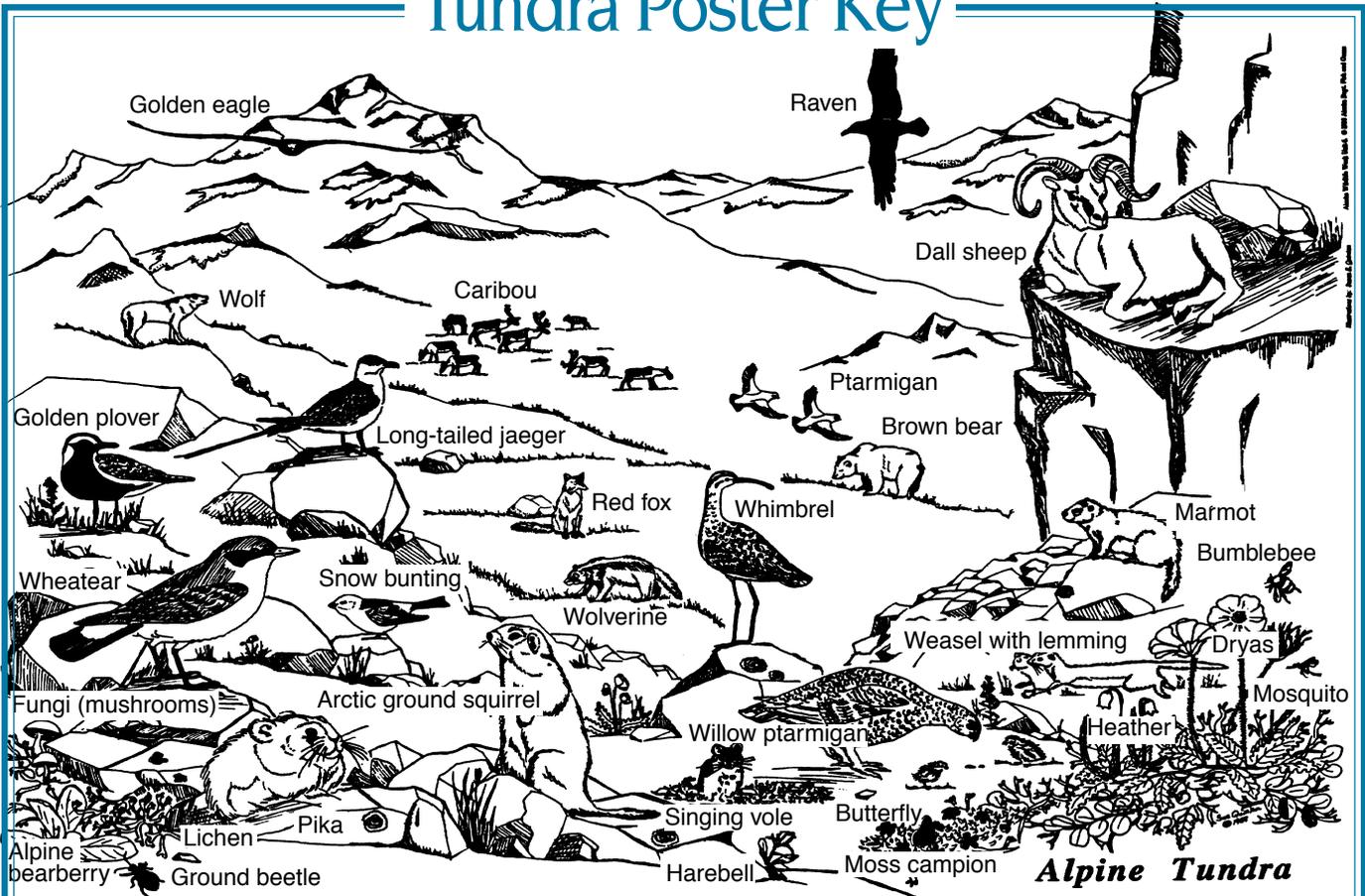




Lowland Tundra



Tundra Poster Key



high-latitude tundra environments prevent plant growth during much of the year: temperatures are too low, and no sunlight is available to conduct photosynthesis.

Summer Growth Surge: The long hours of sunlight present during the summer stimulate plant growth. As an adaptation, high-latitude plants grow more rapidly in order to complete their cycle in the few months available.

The higher the latitude, however, the more moderated the benefit of the extended daylight. Temperatures decrease and lower energy densities of sunlight reach the plants. The most hardy tundra plants, however, are adapted to photosynthesize at low temperatures and low light intensities.



Movement of Air Masses:

Persistent winds are a common feature of most tundra environments. Winds are the movement of air masses from one place to another. Air movement is caused by differences in air density that are in turn caused by differences in air temperature. Cold air is more dense and sinks. Warm air is less dense and rises.

Cold, dense air prevalent in tundra environments constantly attempts to move to warmer, less dense areas. Over arctic tundra, the motion can be driven by large-scale regional weather patterns or something as localized as cold air over the ice pack moving inland after daytime warming has increased the air temperature over the land's surface.

Air movement above alpine tundra generally occurs because cold, dense air at the higher elevation sinks into surrounding lower elevations where the air temperature is warmer. Gusty conditions are common.

Winds Inhibit Tundra Life in Three Ways: This applies to both arctic and alpine tundra environments.

(1) **Cooling.** Life functions are temperature-dependent processes that are impacted by loss of heat to the surrounding environment. Heat loss is counterbalanced by heat absorbed or generated within the organism. Because this balance is dynamic, plants and animals are subject to **windchill** effects instead of simply to ambient temperatures. Windchill creates a lower effective temperature because air moving across a surface removes more heat energy than does still air. The faster the wind speed (up to about 40 miles per hour), the more energy is removed. Persistent winds lower the effective temperature of tundra environments.

(2) **Drying.** Wind increases evaporation and can dry or desiccate leaves and other living tissues. Living cells and tissues of most plants and animals die if dried. Even in tundra areas, where the occurrence and strength of winds are similar to those of mild environments, the cooling and drying effects of wind are intensified because of the absence of trees to block the wind.

(3) **Scouring.** Tissues of most plants, fungi, or other living things are easily damaged by constant scouring of windblown materials. Wind carries particles of dust, ice, and snow that cut and wear down any object in its path. Every winter, anything that sticks up above the snow is soon cut and worn by the abrasion of ice crystals. During the summer, sand and rock particles can cause the same damage to exposed plant life.

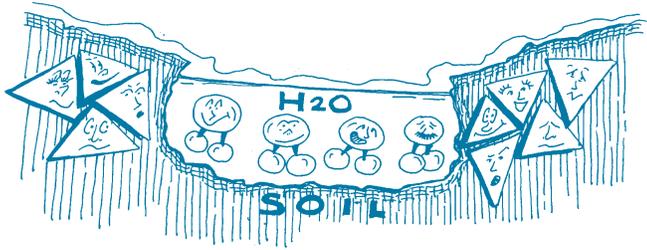
PERMAFROST

Permafrost (perennially frozen ground) is most common in areas with a mean annual soil temperature less than 27°F (−3°C). Locally, on south-facing slopes or in areas of good drainage, no permafrost may exist. Little permafrost exists in alpine tundra. Instead, rock layers near the surface act as barriers to drainage and restrict root systems.

Alaska Distribution: Permafrost occurs under 85 percent of Alaska's surface area. In northern Alaska, permafrost underlies all lowland tundra areas (except large lakes and rivers). In western and southwestern Alaska, and in



the Alaska Range, it is discontinuous (patchy). In the Aleutian Islands and on mountain tops at more southern latitudes, permafrost is absent or rare. Seasonal or nocturnal frost occurs in all tundra soils, however.



When present, permafrost and seasonal frost play an important part in shaping tundra lands and ecosystems. The effects of permafrost in tundra topography are discussed in INSIGHTS Section 2.

Flood Influence: The barrier of frozen ground prevents the downward percolation of water. Flooding is common, especially at spring breakup when meltwater has no where to go and overflows river banks, covering the land.

Permafrost Inhibits Growth: Only a shallow layer of soil thaws each summer, dictating that plant root systems also must be shallow. Permafrost chills even the thawed soil and keeps the root portion of a plant's environment comparatively cold, inhibiting growth or requiring special adaptations [see INSIGHTS Section 3]. Nutrient uptake and gas exchange processes occurring at the roots are slowed by the lower temperatures.

Retards Decomposition: The icy chill also retards the rate of decomposition in the tundra compared to that in more temperate environments, limiting soil building and the recycling of nutrients. Bacteria and fungi, the main **detritivores** in tundra ecosystems, slow down or become **dormant** in freezing temperatures.

Peat Formation: Because of slow decomposition rates, dead organic material accumulates

faster than it can be recycled in lowland tundra ecosystems. Centuries of accumulation of this waterlogged, partially decomposed organic matter form **peat** at a rate of about one meter per 1000 years. Peat bogs are a potential source of nutrients and soil that will remain locked away until a climate change or erosion exposes it.

TUNDRA PRECIPITATION

Life depends on the availability of water in the liquid state. It is an essential requirement for both plant and animal life. The availability of this critical substance in tundra environments can vary dramatically.

Cold Deserts: Tundra regions in the high latitudes have been called “cold deserts” because the amount of precipitation is less than that in many warm region deserts. Subfreezing temperatures lock up much of the water in ice and snow for extended periods. **Desiccation** and dehydration due to lack of adequate water can be important issues in arctic tundra.

Alpine Variations: Precipitation in alpine tundra is usually greater than in arctic tundra, but the rapid runoff caused by rocky substrate and steep mountain slopes gives the two areas similar soil-moisture characteristics.

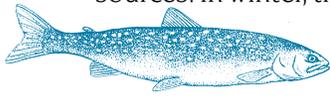
Safety for Birds: If tundra ponds or lakes dry out too early in the summer, birds that chose the safety of islands for nesting will be vulnerable to predation. Similarly, adult waterfowl may have to walk their broods miles to reach adequate water for safe raising of the young. Birds that nest near reliable water bodies have the best chance for successfully reproducing.



Fish Habitat? What looks like a good stream habitat for fish often dries to a beaded necklace of ponds by midsummer. Fish in tundra environ-

Tundra regions in the far north have been called “cold deserts” because the amount of precipitation is less than that in many deserts – less than five inches (12.7 centimeters) per year.





ments are limited to the few all-season reliable water sources. In winter, the oxygen content of a stream can be used up or a lake can freeze to the bottom, both causing fish die-offs.

Snow: Precipitation in both arctic and alpine tundra primarily comes in the form of snow, although its water content is low. Snow has great insulating qualities that help life survive in a severe environment. By its protective drifts or by its abrasive scouring of exposed ridges, snow helps to shape vegetation patterns.

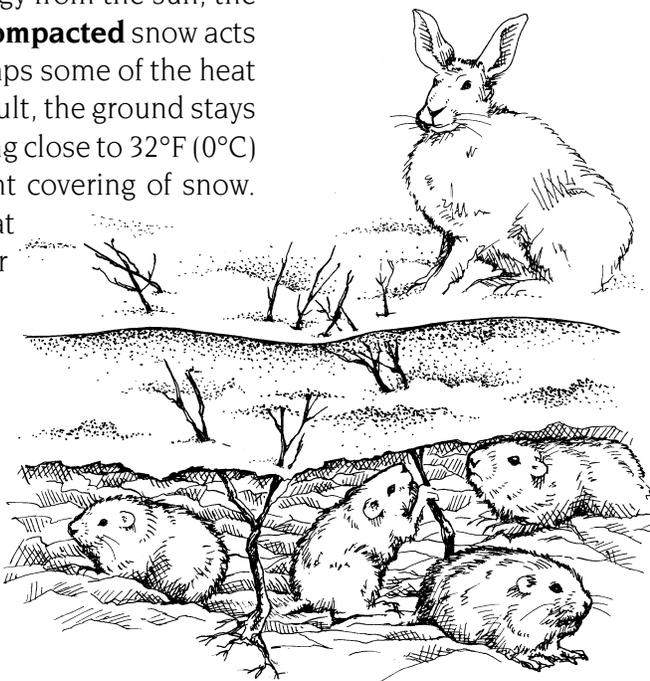
Deep snow cover also significantly reduces the amount of sunlight reaching buried plants in arctic and alpine tundra. In effect, snow cover extends the period of darkness and reduces the time available for photosynthesis (see *INSIGHTS Section 3* for plant adaptations).

Snow Blanket Retains Earth's Heat

Snow is a good **insulator** because air is trapped in between **snow crystals**. The trapped **air**, a poor **conductor of heat energy**, insulates the ground from winter temperatures.

When snow falls in autumn, it covers ground or soil that has stored heat energy over the summer. Without additional input of radiant energy from the sun, the ground cools gradually, but **uncompacted** snow acts as an insulating blanket and traps some of the heat given up by the ground. As a result, the ground stays warmer than winter air, remaining close to 32°F (0°C) – as long as there is a sufficient covering of snow. The ground cools, or gives up heat energy, relatively slowly as winter progresses.

Many tundra animals are **subnivian** and remain active under the snow. Voles, shrews, lemmings, and mice burrow under the snow and dig runways between feeding and resting



sites. Ptarmigan and grouse fold their wings and dive into loose snow for protection from cold and predators.

Some dormant insects rely on the insulating properties of snow to protect them from cold and wind. Insect eggs, cocoons, and adults find shelter under vegetation and in the soil.

Snow Characteristics Change

Snow changes after it falls on the earth. Some changes can be described as **constructive snow metamorphism** or as **compaction** caused by outside impacts. Because these changes affect construction by humans, avalanche danger to humans, and shelters of animals, the study of snow receives attention from scientists and engineers.

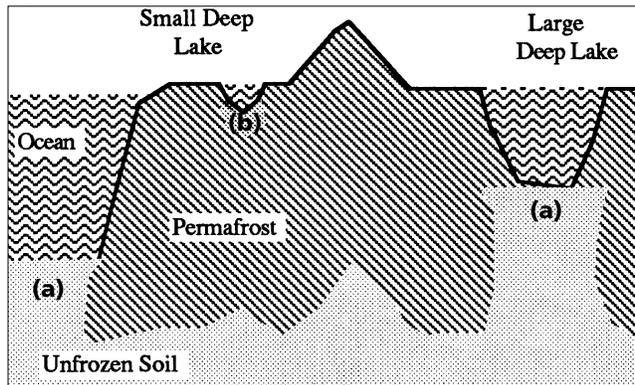
Constructive snow metamorphism includes natural changes in the layers of snow as new snow falls or as temperatures increase or decrease. Compaction by outside impacts includes such effects as animals walking on snow or vehicles driving on snow. The changes in the snow are shown in the way the snow crystal structures are altered, in the volume of water and air in the snow, and in the temperature of the snow.

One measure in the study of fallen snow is the **temperature gradient** of the layers, from the warmer ground level to the exposed surface.

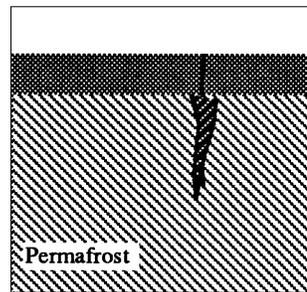
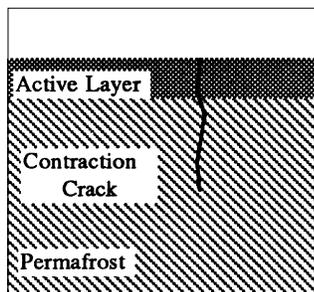
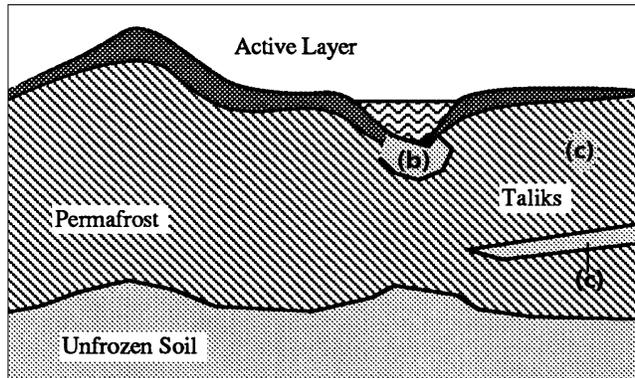
If the snow layer has a steep temperature gradient, snow crystals near the ground lose water vapor through **sublimation** (the water becomes a vapor without going through a liquid stage). Water vapor travels upward



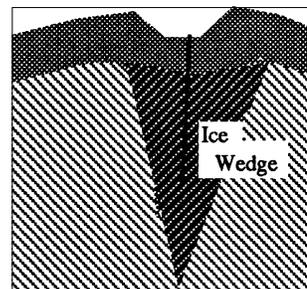
TUNDRA FACTS – PERMAFROST



The occurrence and depth of permafrost is affected by the presence of deep lakes, hills, and the ocean. (a) Permafrost is absent beneath large, deep lakes and most ocean areas. (b) Small, deep lakes are underlain by a bulb of unfrozen soil.



Ice wedges are formed when water drains into a contraction crack in the soil, followed by winter freezing and expansion. The ice wedge grows larger each year, forcing surrounding soil out and upward.



Permafrost

Permafrost is perennially frozen ground or ground in which a temperature less than 32°F (0°C) has existed continuously for two or more years. Permafrost may contain chunks of ice or have little or no ice. The upper surface of permafrost is called the permafrost table. Almost no water can penetrate this table, thus it acts as a barrier to water movement (percolation) through the ground.

Continuous permafrost underlies the tundra of arctic and northwestern Alaska. In these regions, the ground is frozen everywhere except under those lakes and rivers that do not freeze solid in winter. Permafrost can extend to 2240 feet (683 meters) below the soil surface. Below this, heat from the earth's core keeps the ground thawed.

Discontinuous permafrost underlies the tundra and forests of interior and southwestern Alaska. In these regions, the ground is perennially frozen in some places, but is free of permafrost in others. Permafrost may not be present beneath south-facing slopes, at sites where vegetation has been disturbed, and under lakes and rivers.

Active Layer

The **active layer** is the surface layer of soil that thaws and refreezes every year. It usually is underlain by permafrost soil. The depth of the active layer varies from about 12 inches (30 centimeters) to 10 feet (3 meters) depending upon the local climate. Near Barrow, the active layer is about 12 inches (30 centimeters) deep.

Talik

Layers and pockets of unfrozen soil that occur within permafrost soil are called **taliks** – (c) on the adjacent diagram.

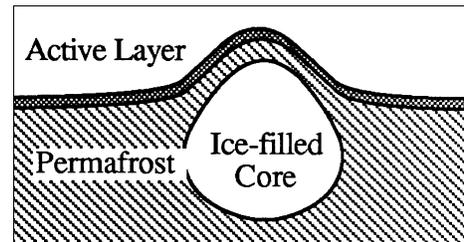
Ice Wedges

Soil contracts or shrinks during periods of intense winter cold. As the soil contracts, cracks form. Often, the cracking makes a loud sound. The winter that it first forms, a contraction crack is small – only 3/8 inch (9-10 millimeters) wide.

During spring snowmelt and summer rains, water flows into the crack and is trapped and frozen by surrounding permafrost. Freezing water expands and forces the surrounding soil upward and outward.

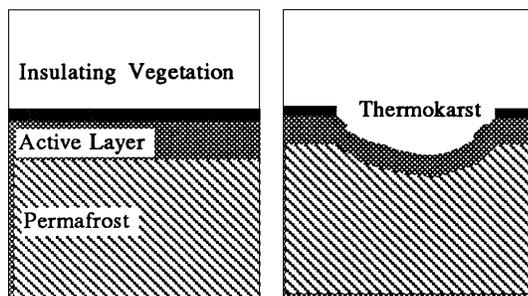
Over many years, the crack gradually enlarges through the freezing and expansion of trapped water and repeated winter cracking. Ice wedges grow to be as much as 33 feet (10 meters) across, and may extend 33 feet (10 meters) below the surface. Some large ice wedges may have taken 1000 years to form. Together, the cracks usually form a polygon (a many-sided geometric shape).

TUNDRA FACTS – PERMAFROST



Thermokarst Dynamics

Water expands as it freezes. Thus, when permafrost melts, the melted water in the soil takes up much less room than it did when frozen. The land slumps into the void, creating a surface depression or **thermokarst**. These thermokarsts may be pits, funnel-shaped sinkholes, valleys, ravines, or, in early stages of melting, caves. Permafrost melts when vegetation is removed (by fire or human activities), the area floods, or the climate warms (see following article: “Ups and Downs of Life on Frozen Ground”).



Thermokarst develops when insulating vegetation is removed.

Pingos

The word “*pingo*” comes from an Inupiaq name for a cone-shaped hill or mound of soil with a core of ice. An average **pingo** is about 100 feet (30 meters) high and 1650 feet (50 meters) in diameter. Pingos occur in areas of both continuous and discontinuous permafrost.

Closed-system pingos are the most common type in tundra areas. They form after drainage or after sedimentation fills in a tundra lake.

The wet soil underlying a deep tundra lake remains unfrozen year-round because the overlying water retains heat and insulates the soil during winter. When a lake is drained, however, or when it fills partially with sediments so that the water is no longer deep, the surface layer of soil on the lake bottom slowly freezes.

This newly frozen surface and the surrounding permafrost trap water in the underlying, but still unfrozen, soil. As permafrost slowly advances around the trapped, unfrozen core, the water in the soil is forced inward by pressure through soil pores.

When the trapped water itself freezes, it expands in the only direction possible – upward. This creates a hill or mound. The size of the pingo depends on the amount of trapped water. Pingos form and grow by as much as 5 feet (1.5 meters) per year, and continue to grow slowly (1 to 1½ feet [0.3-0.5 meters] per year) for thousands of years.

If vegetation on top of a pingo is disturbed or if pressure from the expanding ice cracks the surface soil, the ice core is exposed to air and warm summer temperatures. When the exposed ice melts, the top of the pingo collapses, creating a crater. The crater may or may not contain a lake.



TUNDRA FACTS – PERMAFROST



Polygons

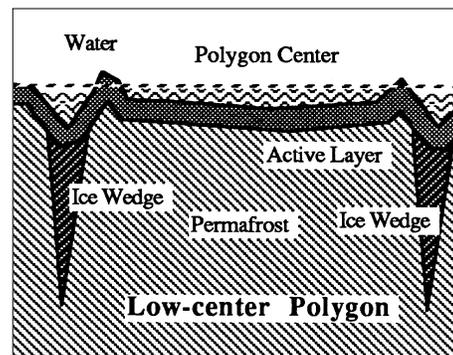
Polygons are a common topographic feature in areas with permafrost and seasonal frost. They are formed by contraction cracks enlarged by ice wedges.

The pressure created by an ice wedge forces the soil around the crack upward to form two small ridges as much as 1 1/2 feet (0.5 meters) tall. This creates a polygonal shape of raised edges, or a low-center polygon.

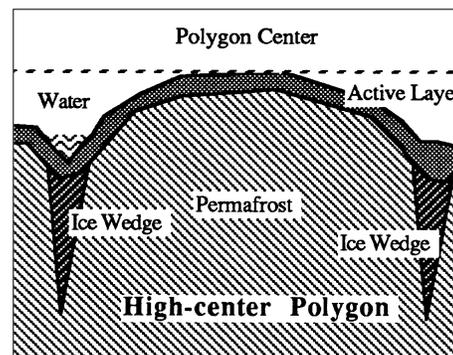
In poorly drained sites, water fills the center of the polygon and the center of the ice-wedge troughs. Collected water efficiently conducts heat from sunlight so it melts underlying permafrost, which causes additional slumping.

As the water-filled troughs and centers enlarge and deepen, they eventually meet to form a small lake. When the lake is drained, or filled in with organic material, a new low-center polygon forms. Over a period of hundreds of years, poorly drained sites gradually cycle between flooded low-center polygons and small lakes.

In well-drained soil, the troughs around a low-center polygon enlarge and sink, while the center remains in place. It appears that the center of the polygon has raised, when actually, the troughs have sunk. The center may be 5 feet (1.5 meters) above the bottom of the troughs. As the thermokarst slumping caused by the growing troughs continues, the mound may eventually collapse, too.



Original Soil Level



Original Soil Level



TUNDRA FACTS – PERMAFROST



Solifluction or Gelifluction

Little water can seep into permafrost soil. Thus, water from rain, melting snow, or melting ice in the surface soil is trapped in the active layer of soil.

On sloping land, the weight of the water-saturated soil causes the active layer to slide, or slump, downhill when thawed in summer. The rate of movement depends on the slope and amount of vegetative cover. Movement can vary from a fraction of an inch per year to an avalanche rush.

Sorted Rock Piles and Frost Boils

In soils containing rocks, the forces created by seasonal freezing and thawing move – and sometimes sort – soil particles. Although the exact processes that cause this are still debated, scientists agree that different rates of freezing and the forces of expansion, contraction, and gravity are involved.

Similarly to the creation of pingos, frost action first pushes noncompressible objects – large particles or stones – to the soil surface. When these formations occur in soil with water-filled, fine-grained soil, the expansion and contraction of this soil tends to move surface stones laterally across the ground. The movements create sorted nets, circles, and polygons rimmed by large- and medium-sized stones with centers of fine silt or clay material.



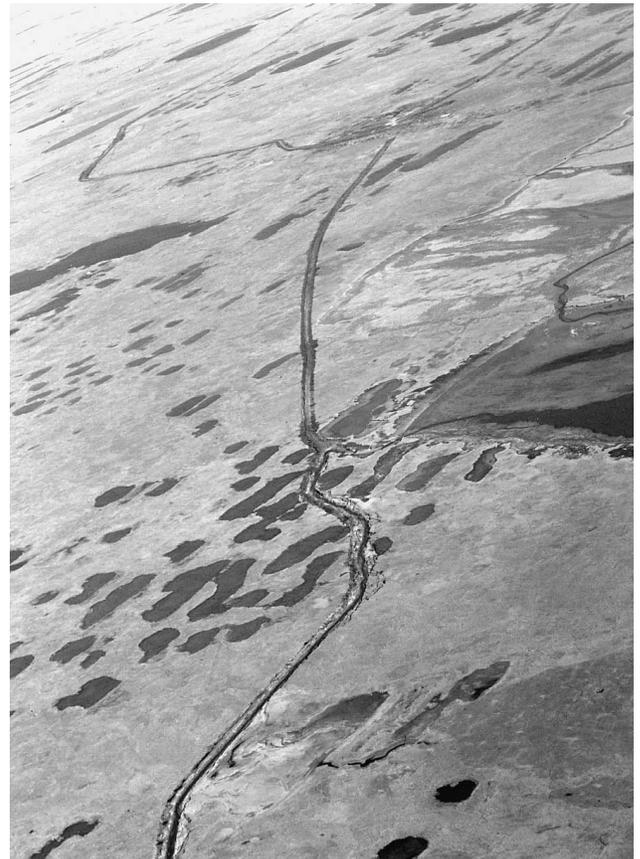


Thermokarst Slumping in Vehicle Tracks

A tracked vehicle left a swath of newly disturbed vegetation and compacted soil as it crossed the tundra (*photograph at left*) at Storkersen Point, northwest of Prudhoe Bay in 1971.



Five years later, this photograph was taken at the same location at Storkersen Point. The tundra disturbed by the tracked vehicle formed thermokarst depressions. Water from surrounding areas now accumulates in the ruts. Note that few plants have colonized the tracks after five years.



This 1971 aerial photograph shows a summer view of a winter road across the tundra near Oliktok Point. Thermokarst formation in the winter road has affected the surrounding tundra by causing drainage of large and small lakes.

The Ups and Downs of Life on Frozen Ground

ALASKA SCIENCE FORUM

June 2, 1999 (Article #1443)

by Ned Rozell

Creeping glaciers, ash-spouting volcanoes, and persistent earthquakes that rearrange the landscape make Alaska an exciting place to live. A less dramatic feature of Alaska's landscape, permafrost, is also changing Alaska as it slowly disappears.

Permafrost, ground that remains frozen all year, forms a foundation for about 85 percent of Alaska. From Barrow to Anchorage, most of the ground beneath our feet contains frozen soil and ice that sits in spaces between soil grains or takes the shape of wedges, lenses, and veins.

North of the Brooks Range, permafrost is generally found everywhere you might sink a drill. Farther south, permafrost is spotty but still plentiful. Alaskans have adapted to the challenge of building on permafrost with clever engineering tricks, but a warmer climate might soon make all our adaptations pointless.

Tom Osterkamp and Vladimir Romanovsky think permafrost might soon be on the minds of all Alaskans, and not just when they drive over waves of asphalt created by melting beneath. Osterkamp, a professor of physics at the Geophysical Institute, and Romanovsky, a research assistant professor here, just wrote a paper on the condition of Alaska's permafrost. The verdict: permafrost south of the Yukon River is quite near the thawing point, and, without a dramatic turn in climate, Alaskans are in for a messy transition.

For more than 20 years, Osterkamp has checked the temperature of permafrost using holes drilled in the ground on a transect paralleling the trans-Alaska pipeline. These "permafrost observatories" are also located in Anchorage, Barrow, Bethel, Bettles, Kaktovik, Nome, Kotzebue, Healy, and Eagle. The holes are from 100 feet to 200 feet deep, and with them Osterkamp and Romanovsky have been able to track the fate of permafrost for the last two decades.

Most permafrost south of the Yukon River is within two degrees Celsius of thawing. If a warming trend that began in the winter of 1976 – 1977 continues, the permafrost will melt. While getting the ice out of the soil may seem like a welcome relief to those who build roads, houses, bridges, and pipelines, it will be a bad thing for the thousands of people who now live on houses above permafrost and use roads, bridges, and pipelines built over permafrost.

Air temperatures in Fairbanks have increased 1.5 degrees Celsius in the last 20 years. During the same period, Bettles warmed by 1.4 degrees Celsius and Gulkana by 1.3 degrees Celsius. If the increase is consistent for the next 20 years, Alaskans are going to notice a dramatic difference in the world around us. Roads will slump, floors will slant, and huge sinkholes will appear in forests, swallowing trees and creating new lakes.

"The transition period will create whole new ecosystems," Romanovsky said. "It's a disaster for us, but not for nature."

And who's to blame for melting permafrost? Is it the species building the houses, roads, and pipelines? That's the big question—are humans causing global warming, or is the warming we've seen in Alaska since the 1970s a natural variation, one that could quickly reverse itself and preserve all this permafrost? Maybe the warming is a quirk of nature unaffected by man. Maybe not. All we know now is that one of Alaska's most visible signs of climate change is thawing right under our feet.

Science Forum articles are a public service of the Geophysical Institute, University of Alaska Fairbanks, in cooperation with the UAF research community. Ned Rozell is a science writer at the institute.

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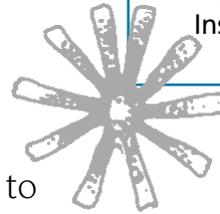
Life Forms and their Tundra Adaptations



There are five life forms or kingdoms (highest biological classification) in the tundra as well as in the world. These range from the most familiar – plants and animals (including humans) – to the lesser known and seldom noticed fungi and microscopic monerans and protists.

- Five Kingdoms of Tundra Life
 - Monerans
 - Protists
 - Fungi
 - Plants
 - Animals
- Tundra Adaptations
 - Migration
 - Shelter
 - Food
 - Size and Shape
 - Fur, Feathers, and Movement
 - Color
 - Antifreeze
 - Growth the Reproduction
 - Plant Growth
 - Insect Insider Tips

The following pages introduce each of these five biological kingdoms and then highlight **adaptations** by some of their members to not only survive but also to thrive in the harsh tundra environment.



Tundra life forms have adapted to their harsh environments with physical, physiological, and behavioral traits not needed by others of their kind living elsewhere. Adaptations occur slowly over thousands of years. The traits that are kept are those of individuals that produce the most offspring. In *Alaska's Tundra and Wildlife*, the focus is on adaptations for cold environments.



Migration

Migration is an adaptation for avoiding the worst and enjoying the best of tundra environments.

Many birds, mammals, and fish enjoy the summer riches of the tundra and then avoid the winter by migrating to milder locations. The seasonal movements of large numbers of animals into and out of tundra environments are among the most spectacular natural events in the world.

Each spring, huge flocks of shorebirds and waterfowl rush toward the tundra. Areas with no visible life suddenly come alive with the movements and calls of arriving migrants. As soon as enough snow melts, these birds spread over the tundra in low densities to nest. When they and their young gather before hurrying south, the surprising productivity of the tundra is once again revealed.

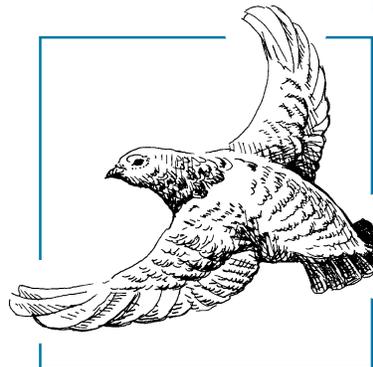
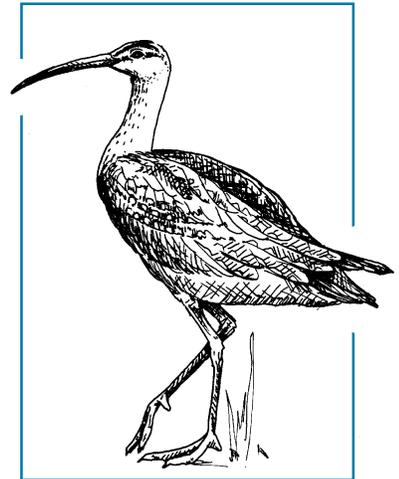
The gathering places of migrants, called *staging areas*, are fixed locations where food is abundant so the migrants can fuel up for their long travels. Some migrant birds nearly double their weight with layers of fat before leaving.

Many birds travel thousands of miles to wintering areas in Central and South America or Polynesia. Some birds such as ptarmigan migrate relatively short distances. They move south out of arctic tundra areas and down slope from high alpine areas to low alpine or forested areas in the interior of Alaska.

The migration of caribou between tundra areas and **taiga** or forest environments is one of the best known examples of migration by mammals. Caribou come to the tundra to give birth to their calves just as the tundra plants become most nutritious.

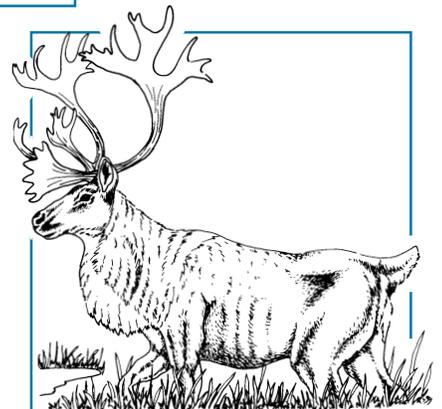
Many tundra fish also migrate. In fall, they move into places where the water will not freeze solidly. Deep lakes, deep channels in large rivers, and spring-fed streams are important winter habitats for tundra fish.

Whimbrels nest in tundra but migrate to spend the winter on the Pacific coast from California to Chile. Most shorebirds migrate thousands of miles to return to the tundra from southern wintering areas.

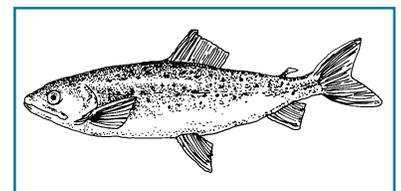


Ptarmigan migrate out of the northernmost tundra regions to winter in the low alpine tundra and forests of central Alaska.

Caribou migrate out of tundra areas to winter in taiga and forests.



Tundra fish, such as arctic char, migrate to places where some water remains liquid throughout winter.



Shelter

Because they find shelter from the severe winds and cold, many living things remain on the tundra year-round.

The small mammals, insects, and plants living in the tundra cannot migrate to distant places to avoid the severe winter conditions. Their adaptive strategy is to remain beneath the snow, near the ground. Lemmings, for example, tend to live together in areas where the snowpack is deepest and least dense. This type of snow shelters them from the wind and offers some protection from the cold of winter. In contrast, dense, wind-packed snow is a poor insulator and provides only limited protection from the cold.

Some animals, such as the arctic ground squirrel, move underground for winter. Soil, like snow, provides insulation against the cold and wind. Many plants have a similar adaptation: their above-ground parts die back each winter, while their main growth and energy storage is in their underground roots, sheltered by soil and snow.

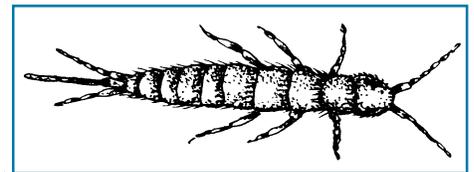
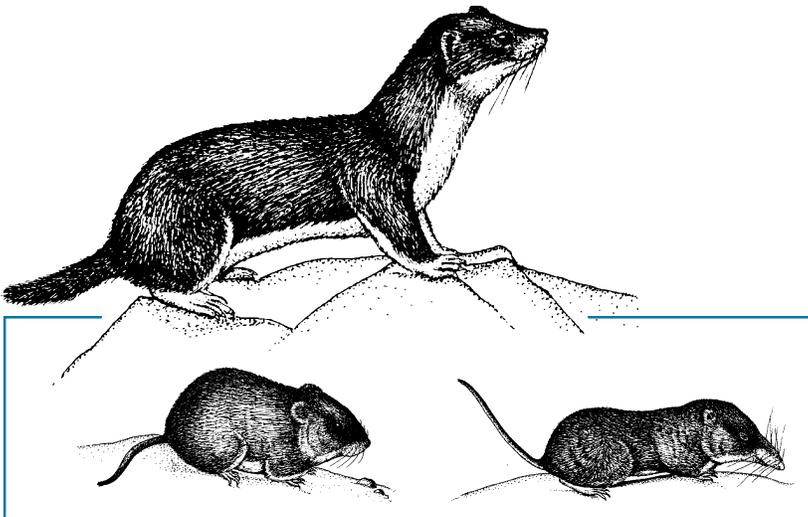
The cool temperatures and strong winds of tundra summers also call for special adaptations. The answer for many is to live close to the ground. Just place your hand on the ground to feel the advantage – it's WARM! Due to friction, the wind speed within 2 inches (5 centimeter) above the ground is slower. The

air is also warmer near the ground than higher above it because soil absorbs and radiates heat from the sun into the air.

Tundra plants typically are small and grow in flattened, cushionlike forms. Many tundra insects live their entire lives in the shelter of ground plants, thus avoiding the most severe cold and wind. Wingless forms of many insect groups are the most common in tundra environments. Arctic ground squirrels and brown bears dig their underground dens on south-facing slopes that will be the first to warm in spring.



Air temperatures are warmer and winds are slower near the ground's surface. Many tundra plants, such as moss campion, grow in low, flat mats or cushions to take advantage of these milder conditions.



Wingless insects are common in tundra environments. They spend their entire lives in the shelter of soil, mosses, or other plants.

Lemmings, voles, shrews, weasels, arctic ground squirrels, insects, and most plants survive the winter winds and cold by living beneath the snow. Temperatures under a blanket of deep, soft snow are usually 20°F (7°C) warmer than the air temperature above the snow.



Scarcity of food in winter prompts a range of adaptations from dormancy and hibernation to stocking up.

Sheltering near or under the ground is only half the survival mechanism for some tundra life that stays year-round. Plants, insects, and microscopic organisms simply cease functioning during the tundra winter. They stop moving, growing, and breathing during the winter, so they have no need for food. Birds, mammals, and fish, however, cannot survive unless they continue to breathe, thus they cannot become **dormant**.

Some animals survive by reducing their functions to the minimum needed for survival. Arctic ground squirrels and marmots **hibernate**. During winter, an arctic ground squirrel's heart beat slows from 200-400 beats per minute to 7-10 beats per minute; its body temperature lowers from 97° to 62°F (36° to 17°C); and it breathes only three times each minute instead of 60 times. While hibernating, a ground squirrel uses 98 percent less energy than while awake.

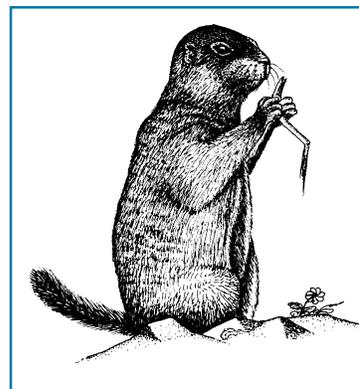
Brown bears survive winter in a modified hibernation. Their heart rate slows from 50 or 60 beats per minute to 20 beats, but their body temperature is not reduced.



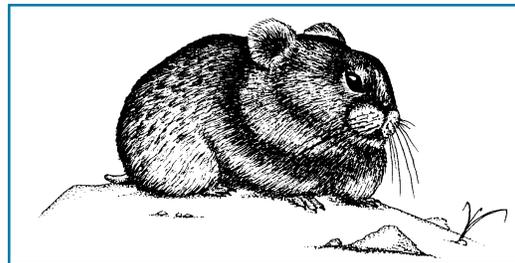
Brown bears eat only during four to five months of the year. Some lose up to 60 percent of their body weight during winter when they must live off the energy stored in their fat.

Arctic ground squirrels, marmots, and brown bears must eat enough food in four months of summer to maintain their body functions during eight months of sleep. They store this needed energy as layers of fat. In tundra habitat, a brown bear weighing 300 pounds (136 kilograms) in fall emerges from its den in spring weighing less than 200 pounds (91 kilograms) because it used its fat – energy reserves – while in its den.

Other tundra animals, lemmings for example, remain active and even raise young during winter. They survive by feeding on the energy-rich buds, stem bases, and **rhizomes** of dormant plants. Pikas and singing voles remain active during winter and survive by eating food they cached for winter use. During summer, pikas busily gather and dry grasses in the sun, then store the hay near their nests. Singing voles build large piles of grasses and other plants for winter food.



Humans may die if their body temperature drops below 90°F (32°C) for even a short time; arctic ground squirrels, however, lower their normal 97°F (36°C) body temperature to only 62°F (17°C) during hibernation. This greatly reduces their need for energy.



Pikas cut grasses and other plants, dry them in the sun during summer, and store the dried hay underground as a winter food supply.

TUNDRA ADAPTATIONS

Size and Shape

Large size and short appendages are adaptations that help tundra animals keep warm. “Small” works best for plants.

Many tundra birds and mammals are larger and have smaller appendages than do similar species living in warmer environments. Tundra hares, for example, are among the largest hares and have shorter ears and legs than do desert hares (called jackrabbits).

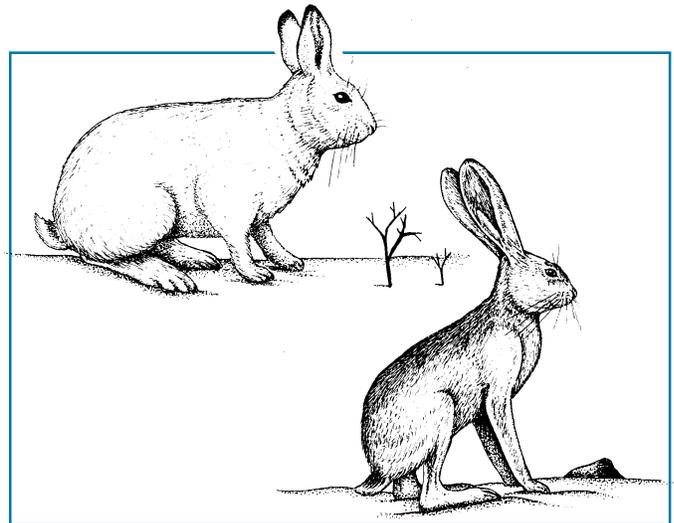
Similarly, arctic foxes have shorter ears than do desert kit foxes. Even lemmings are larger and have smaller ears and tails than do most other mouselike animals. Large body size and short appendages are adaptations that reduce heat loss and resist the cold.

The amount of heat loss increases as the ratio of exposed surface area to body weight increases. Because small animals have more surface relative to their weight than do large animals, they lose heat more quickly. An animal with long legs, ears, or a tail has more surface area than does an animal of the same size that has shorter appendages.

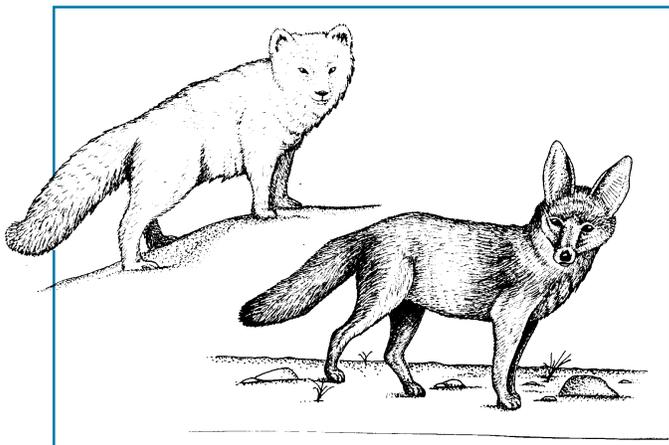
Small size, however, can also be an adaptation for survival on the tundra. Why? A small organism can survive on less food than can a large organism of the same species. Very small organisms can live under the

snow and avoid the most severe conditions of winter. Shrews, the smallest of all mammals, thrive in the tundra.

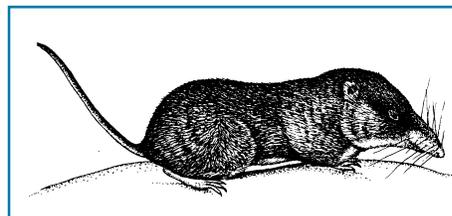
Tundra plants are often dwarf relatives of similar plants from milder climates. Short plants can better avoid drying and abrasive winds and stay warmer in the near-ground microclimate. Their small flowers save energy.



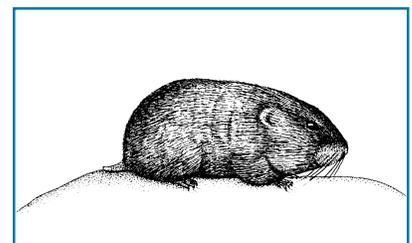
Tundra hares are larger and have shorter ears than hares that live in hot environments.



Arctic foxes have shorter ears than desert kit foxes.



Small animals such as shrews are able to keep warm on the tundra despite their small size, in part because they can live under the snow.



Lemmings are large and have smaller ears and tails than most other mouselike animals.

TUNDRA ADAPTATIONS

Fur, Feathers, and Movement

Most tundra organisms have insulation to help them stay warm.

Feathers and fur are the most obvious adaptations for life in a cold environment. Most tundra birds and mammals actually wear two coats. Their outer coats are made of tough, coarse, water-repellent feathers or guard hairs. Their inner coats are soft, fluffy feathers or hairs that trap air. Even at temperatures of -29°F (-34°C), ptarmigan can keep their body temperatures at 104°F (40°C) without increasing their respiration rate. Caribou and muskoxen have hollow hairs that are fatter at the tip than at the base. This shape helps trap a layer of air next to the body. Trapped air provides excellent insulation.

Even tundra bumblebees wear an insulating coat of dense body hairs that slows heat loss. They “shiver” their flight muscles to generate heat, which is temporarily trapped within their velvet coats. They can keep their body temperatures $68 - 86^{\circ}\text{F}$ ($37 - 47^{\circ}\text{C}$) above air temperatures, allowing them to be active at colder temperatures when the other cold-blooded insects are grounded. The chemical reactions necessary for movement need heat.

Many tundra plants also wear adaptive coats – furry and waxy coatings on their leaves and stems. Fine hair or fuzz slows the wind, thus reducing drying and preserving heat. Dense hairs around the flowers of the woolly lousewort also act like the glass of a greenhouse – trapping solar energy. This surrounds the flowers with relatively warm air, sometimes 34°F (18°C) warmer than the environment. This is important because cell division, necessary for seeds to form, cannot occur at cold temperatures.

The waxy coating of many plants also reduces water loss and evaporative cooling by the wind. Many tundra plants retain, rather than shed, their dead

leaves each year. The dead leaves insulate fragile new buds from the wind and cold. Grass tussocks provide a good example of this.

Woolly lousewort, a tundra plant, is covered with hairs that help block the wind and trap warm air around its leaves and flowers.



Ptarmigan, whose feathery coats cover even their feet, have the best insulation of any tundra bird.



Tundra bumblebees have dense, velvet-like hair that helps them keep the heat they generate when they move their wing muscles.



A double coat of dense hair helps muskoxen stay warm even when the air temperature is -40°F (-40°C).



Tundra organisms use color to increase heat absorption or to hide from predators.

Dark colors absorb solar energy, and light colors reflect it. One would expect that, to take advantage of summer sunlight, organisms living in cold tundra environments would be darker than organisms living in warmer environments. However, dark objects also radiate and lose heat more rapidly than do light objects, therefore during winter, some organisms reduce heat loss with white coloration.

Many of the tundra's summer flowers are purple or blue because these colors absorb more heat than do white or light yellow. Indeed, the percentage of dark-colored flowers is greater in the tundra than in warmer environments. Certain tundra insects, active in the summer, are darker than related species occurring in warmer habitats.

The value of a dark color can be increased by an organism's behavior. For example, many butterflies bask in the sun with their dark wings spread wide to absorb heat.

Surprisingly, the light coloration of yellow arctic poppies and other flowers is also an adaptation to the cold environment. The flowers of these plants are **heliotropic**; they turn to face the sun. The shapes of the light-colored petals reflect sunlight toward the flower center where the seeds are produced. Several kinds of insects bask in the centers of these heliotrophic flowers and benefit from the focused solar heat.

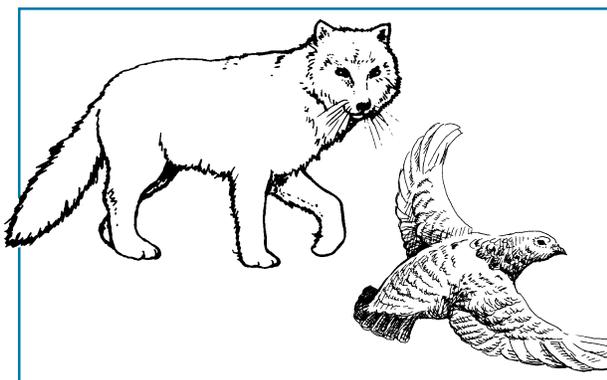
For survival, sometime protection or hunting success is more important than heat absorption. Many arctic animals change colors seasonally to use the advantage of camouflage throughout the year. White fur and feathers hide animals in the snow. White coloration helps collared lemmings, ptarmigan, and snow buntings escape their predators.

Some predators also use color to their advantage. Weasels and arctic foxes change color seasonally, and that helps them sneak up on their prey. Polar bears that den in winter in the coastal areas of the arctic tundra are white year-round because they rely on camouflage for surprise as they hunt on the sea ice.

More tundra plants have blue or purple flowers than do plants in warmer environments because these colors absorb more solar energy.



Most tundra insects are darker than related insects in warmer environments.



Many warm-blooded animals that live in tundra have white fur or feathers during winter for camouflage and to reduce heat loss.

Some tundra organisms make antifreeze.

Humans add antifreeze to water in vehicles to prevent the water from freezing in winter. This antifreeze is ethylene glycol, a fluid that freezes at a temperature lower than the freezing point of water.

Most living things are 70 percent water. When water freezes, it expands as it forms ice crystals. If this occurs in a living organism, cells burst or are damaged. Repeated freezing and thawing are particularly hazardous for living tissue, yet these fluctuations are characteristic of summer temperatures in tundra environments. How do living things survive these conditions?

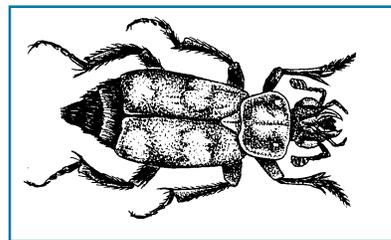
Some organisms overcome this problem by producing chemicals that lower the freezing temperature of cell fluids. These antifreezes prevent the formation of large ice crystals within the cells, even at very low temperatures.

Because of the antifreeze in their blood, wood frogs can survive temperatures of 21°F (-6°C). Most arctic insects produce glycerol, which is an effective antifreeze. If cooled slowly, certain arctic insects can withstand temperatures of -76°F (-60°C). Mosquitoes can survive temperatures down to about -25°F.

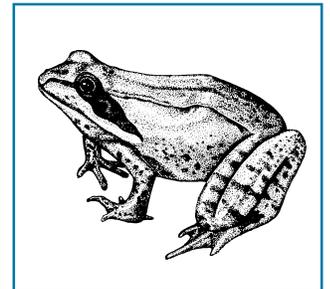
Some tundra fishes also have antifreeze. The Alaska blackfish is able to breathe air through its esophagus in addition to getting oxygen from water through its gills. It can survive temperatures as low as 4°F (-16°C), and some have survived being partially frozen for 45 minutes. Some parts of the fish must remain unfrozen, however, for it to survive.

Plants need antifreeze not only to prevent freezing, but also so that they can make enough food to survive. Because the process of photosynthesis

requires water, many plants cannot function if the temperature is less than 32°F (0°C), the freezing point of water. But air temperatures in tundra environments frequently drop below freezing in spring, fall, and even summer. Many tundra plants, such as the tundra grass, are able to photosynthesize at temperatures of 25°F (-4°C) because they produce antifreeze that keeps their cell fluids liquid even at this low temperature.



Some tundra insects can withstand temperatures of -76°F (-60°C).



Wood frogs can withstand temperatures of 21°F (-6°C).



Many tundra plants, such as the tundra grass, can photosynthesize sugars at temperatures below the freezing point of water because they produce antifreeze.

Growth and Reproduction

Most tundra animals grow slowly and raise young only when conditions are favorable.

Growth and reproduction require food – energy and minerals. Any organism growing faster than it is able to obtain food starves to death. Similarly, an animal that produces young when food or other conditions are unfavorable reduces its own chances for survival as well as the chances for survival of its offspring.

Food availability and weather are variable in tundra environments. Thus, opportunism, or the ability to adjust growth and reproduction according to environmental conditions, is a survival adaptation in tundra environments.

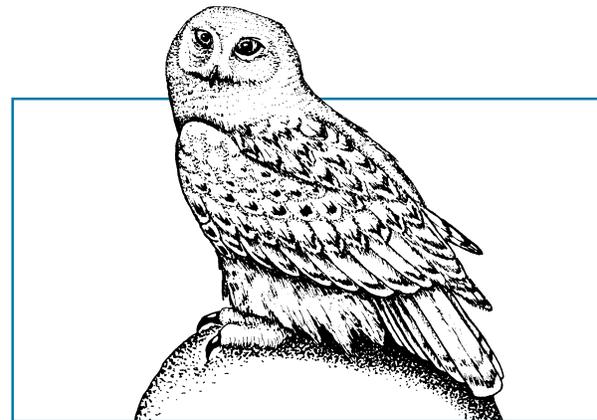
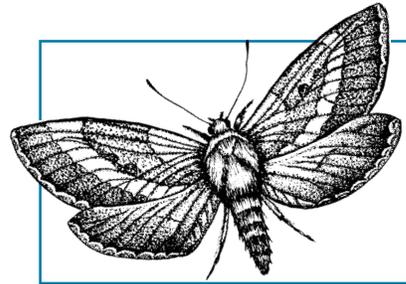
Most cold-blooded tundra organisms grow slowly or not at all when temperatures are too cold. They do not reproduce until they reach a certain size and conditions are favorable. For example, certain arctic moths may require up to 10 years to develop into adults. In milder environments, the same species can reach adult size within two years. Similarly, lake trout in the tundra need 10 years to grow to adulthood, compared with five or six years needed by a lake trout living in nontundra lakes.

Brown bears living in northern tundra of Alaska do not begin breeding until they are eight years old; they give birth to only two young every four years. Compare this to brown bears of southeast and southcentral Alaska – they begin breeding when three or four years old, and give birth to two or three young every three years.

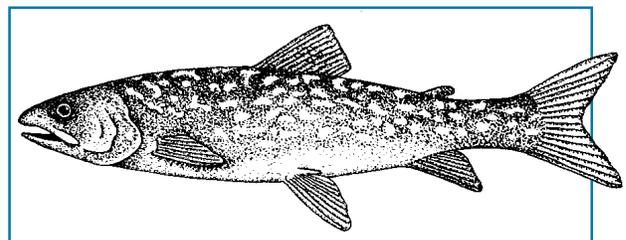
Some migratory birds, including geese, swans, and shorebirds, lay fewer eggs or none at all when winter snows melt late. They save their energy for another year when food will be more plentiful.

Predatory animals such as jaegers, snowy and short-eared owls, rough-legged hawks, arctic foxes, and weasels produce more young in years when lemmings (their main prey) are abundant. When lemmings are scarce, some of their avian predators do not nest.

Most tundra insects grow very slowly. Certain moths live 5 to 10 years before becoming adults.



Predatory birds such as snowy owls do not nest when lemmings (their main prey) are scarce.



Lake trout living in tundra lakes do not reach adult size for about 10 years because of short growing seasons, low temperatures, and scarcity of food.

Tundra producers beat the short growing season with long life cycles.

As with an iceberg, there is more to tundra plants than what you see on the surface. Aerial parts are reduced in favor of root mass in the protective soil. This is also an adaptation used by many desert plants. Tundra plants tend to form clumps or cushions, which create milder microclimates (as much as 20 degrees warmer) to insulate growing tissues and preserve moisture. Keeping their dead leaves is such an adaptation.

Arctic tundra plants can grow at lower temperatures than can similar plants in milder environments. The energy and minerals stored in their large roots allow the plants to start to grow instantly in the spring – even under the snow.

Tundra plants further make up for the short growing season by adopting long life cycles to accomplish reproduction. Many tundra plants grow for 10 years or more before saving enough energy to form flower buds. Even then a plant might form flower buds one year, bloom the next, and make seed a year later.

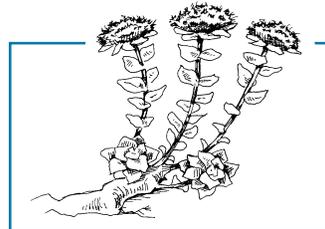
The fragile flower buds develop underground or encased by dead leaves so they are well insulated. When spring comes, the tundra can literally burst into bloom because the flower buds were formed in previous years.

Many plants reproduce by rootstocks or runners instead of, or in addition to, seeds. The tiny plants that sprout from rootstocks are identical to their parent plant. The parent plant nourishes the clone plants until the clones have many leaves of their own.

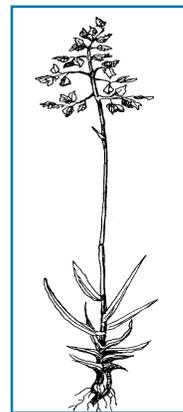
Some plants, such as the alpine poa, produce seeds that germinate and begin to develop while still attached to the parent. This is an advantage, because when the young plants drop from the parent, they

already have tiny leaves and can begin photosynthesis immediately.

Alpine tundra plants can photosynthesize under widely fluctuating temperatures, in brilliant light, and in short periods of daylight. Arctic tundra plants can photosynthesize at low temperatures, at low light intensities, and for long periods of daylight.



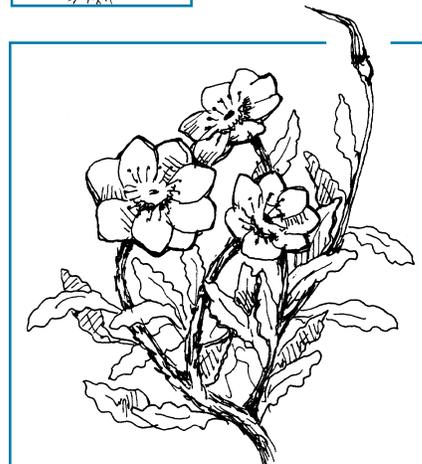
Many tundra plants reproduce by rootstocks or runners.



The seeds of alpine poa germinate and grow while still nourished by the parent plant.



Tundra flowers bloom from buds that are one to two years old.



Most tundra plants are several years or decades old. The age of some woody tundra plants has been estimated at 200 to 300 years, based on counts of their annual rings.

“Cold-blooded” organisms find ways to keep warm, use less energy, and ensure reproductive success.

Cold, short growing seasons, relatively little plant life, and variable day lengths have led to extraordinary adaptations in life span, reproduction, and behavior for tundra invertebrates (earthworms, mites, **springtails**, and flies are the most common).

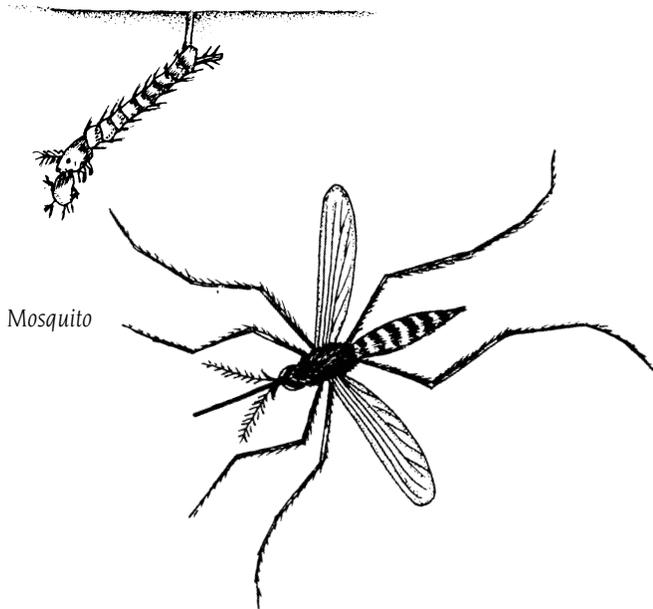
Unlike invertebrate animals in warmer climates, tundra invertebrates live much longer (except for many mosquito species). Tundra invertebrate species tend to have long **larval stages** (sometimes years) and very short adult stages. This life-cycle adaptation is a means of taking advantage of the stage in which the animals live and grow in the protection of the warmer soil layer.

For example, woolly bear caterpillars spend much of their long lives in the larval caterpillar stage before their brief lives as moths. This reduces their energy consumption and their exposure to risks. These big, active caterpillars are clothed in long, rusty orange

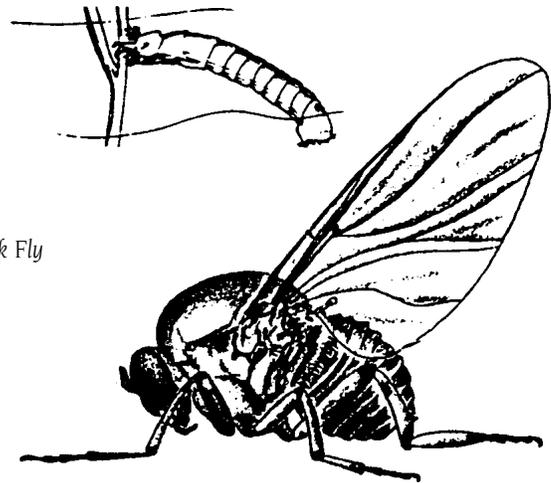
“hairs” for added warmth. The caterpillars can live as long as five years. Like most invertebrates, they are **dormant** in winter and develop only during the short summer.

Many tundra invertebrates have flexible life cycles. Some arctic blackflies develop eggs while they are still **pupae**. When they finally emerge from a stream as flies, their eggs are mature and they need only to mate and lay eggs during the few days of their adult life.

Tundra insects also have behavioral adaptations for surviving on the tundra where just keeping warm requires the majority of their energy. Instead of flying, many tundra insects crawl because the energy cost of flying is so great.



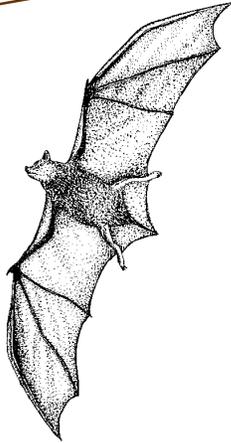
Mosquito



Black Fly



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

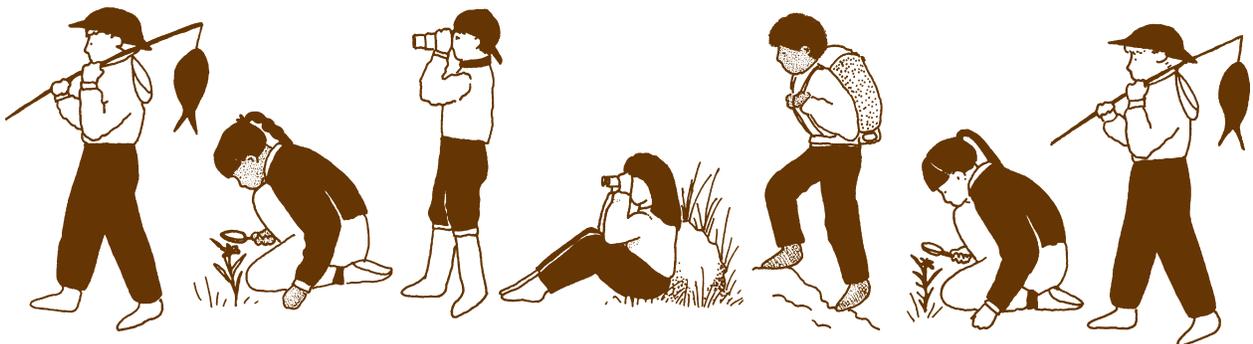
Eaten by: Owls, squirrels

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:

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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.

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Division of Wildlife Conservation

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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

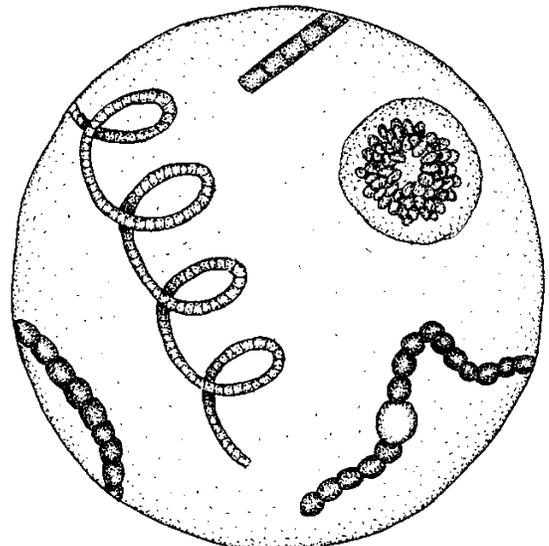
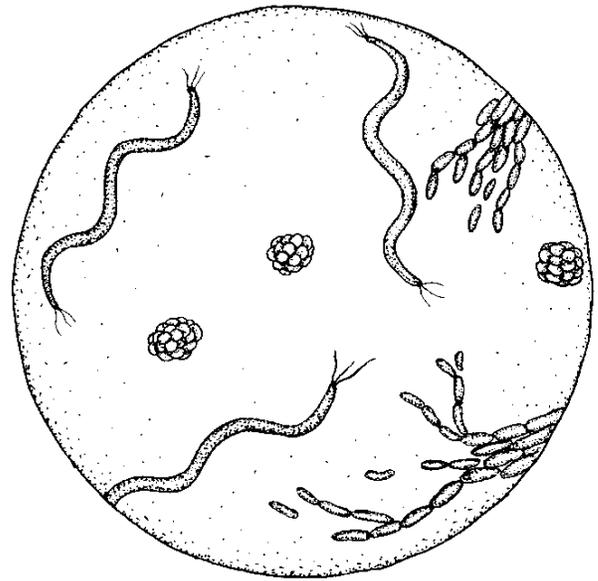
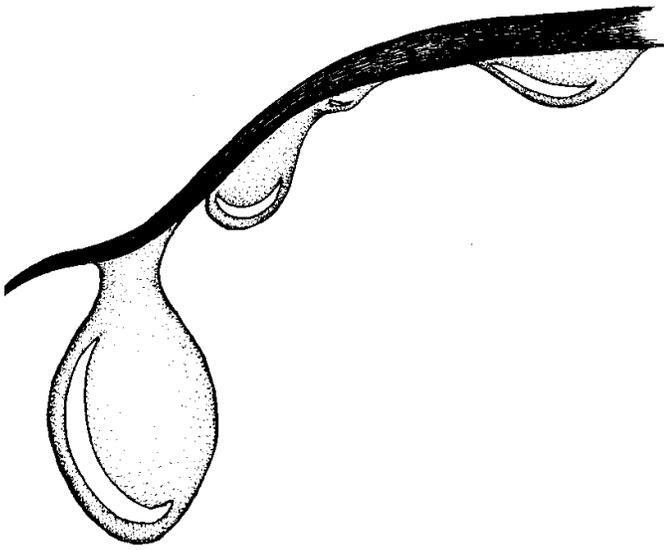
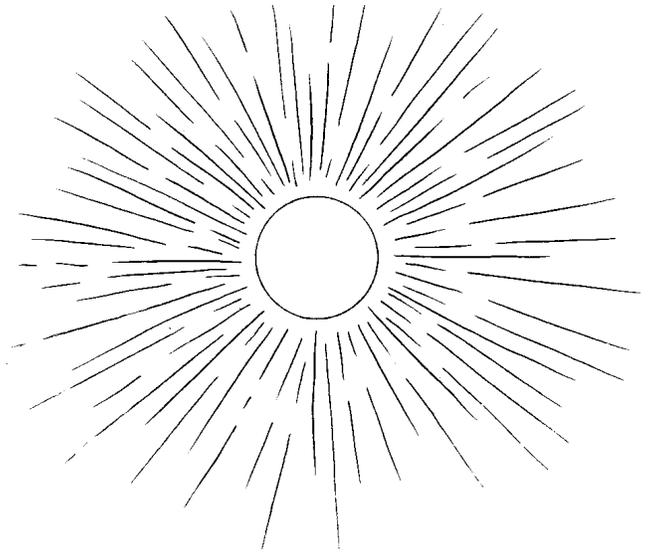
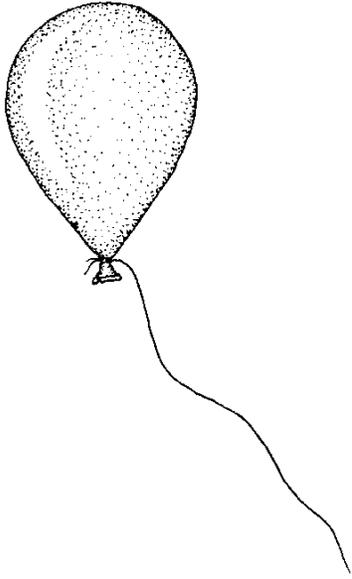
- Anthus spinoletta*
- Bombicilla garrulus*
- Lanius excubitor*
- Family: Emberizidae
- Plectrophenax nivalis*
- Calcarius lapponicus*
- Leucosticte arctoa*
- Carduelis flammea*
- Pinicola enucleator*
- Genus: *Loxia*
- Carduelis pinus*

- 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*

- Onodra 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

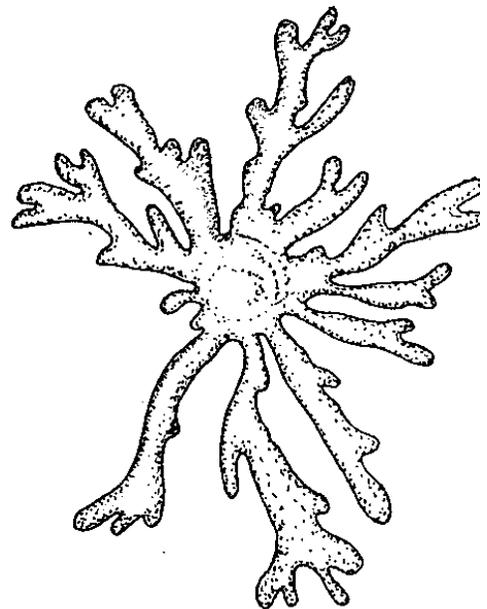
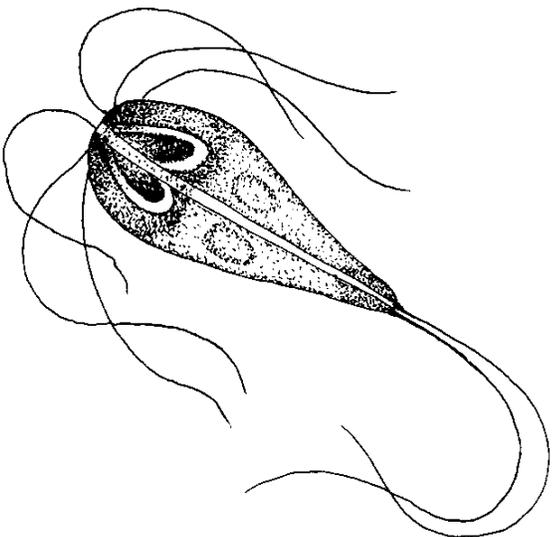
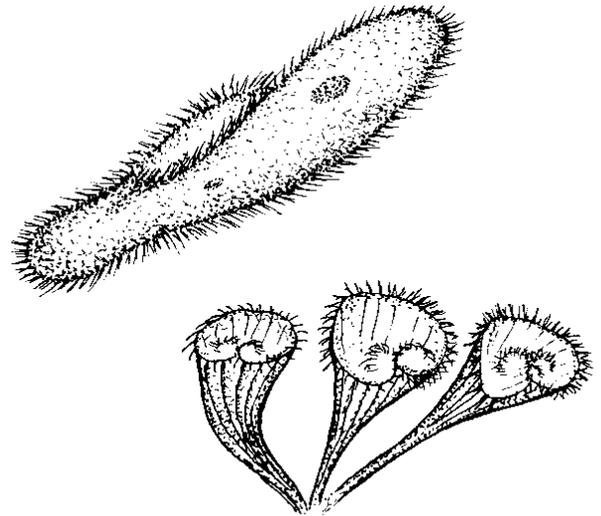
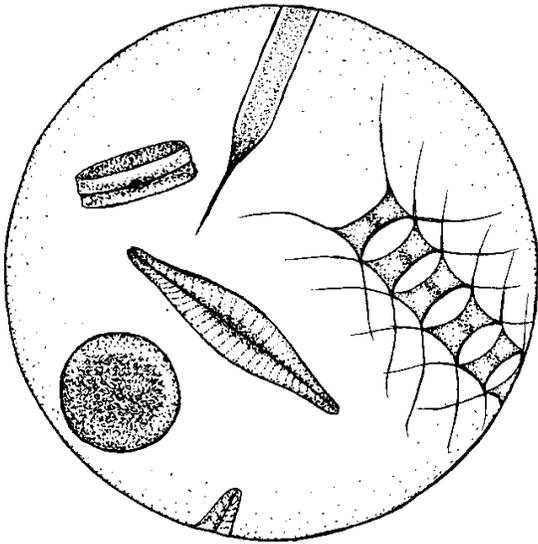
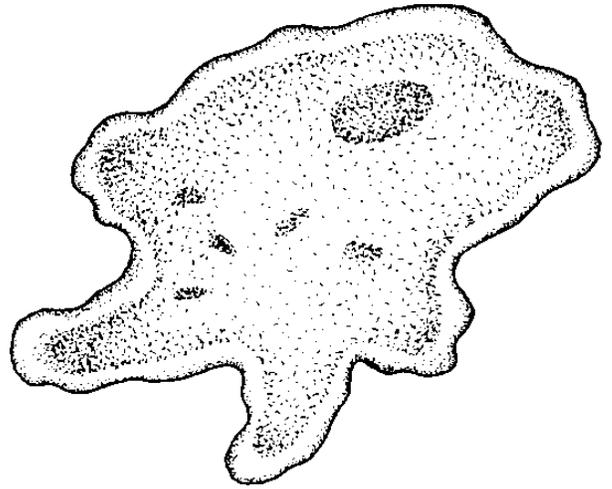
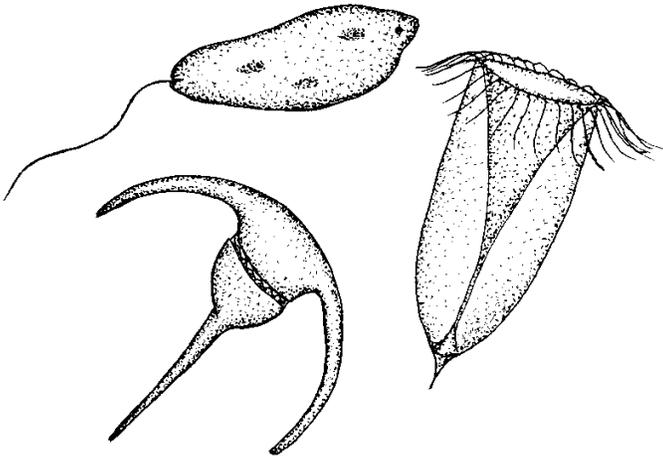
F,T,W

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

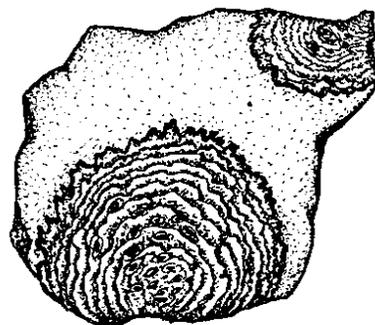
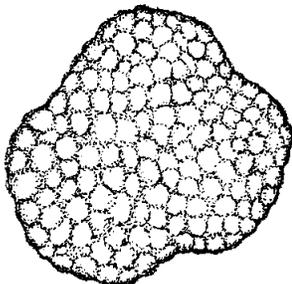
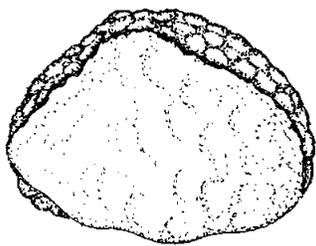
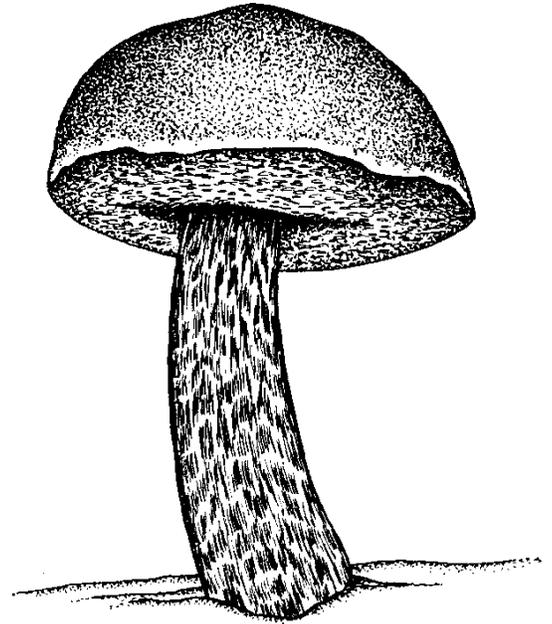
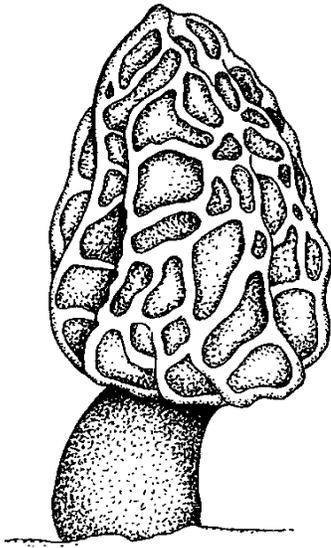
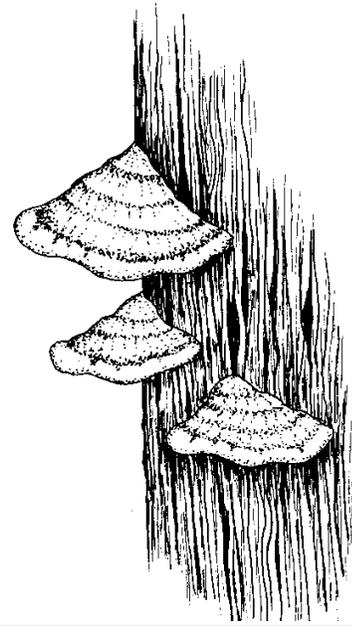
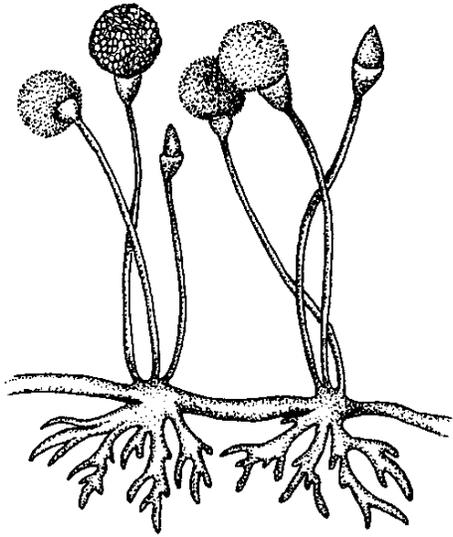
Traits: Microscopic, single-celled organisms (protists) with long, whiplike structures called flagella, which help them move

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

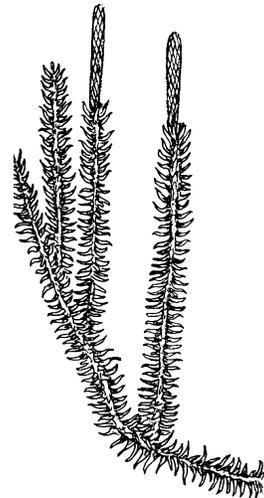
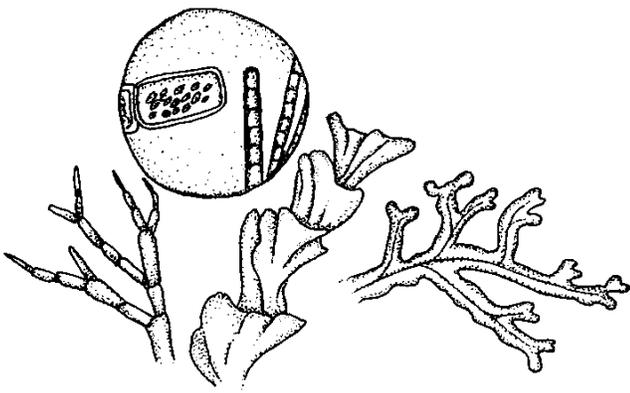
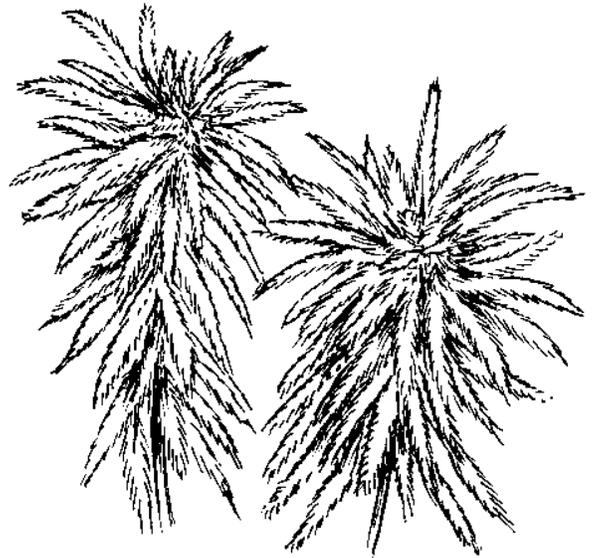
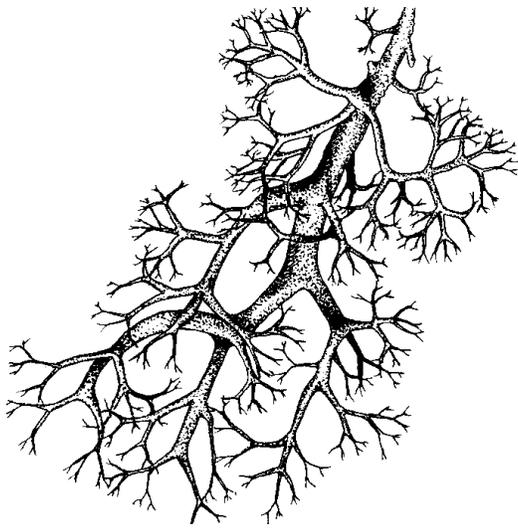
Traits: Fungi that produce underground fruiting bodies that look like spongy balls

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

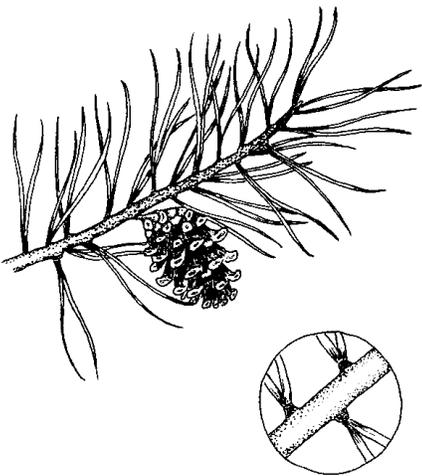
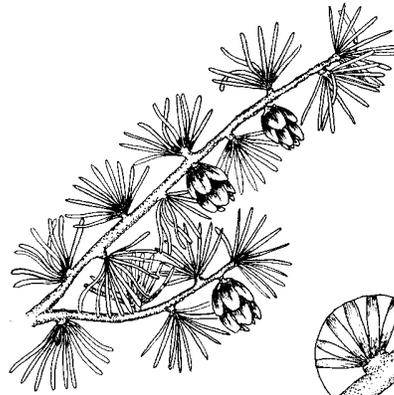
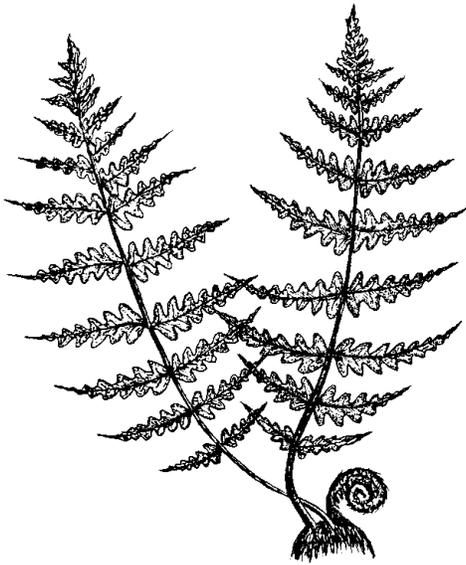
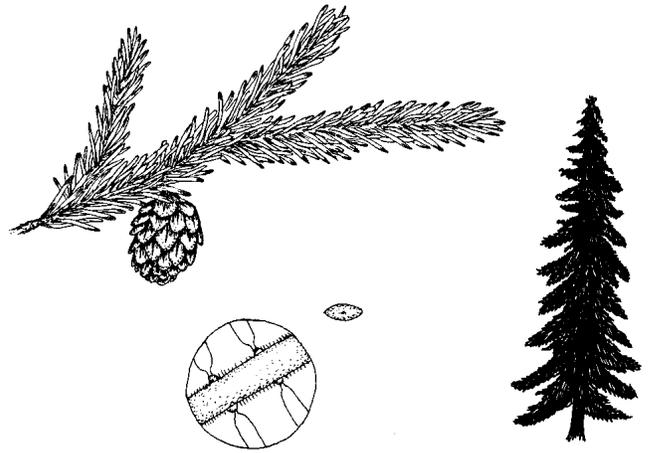
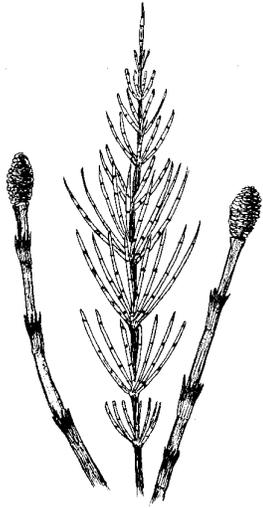
Traits: Green algae are single-celled organisms capable of photosynthesis. They occur individually, in filaments, or in colonies. The cells store food in the form of starch.

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

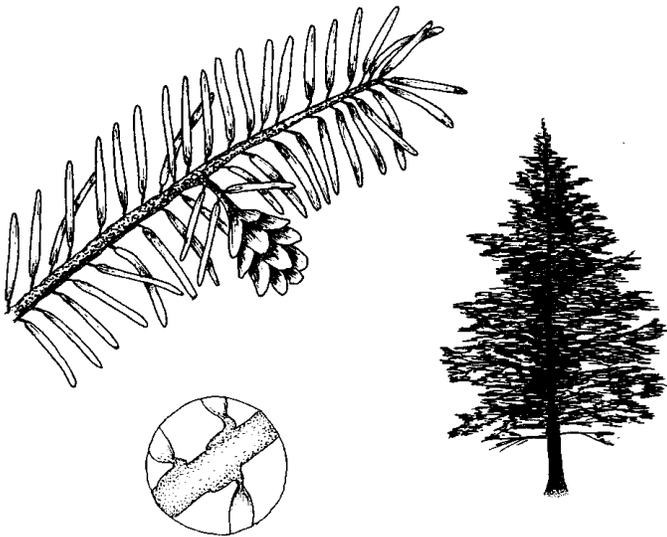
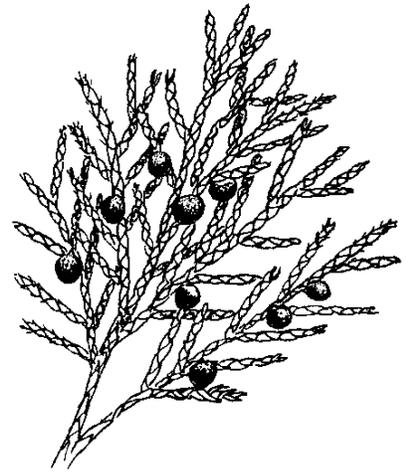
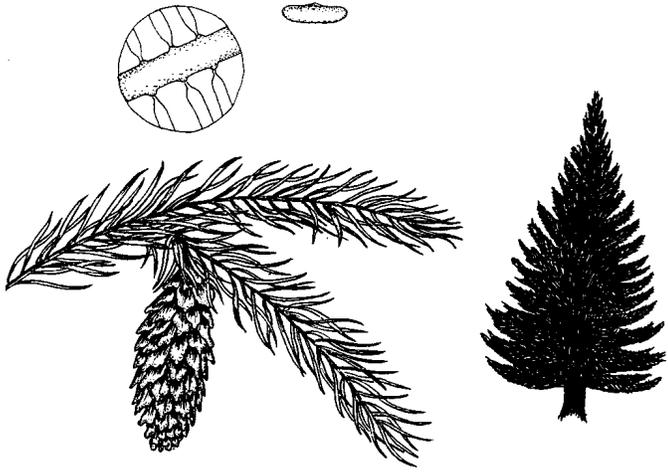
Traits: A low-spreading or scrubby conifer tree that has two needles per bundle; sometimes grows as a shrub in poor soil

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

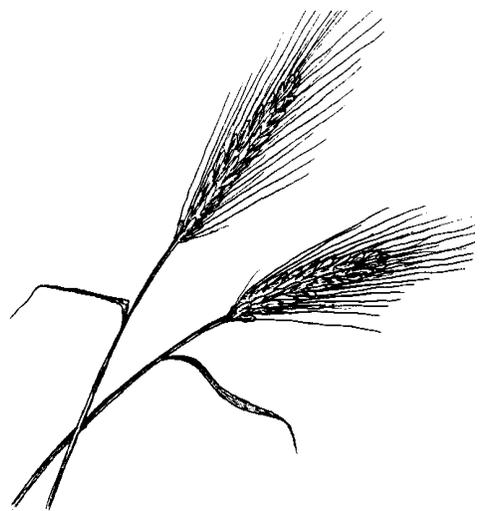
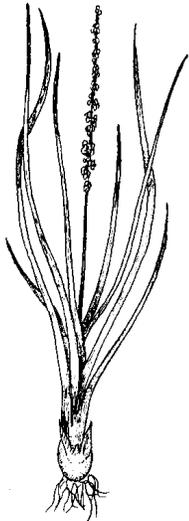
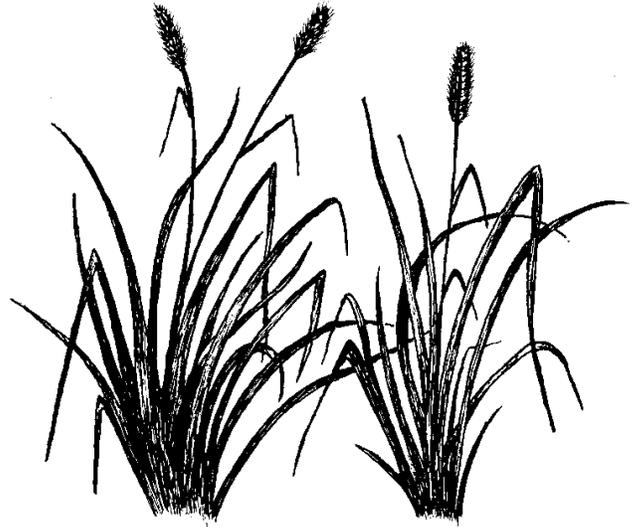
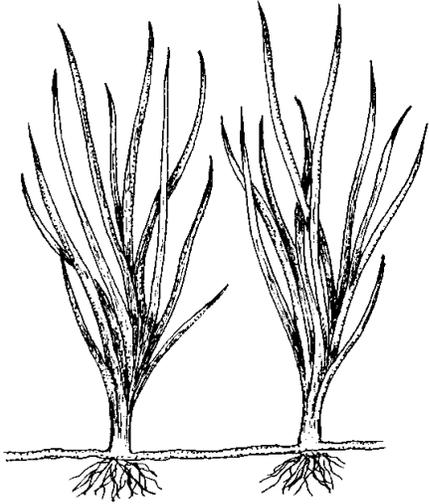
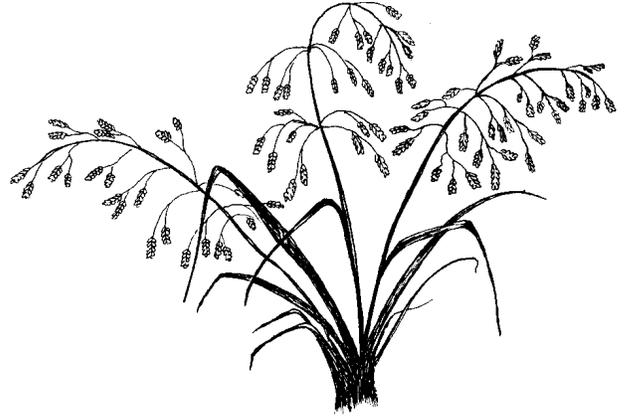
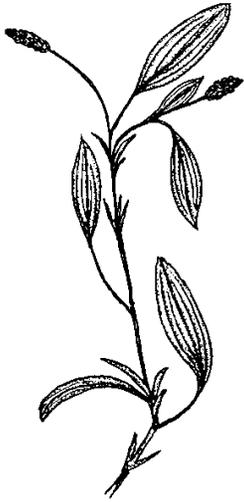
Traits: Conifer tree with rounded, blunt needles; fine hair on twigs; gray to dark brown bark; thin-scaled cones hang down

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

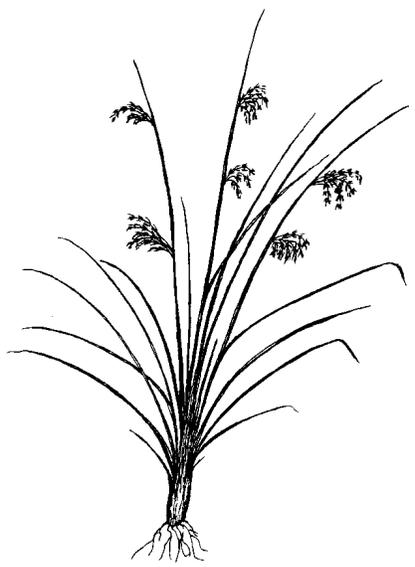
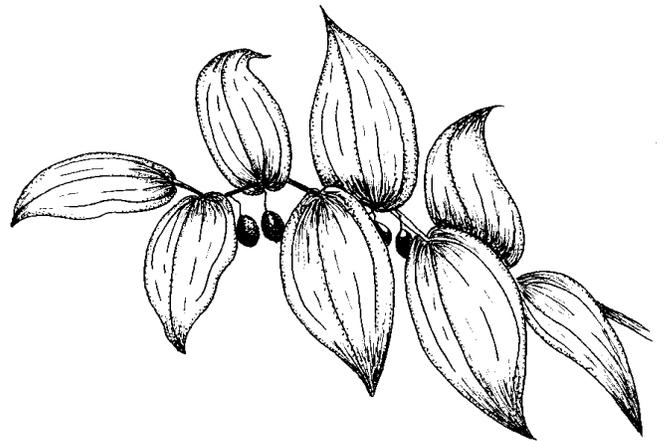
Traits: An emergent, aquatic plant with long, narrow leaves that rise from a horizontal root; the rounded fruits are loosely arranged along the stem. May grow 4 to 35 inches (10-89 cm) tall, but they are usually small. This plant contains small amounts of cyanide.

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

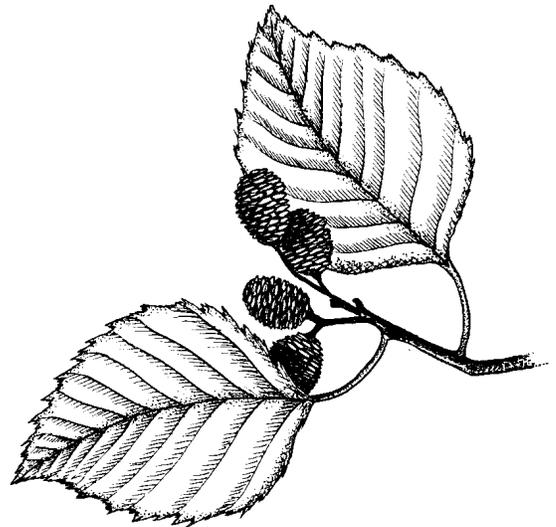
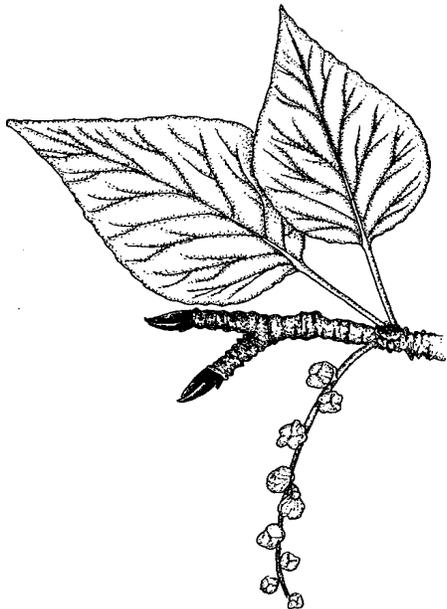
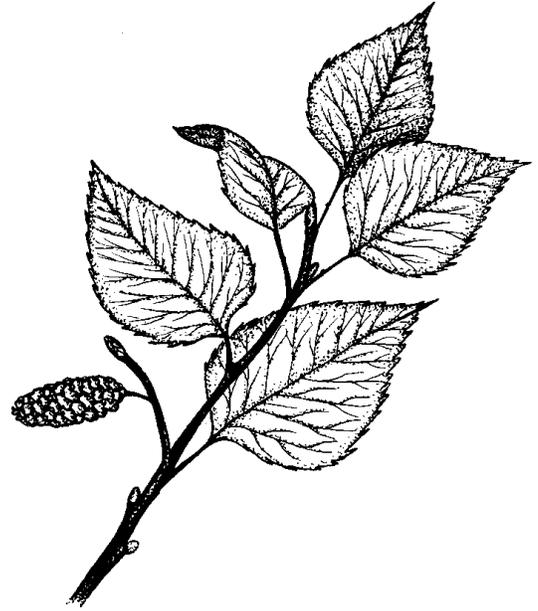
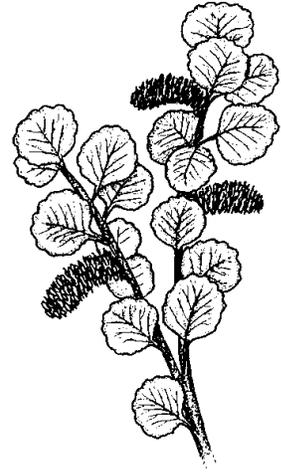
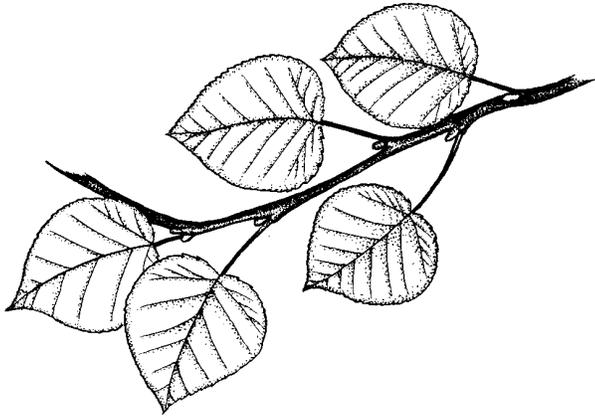
Traits: Emergent, aquatic plants with round leaves that have parallel veins; the tiny flowers have three greenish petals and grow in clusters along the side of the leaves.

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

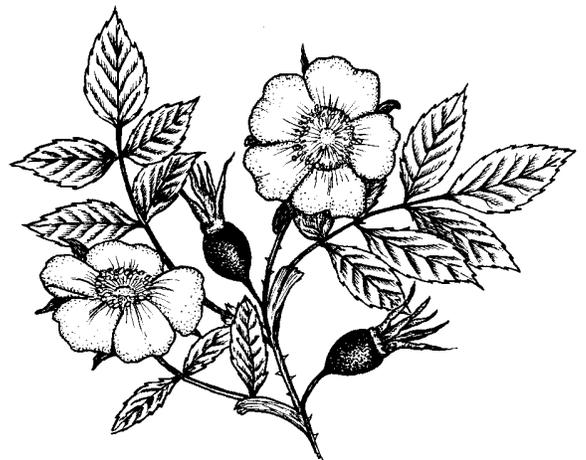
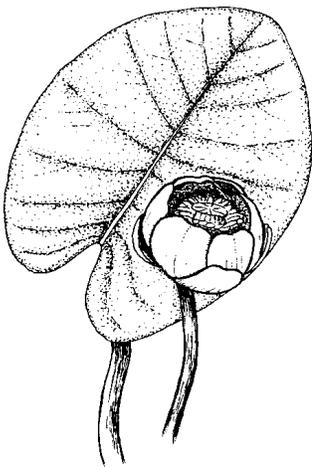
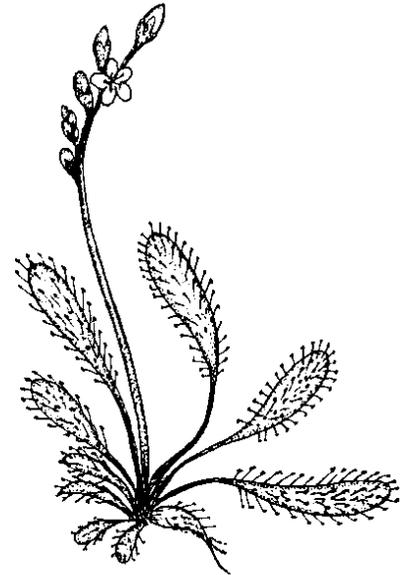
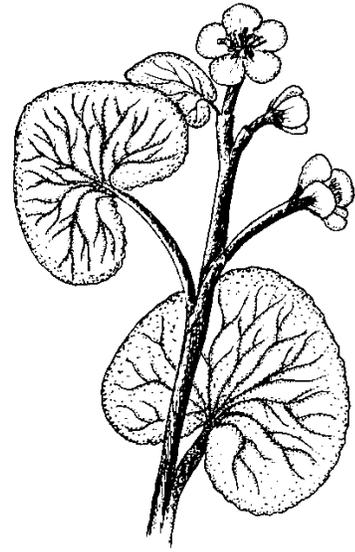
Traits: Broadleaf (deciduous) tree with spade-shaped leaves having small, rounded teeth; gray bark containing deep furrows when full-grown; the male and female flowers grow on different trees; round, three-parted seed capsules within long catkins; tiny cottony seeds

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

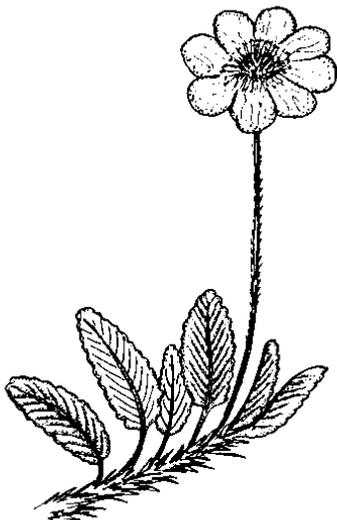
Traits: Floating, aquatic plant with large, long-stemmed, heart-shaped floating leaves; its large, yellow flowers have seven to nine petals.

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

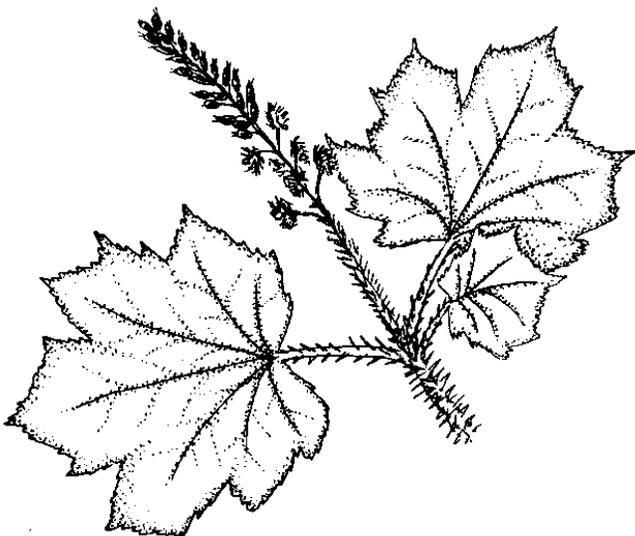
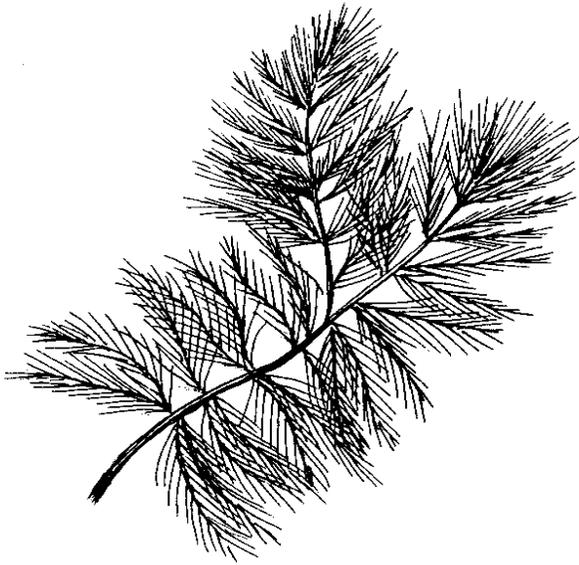
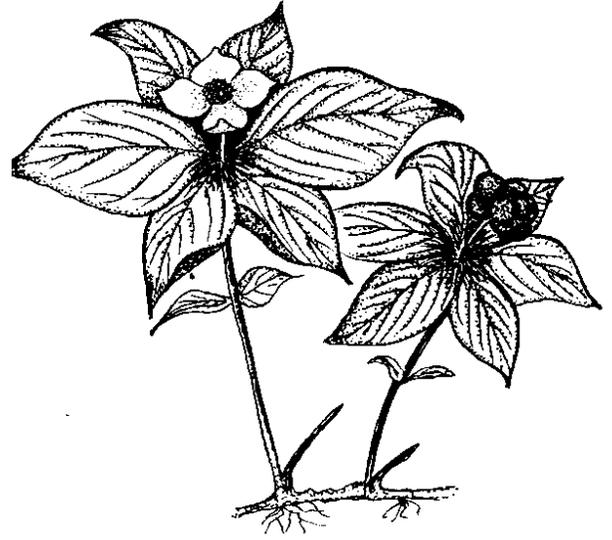
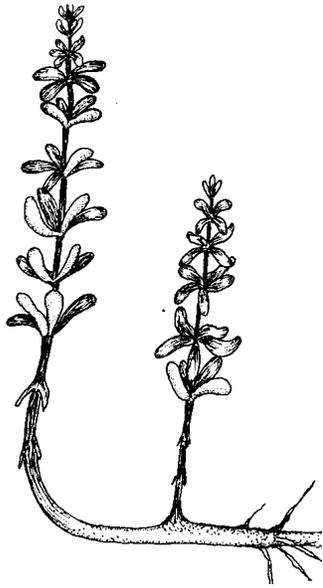
Traits: A low-growing, evergreen, herbaceous shrub with narrow, sometimes wavy-edged, leaves; this dwarf plant often appears matted.

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

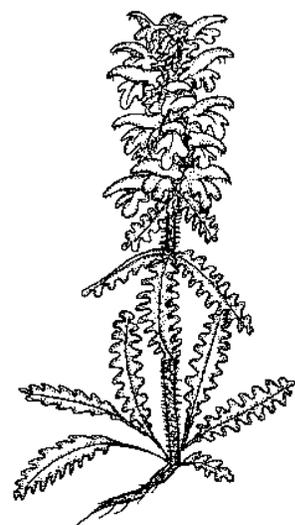
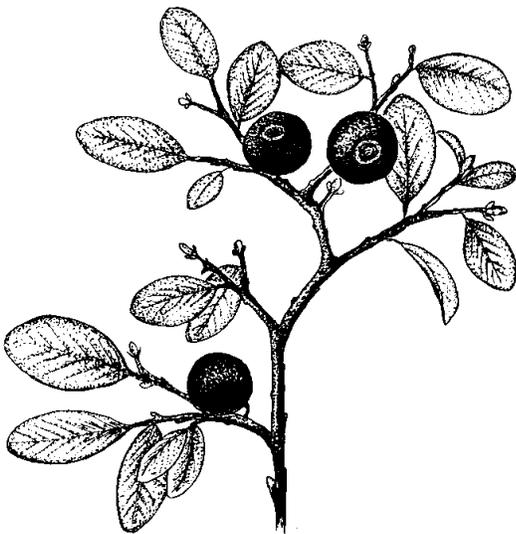
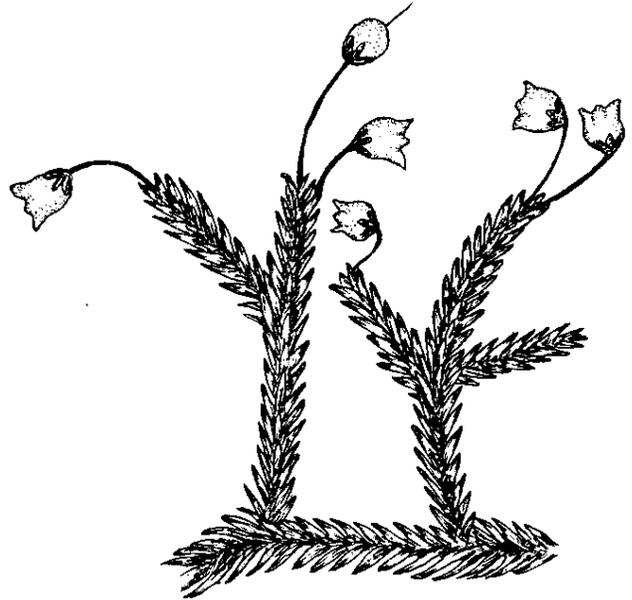
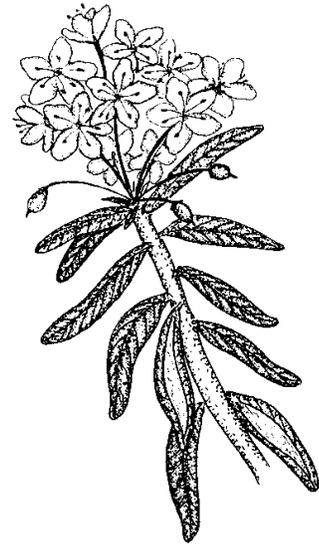
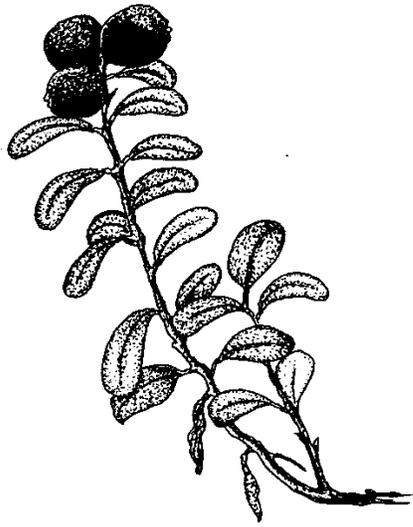
Traits: Spines cover the stems and very large leaves of this plant. Large cluster of flowers; fruit is a red berry.

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)

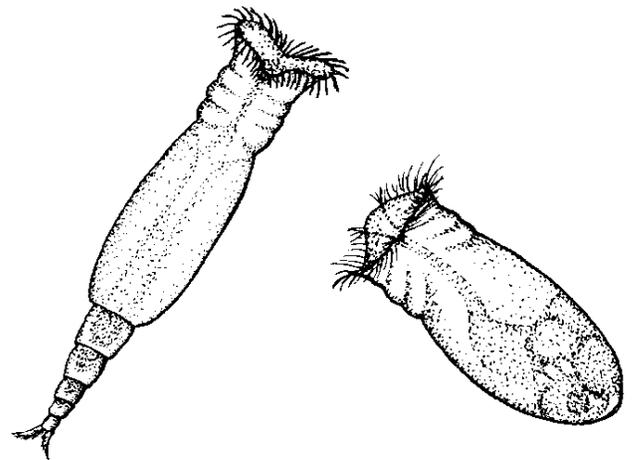
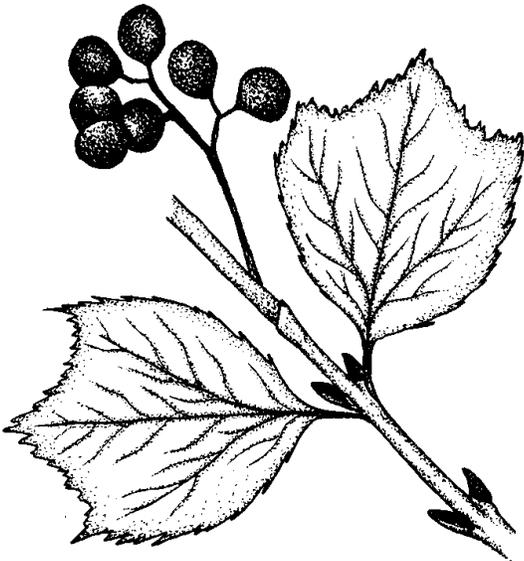
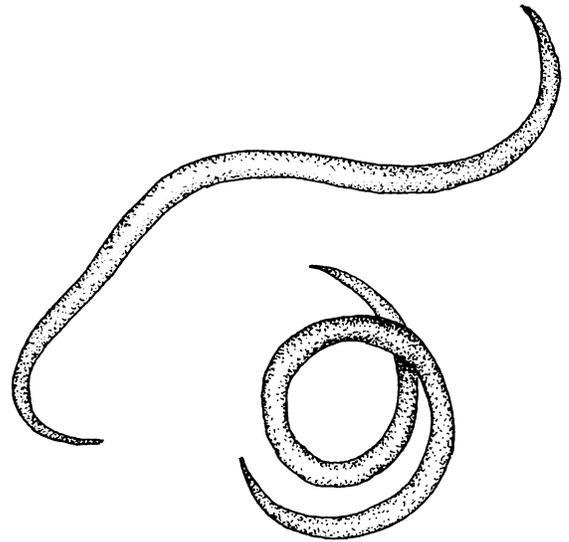
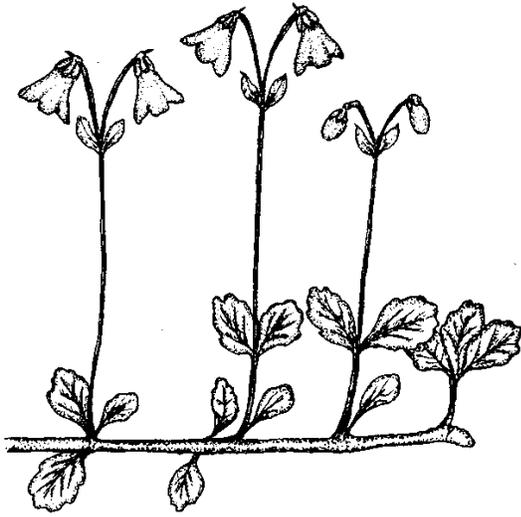
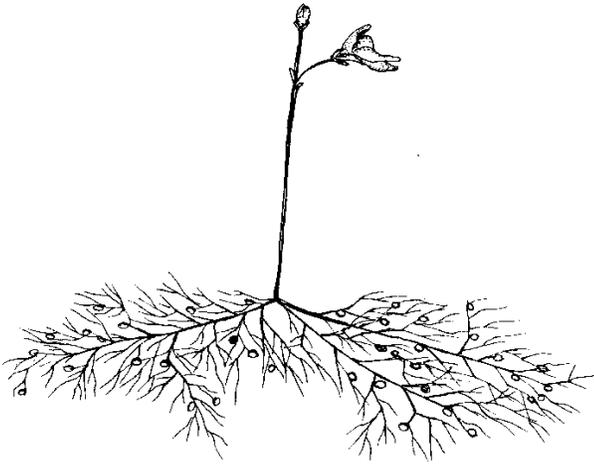
Traits: Shrub with small, oval leaves having smooth edges; small, bell-like flowers; blue, black, or red berries.

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

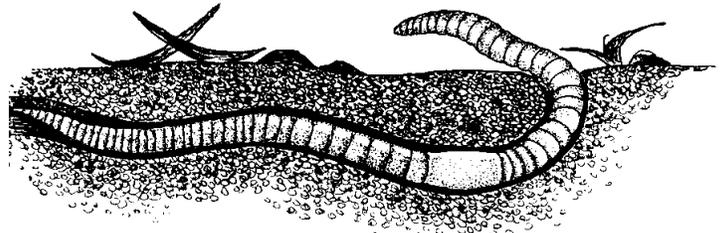
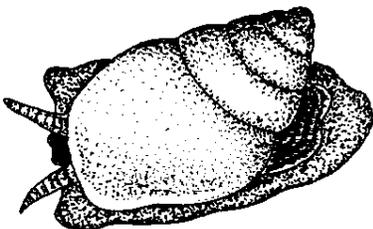
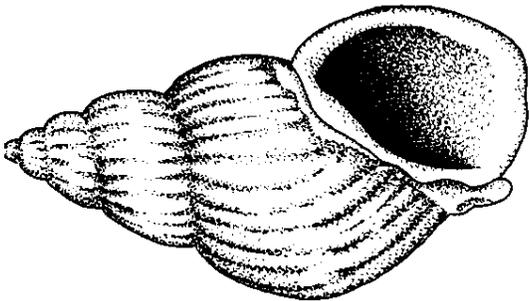
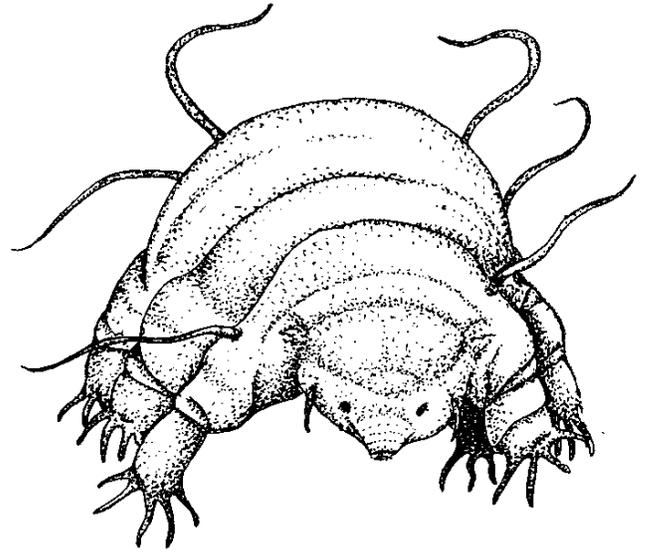
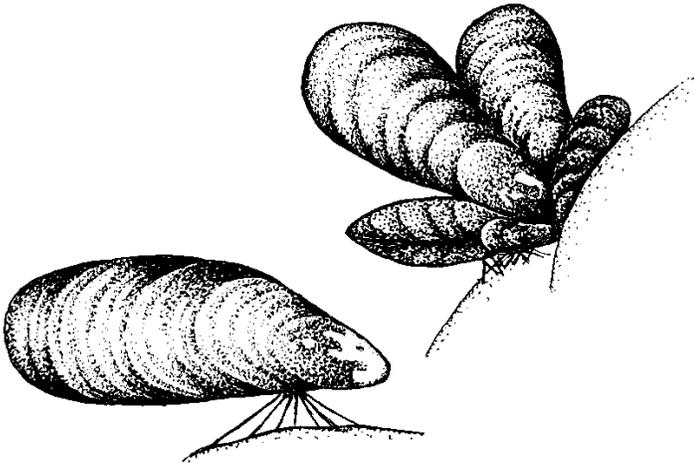
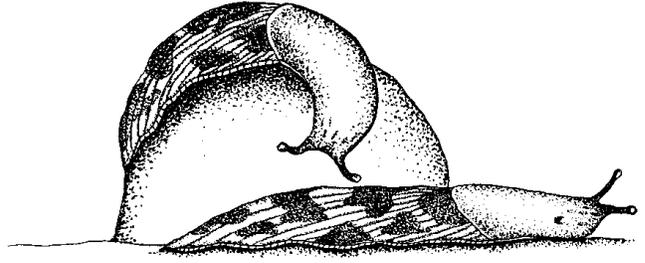
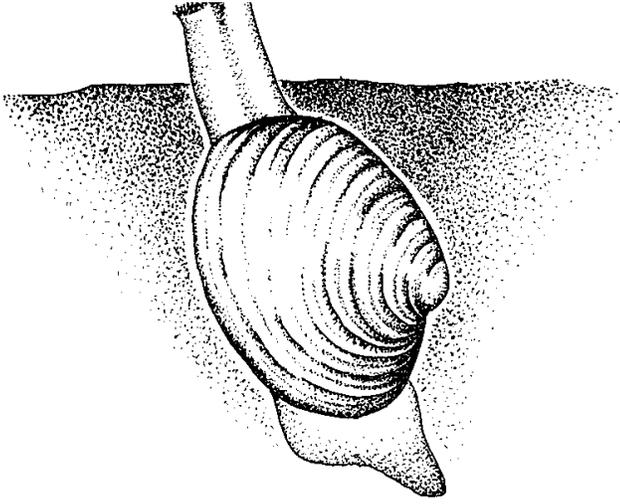
Traits: Shrub with three-lobed leaves growing in pairs along the stem; white flowers in clusters at the end of short twigs; bright red berries

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

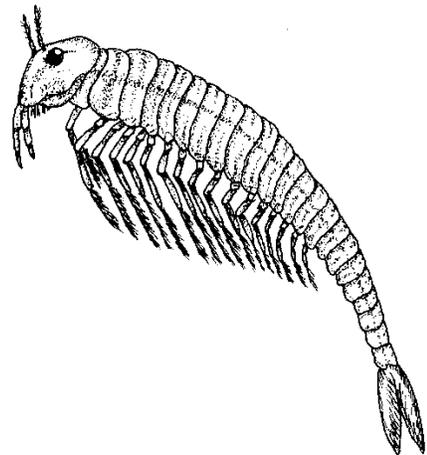
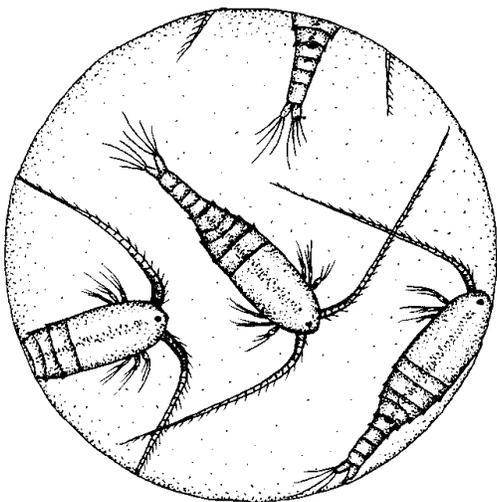
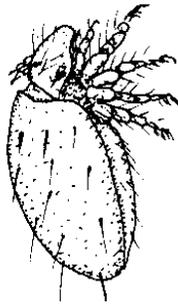
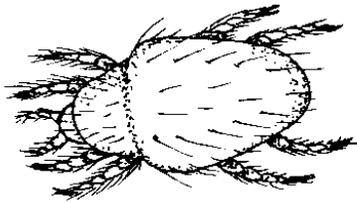
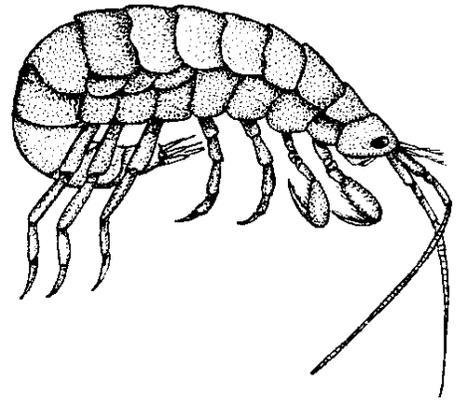
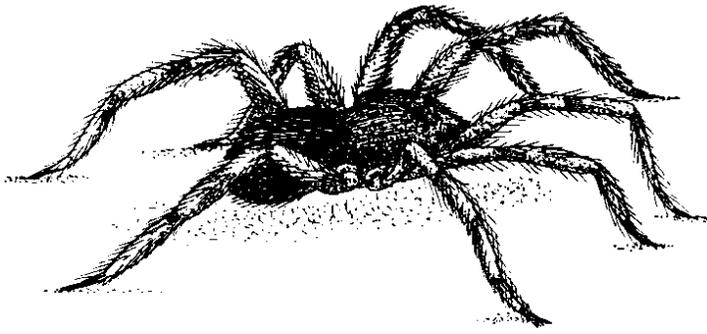
Traits: Invertebrate animal (mollusk) with flat creeping foot, a one-piece shell, and a well-developed head

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

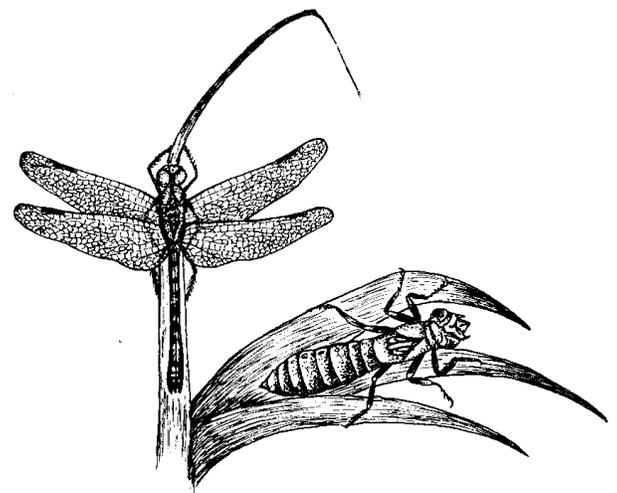
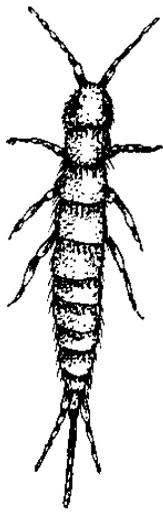
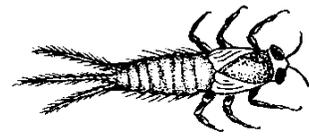
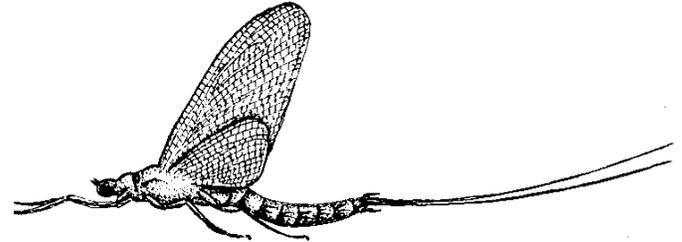
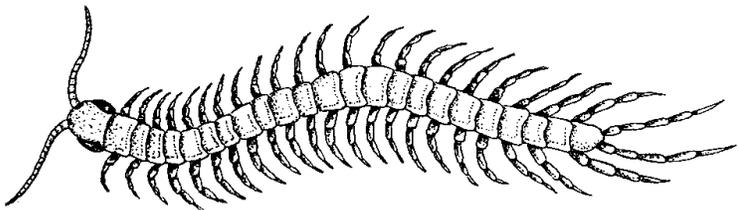
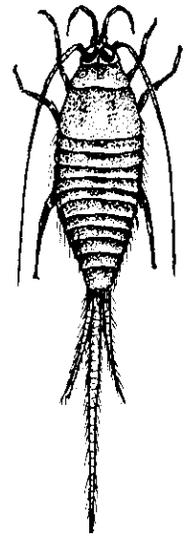
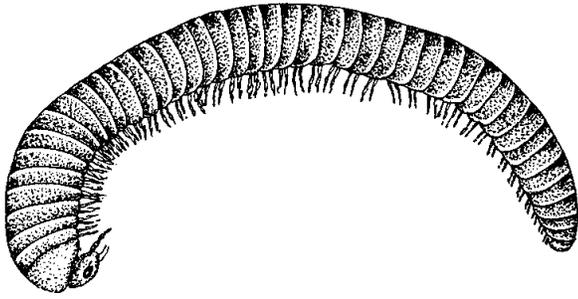
Traits: Crustacean (invertebrate animal) with a short, cylindrical body of ten segments; the first few segments have appendages

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**

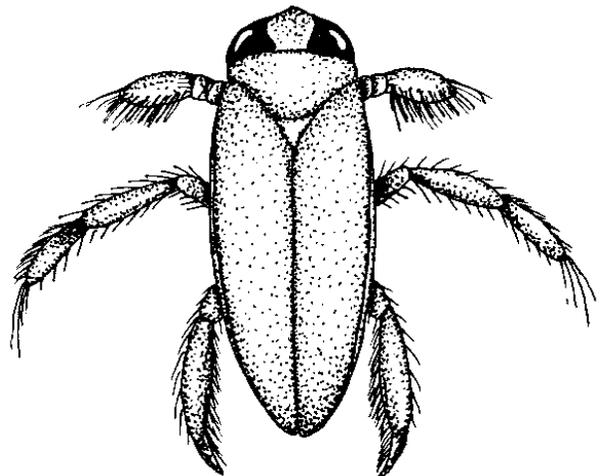
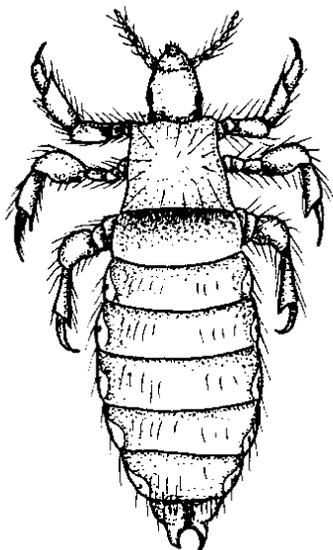
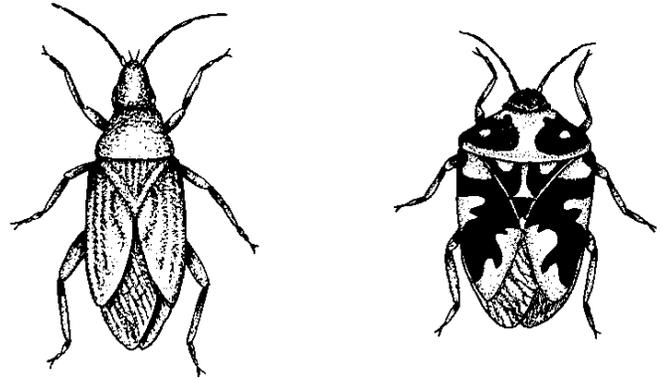
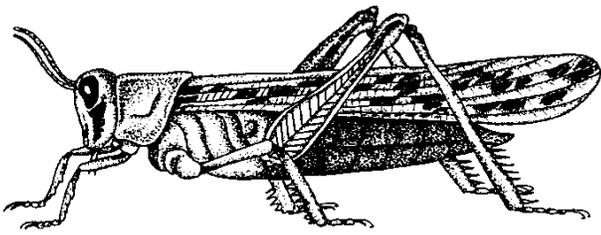
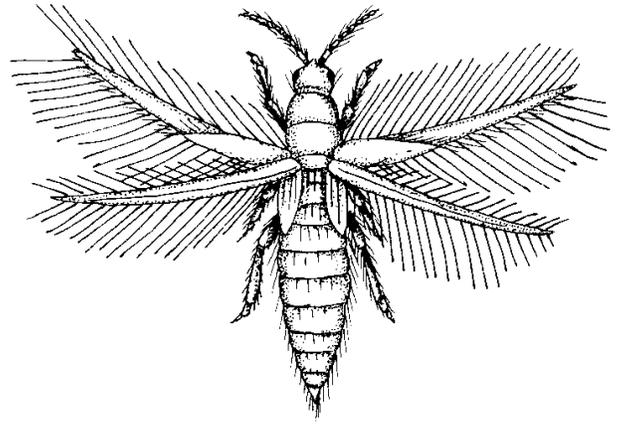
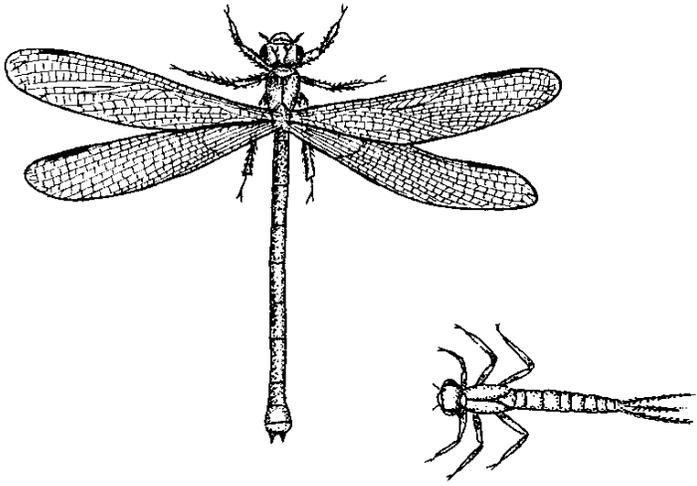
Traits: A small, wingless insect (invertebrate animal) with chewing mouthparts and a tube on the underside of the first abdominal segment

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**

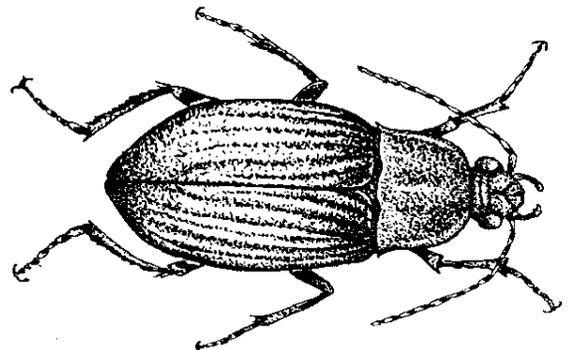
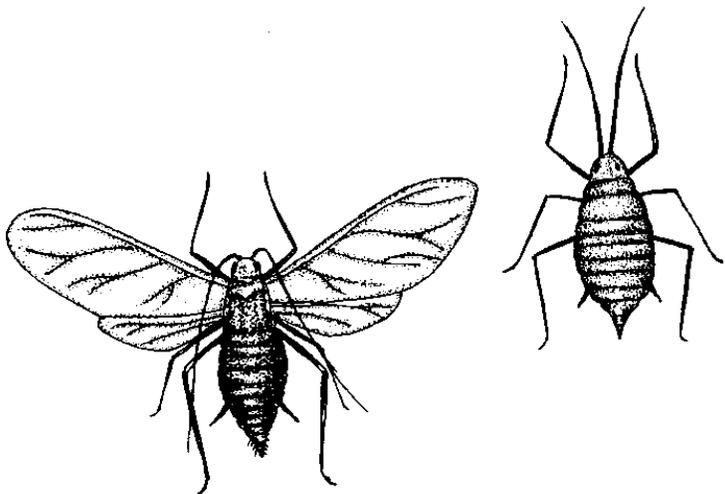
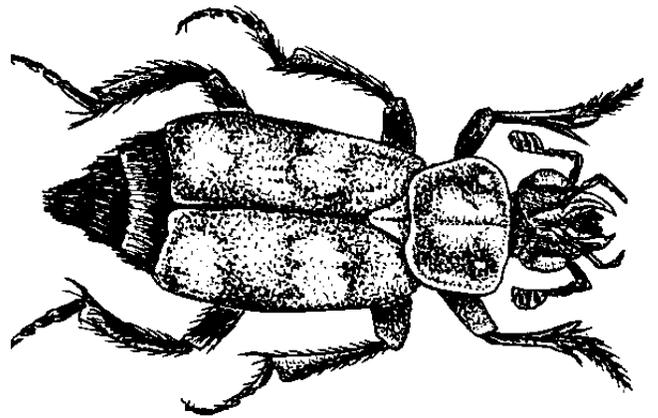
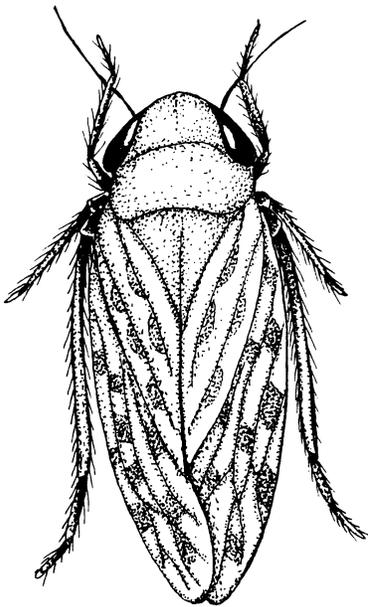
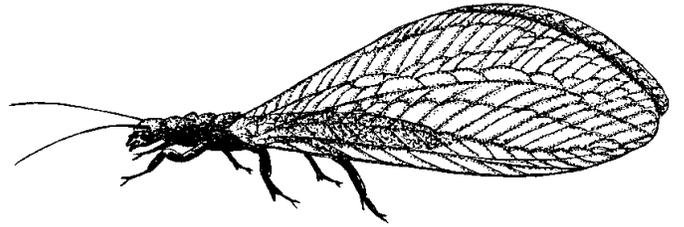
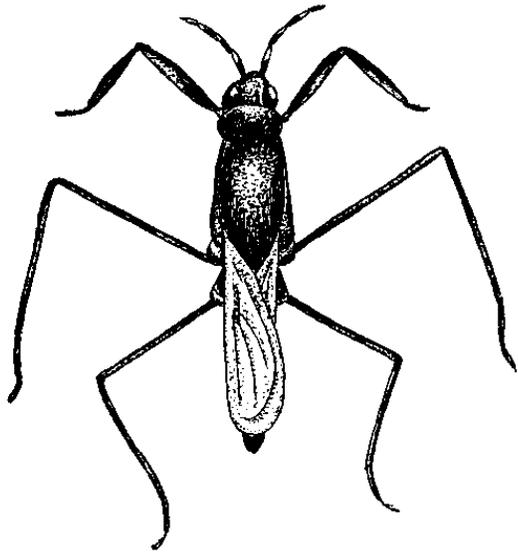
Traits: Small, wingless insects with sucking or chewing mouthparts; invertebrate animals

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

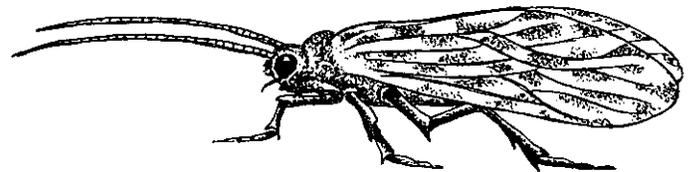
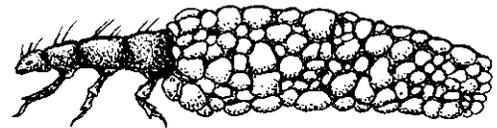
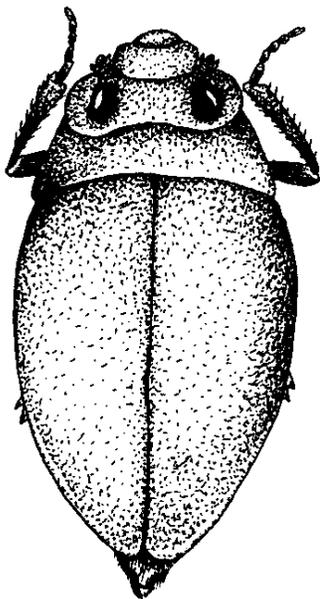
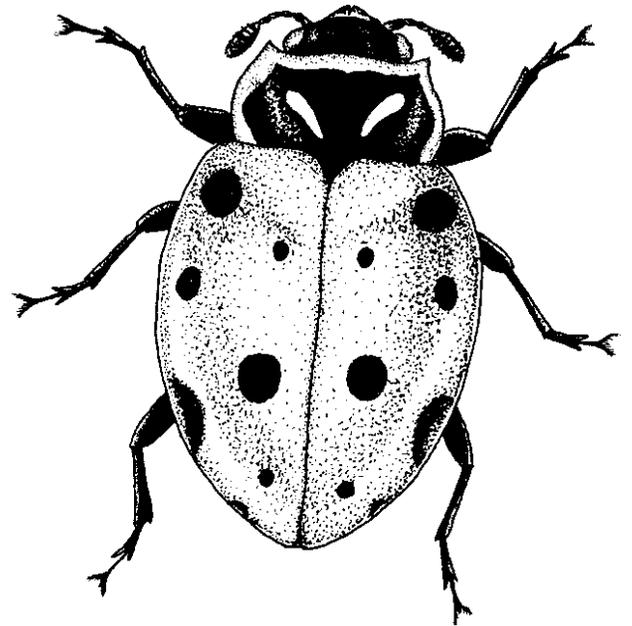
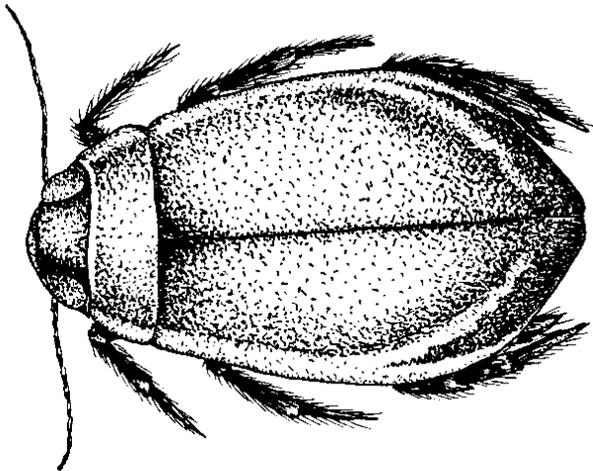
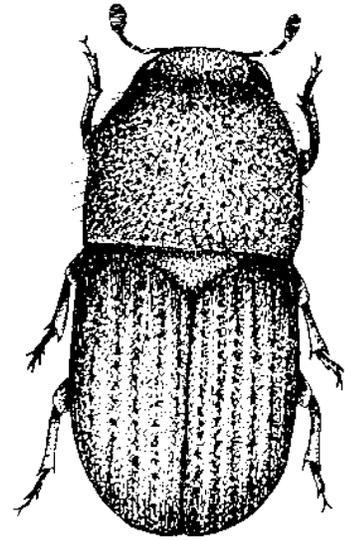
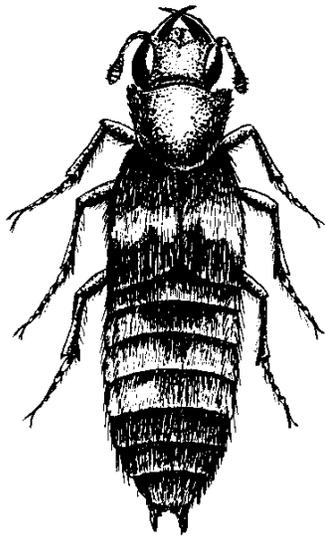
Traits: Pear-shaped insects with winged and wingless forms in the same species; most have two tubes (called cornicles) on the top of their abdomens.

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

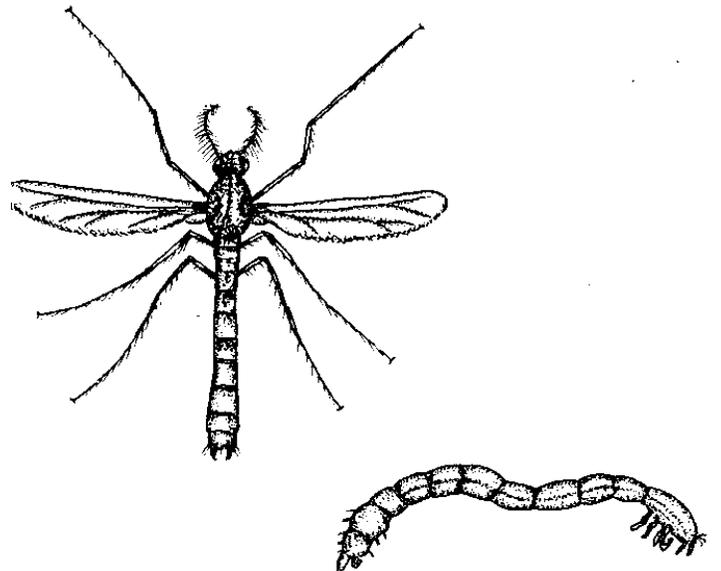
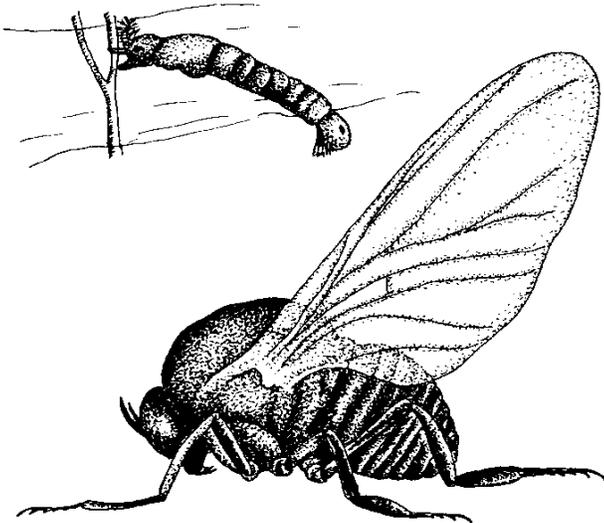
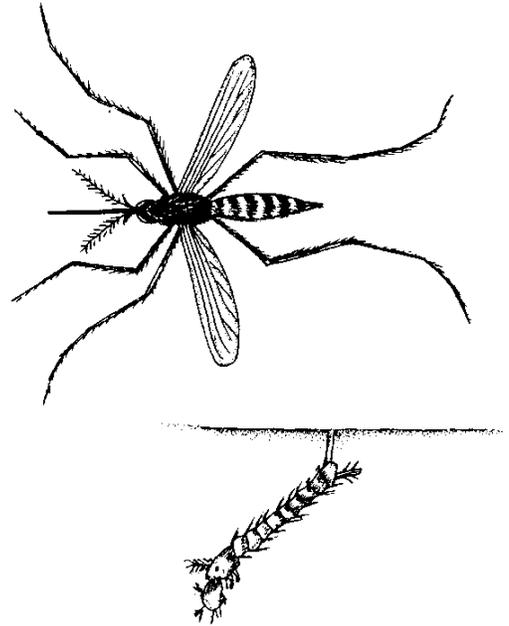
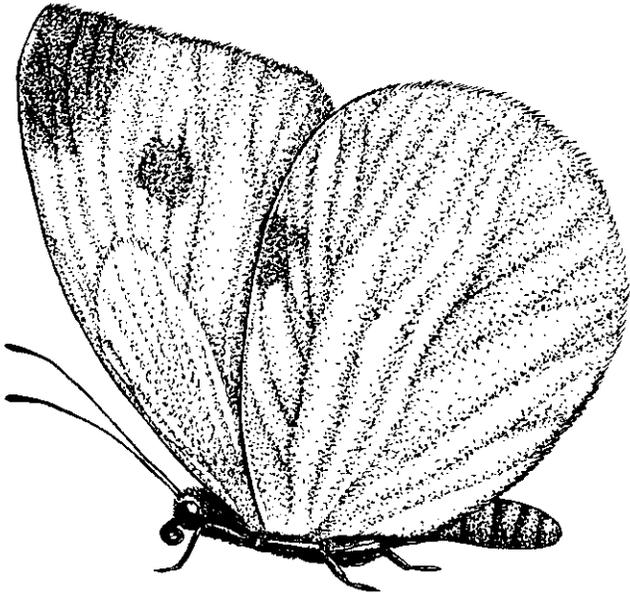
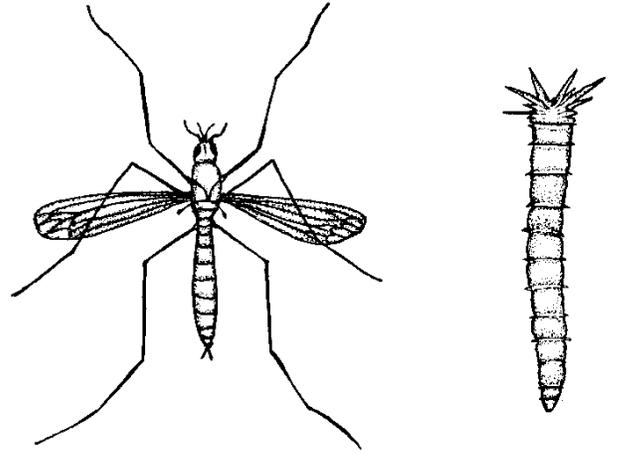
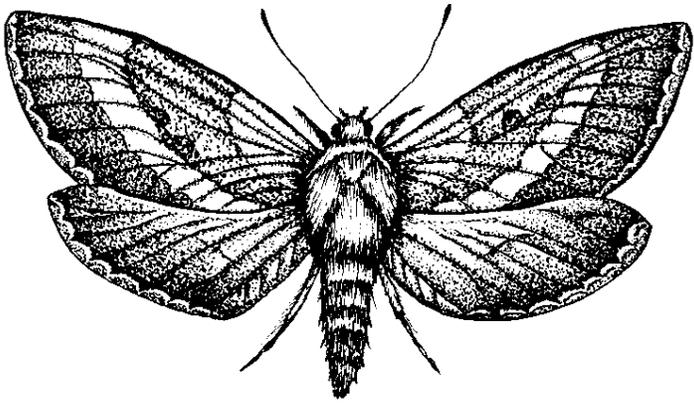
Traits: Aquatic insects; adults are flat, oval-shaped and have two eyes on top of the head and two on the bottom. They are black or greenish and often swim in circles together. Larvae are slender and have feathery gills on abdomens.

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

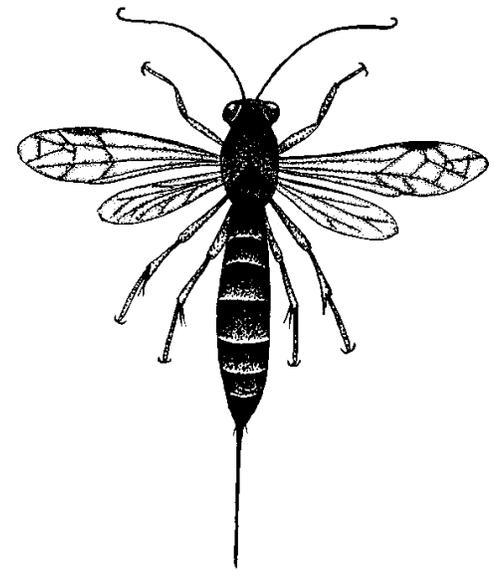
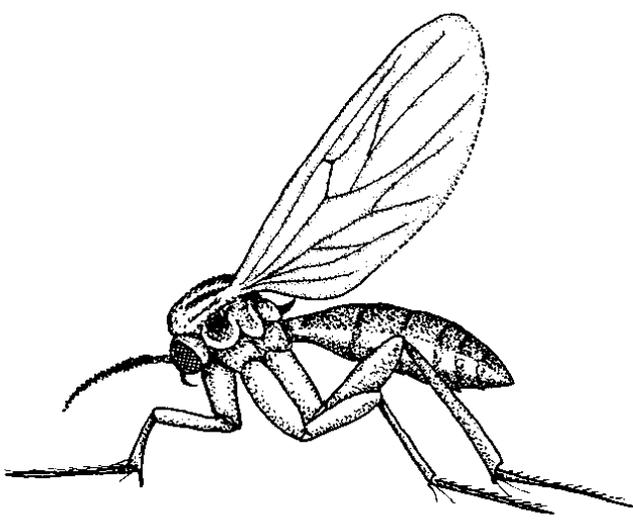
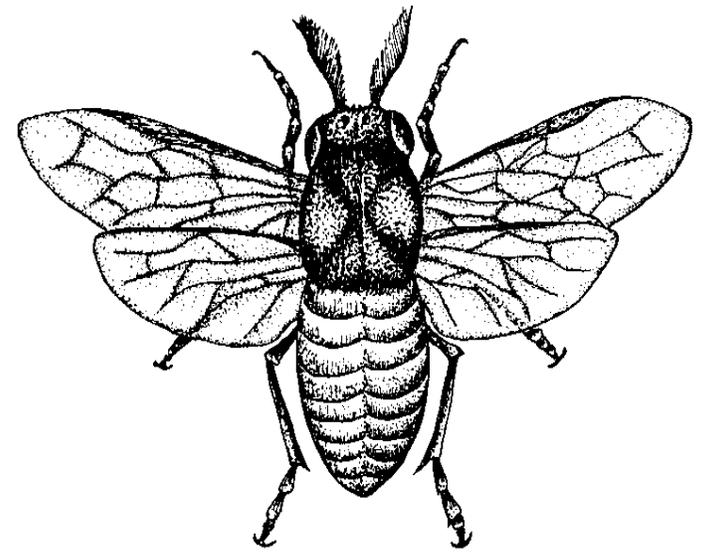
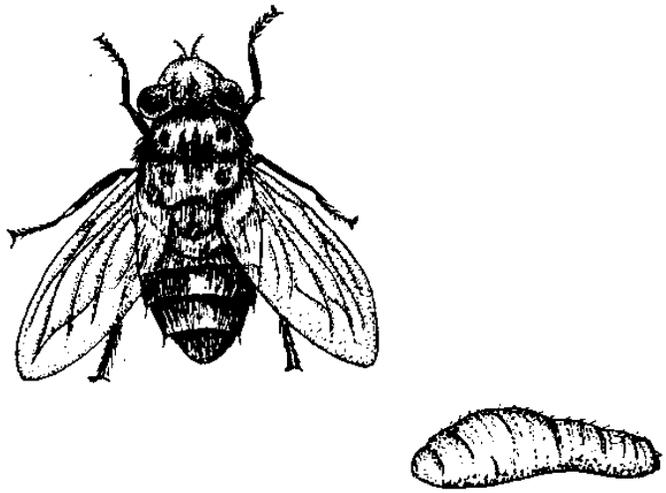
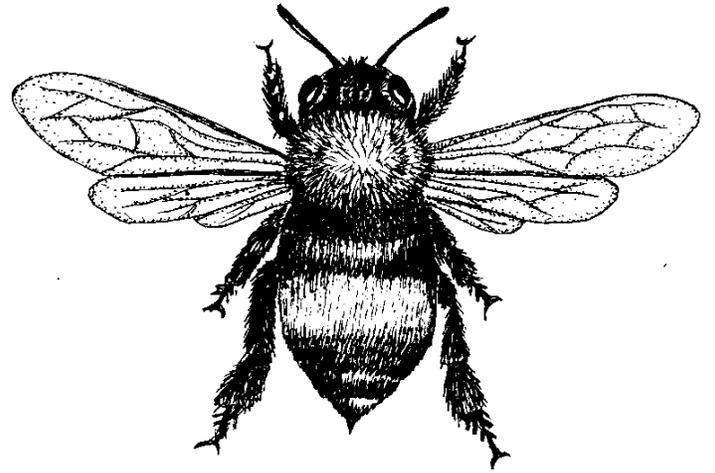
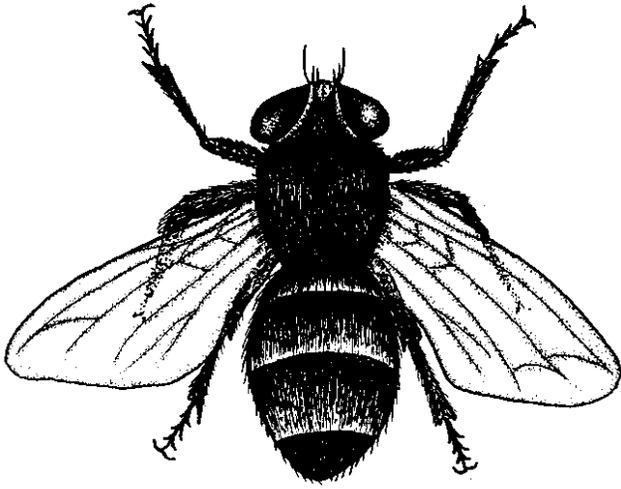
Traits: Adult black flies have six legs and are dark colored with two broad wings and short legs. Larvae are wormlike.

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

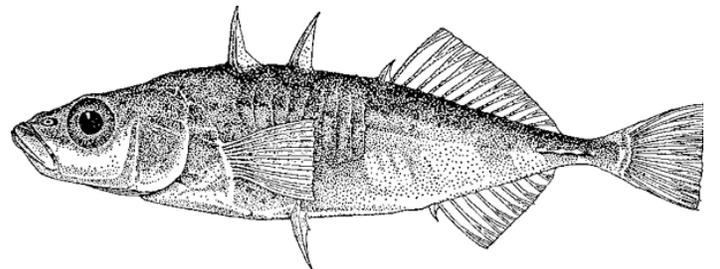
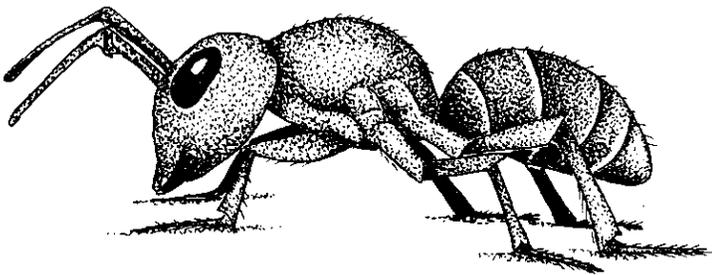
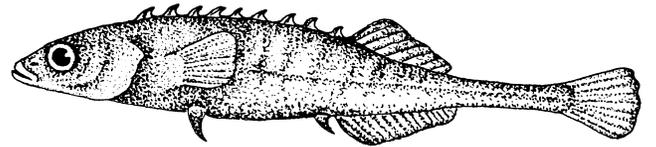
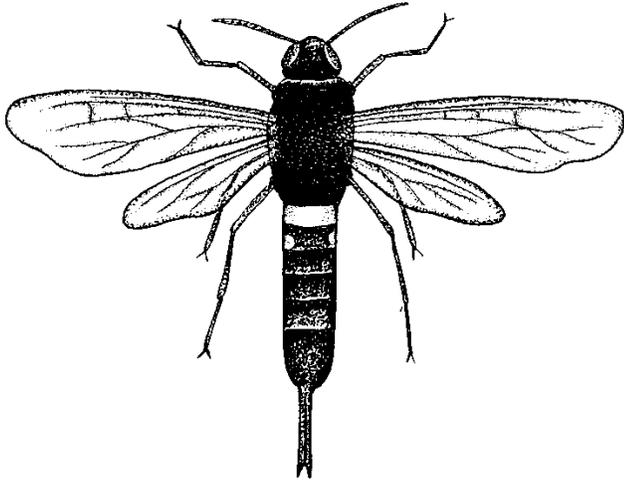
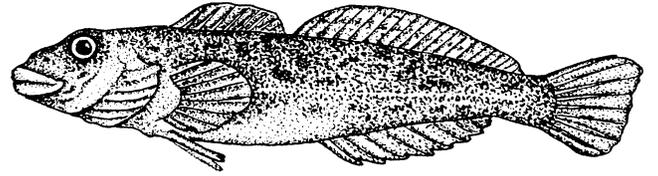
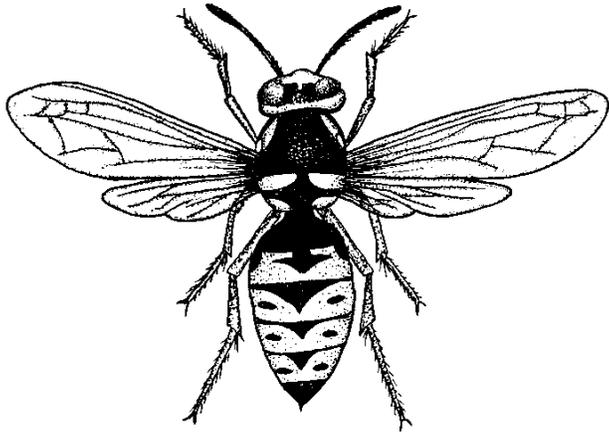
Traits: A slender, mosquito-like insect with long legs and long antennae; invertebrate animal

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

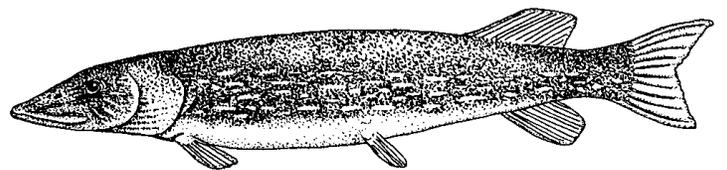
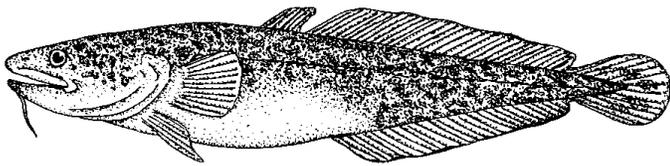
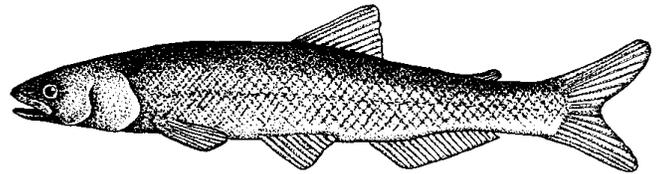
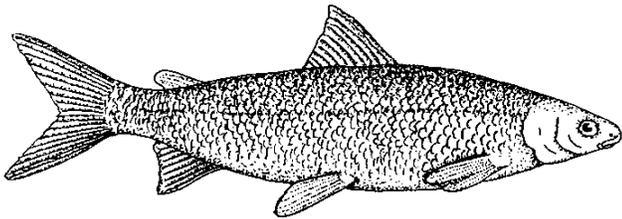
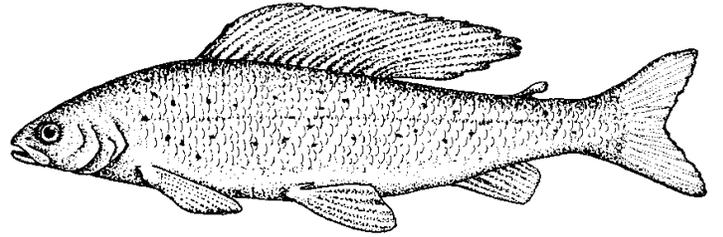
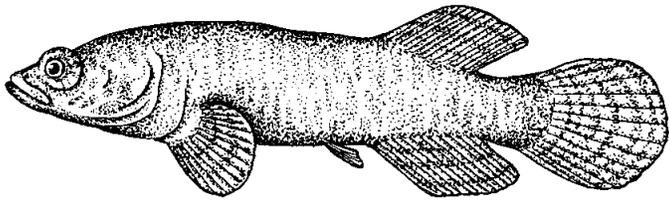
Traits: Body clearly divided into three segments by narrow constrictions, last segment forming a pointed end; many secrete formic acid as a defense. Only certain kinds of adults have wings.

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

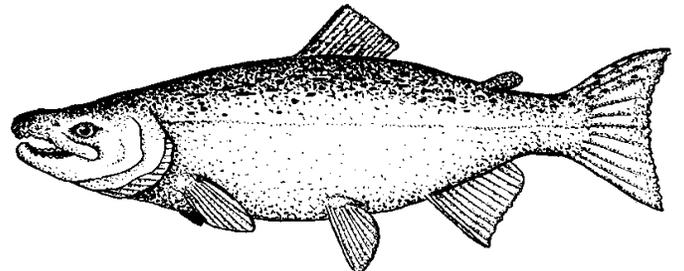
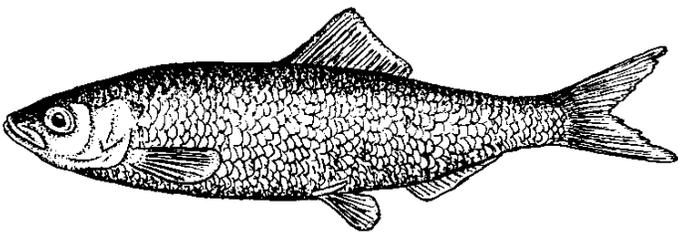
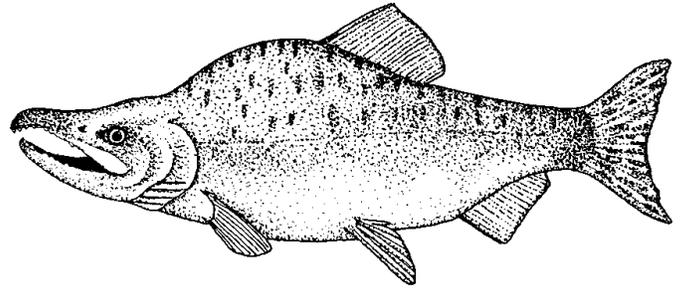
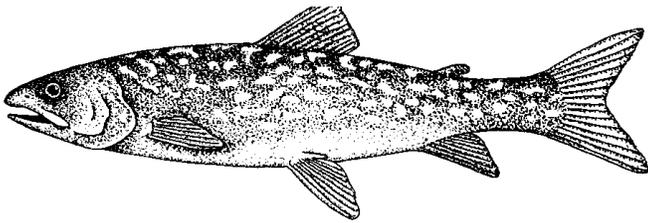
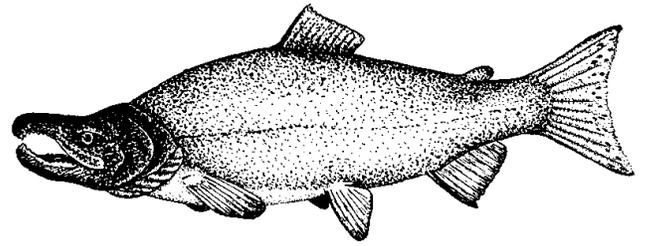
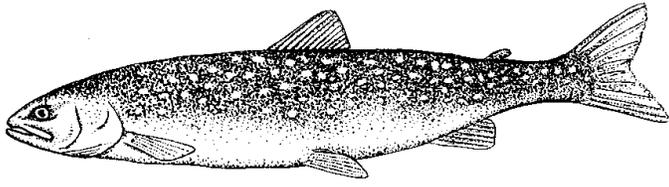
Traits: Fish with a large head, wide gill openings, two dorsal fins (second one long), small barbel on chin; rounded tail, no spines on fins; animal

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

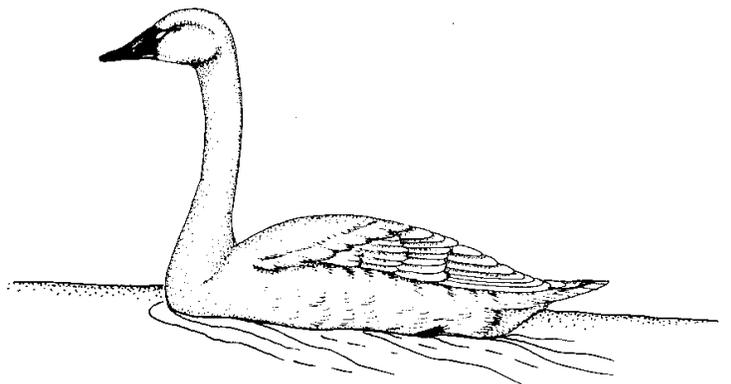
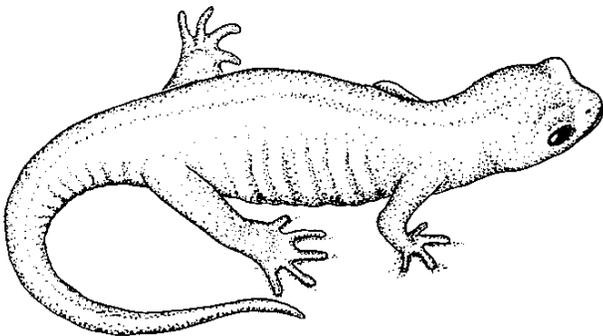
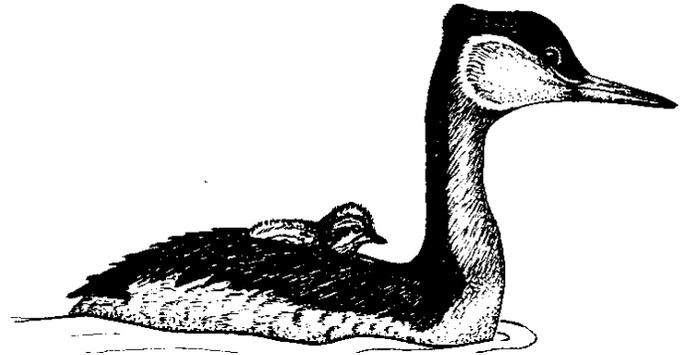
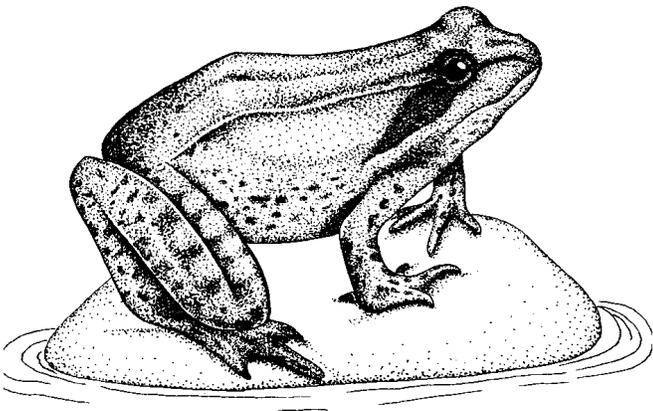
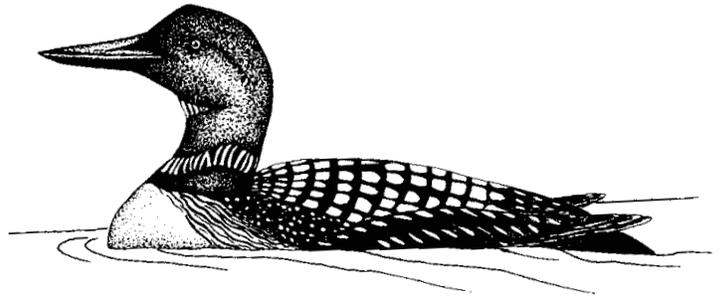
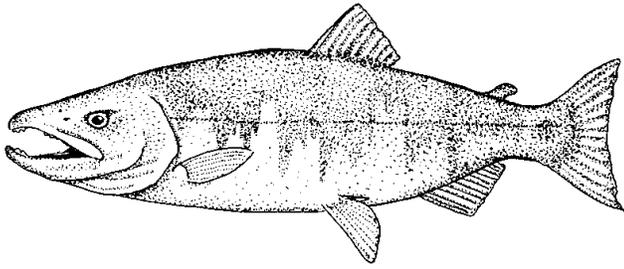
Traits: A medium-sized fish with no lateral line, large mouth, no teeth or jaws, no adipose fin

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**

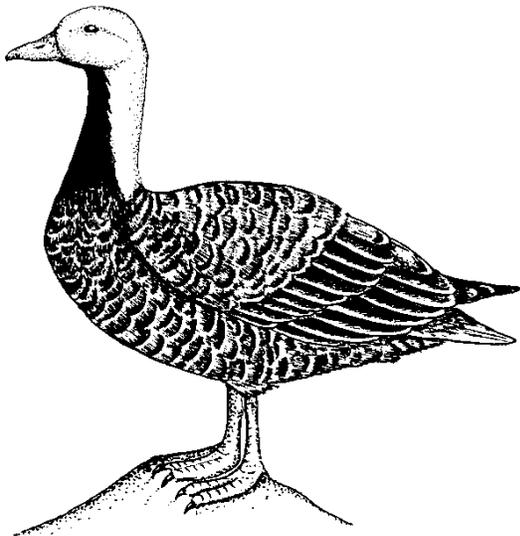
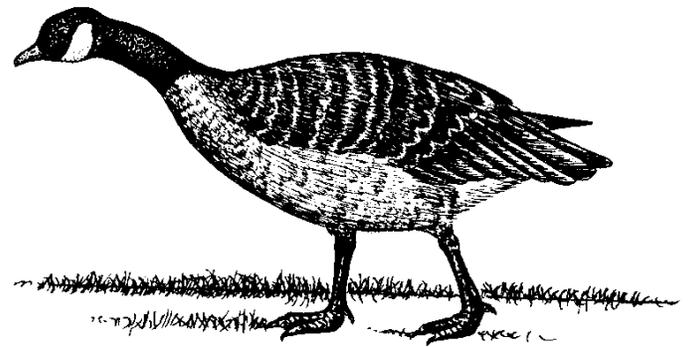
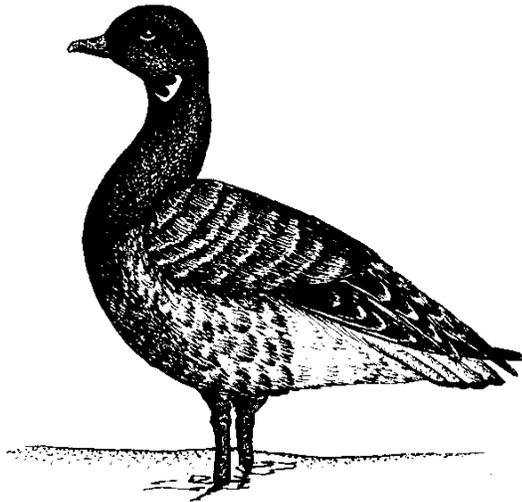
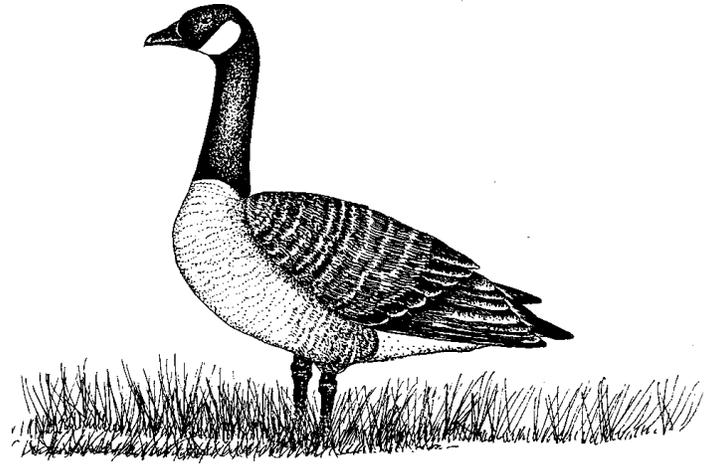
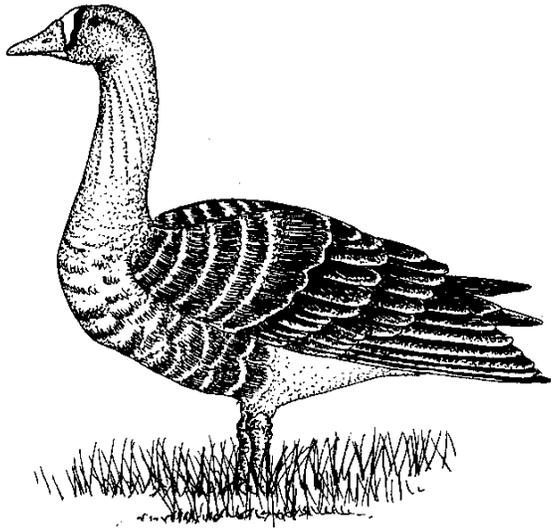
Traits: Small animals with moist skin, no scales or claws, short fore and hind legs, long tail

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

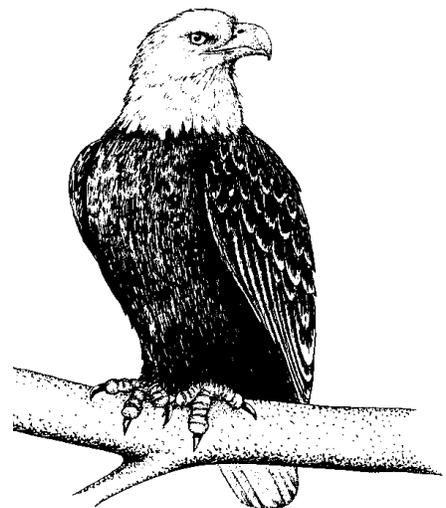
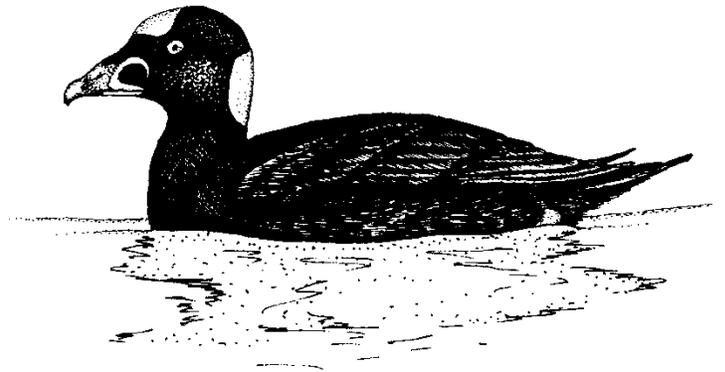
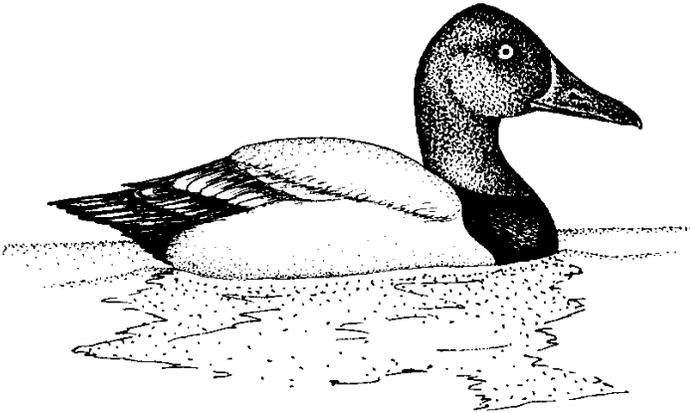
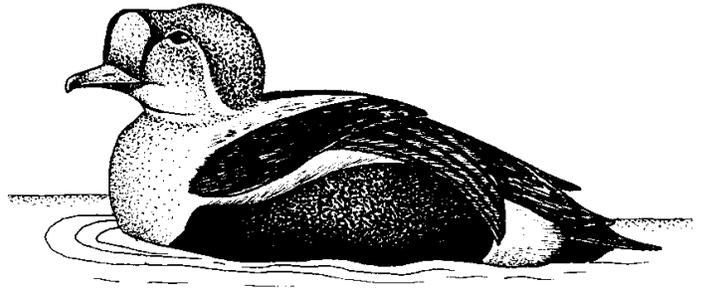
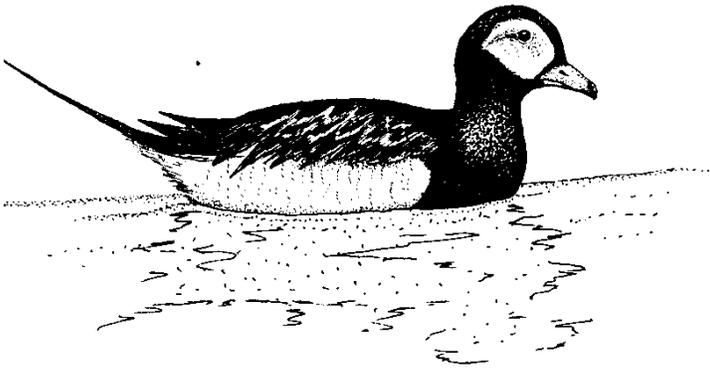
Traits: Blue-gray goose with round body, rounded head, and short, thick neck; the head and back of neck are white.

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**

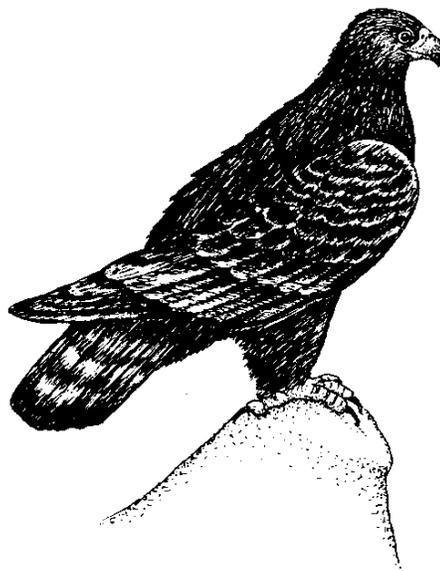
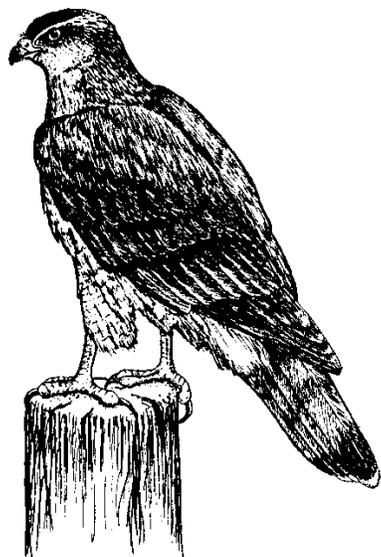
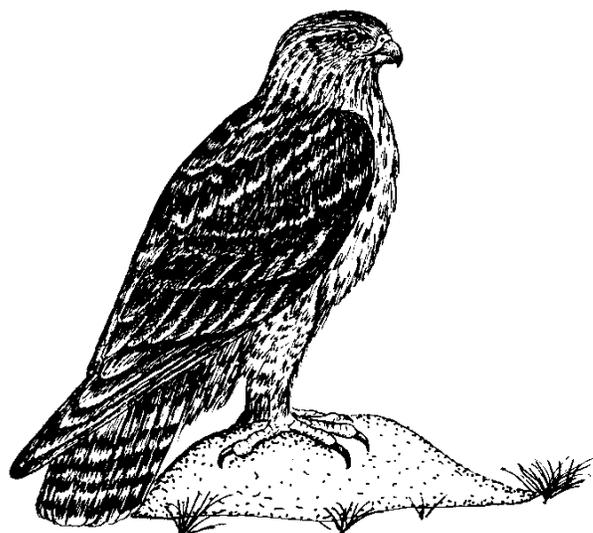
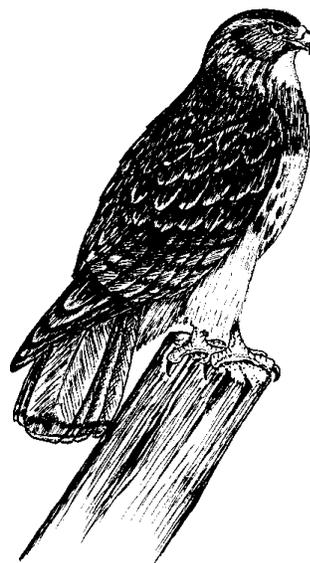
Traits: Long bill with saw-tooth edges and a hooked tip; most have a crest on head; unable to take off from land

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**

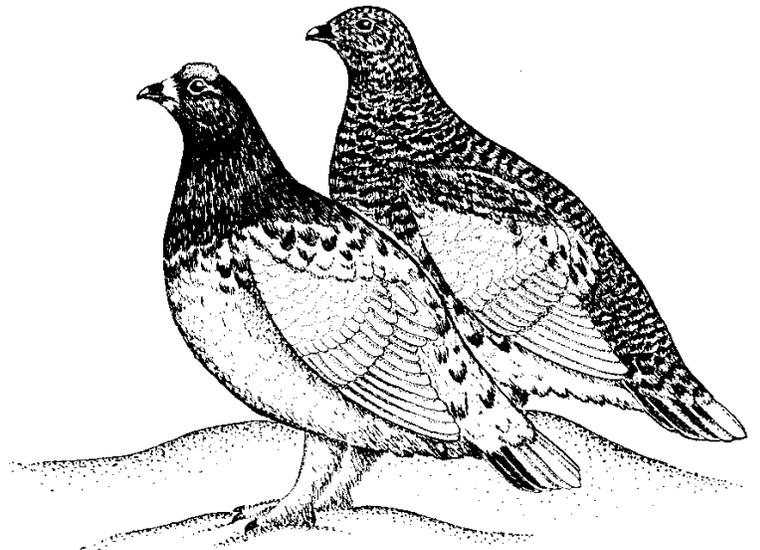
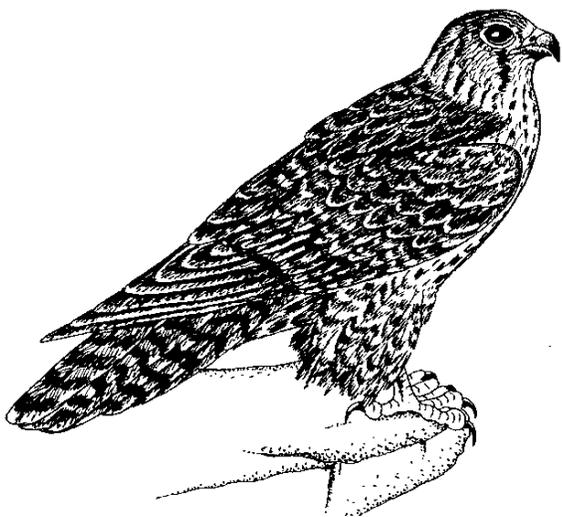
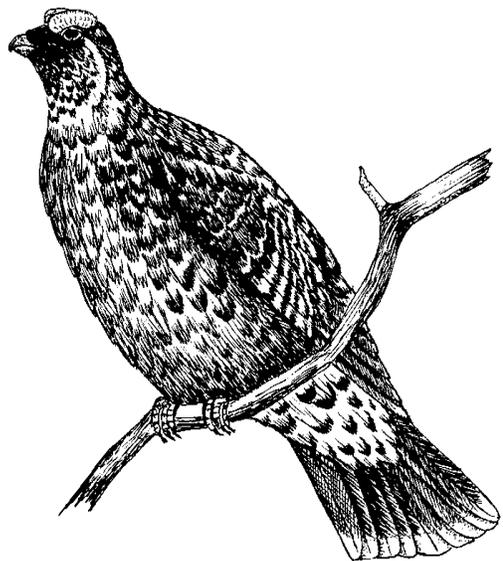
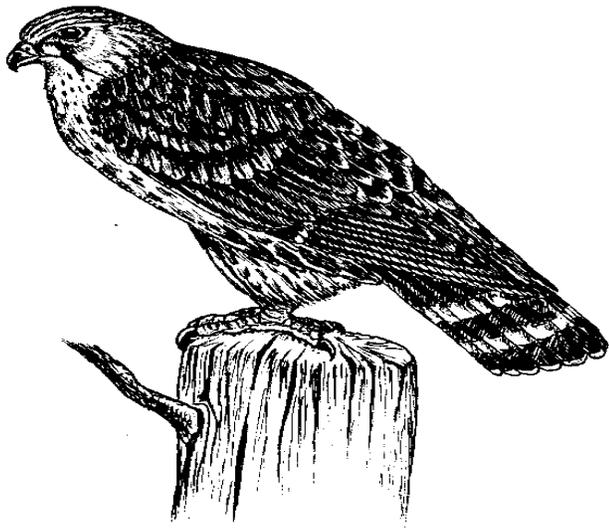
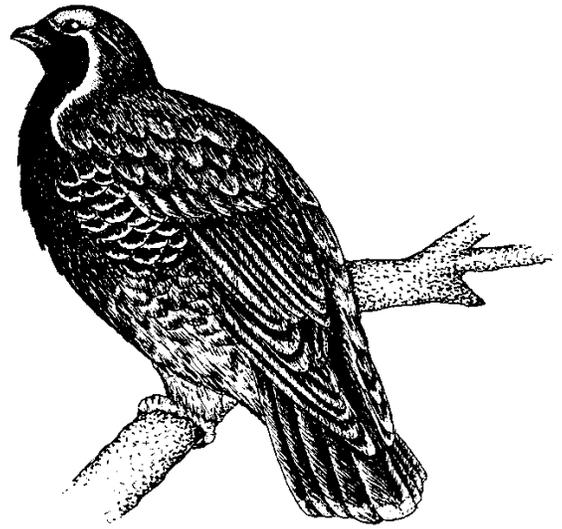
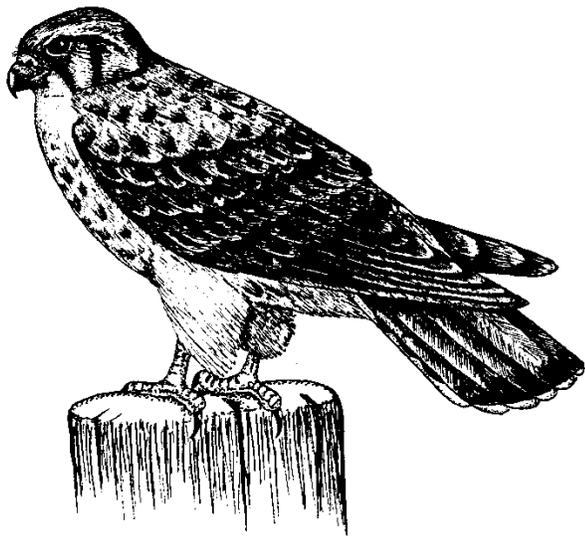
Traits: Large, brown bird with golden wash over back of head and neck; dark bill; tail faintly banded
Habitat: Alpine tundra
Foods: Arctic hares, marmots, ground squirrels, ptarmigan, carrion (dead animals)
Eaten by: No known predators

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.

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.

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.

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.

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.

177. GYRFALCON**T**

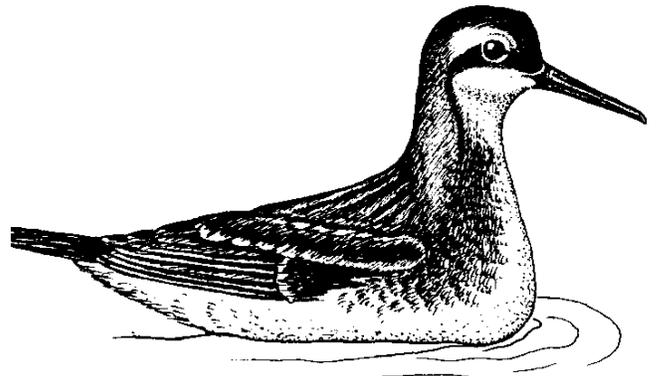
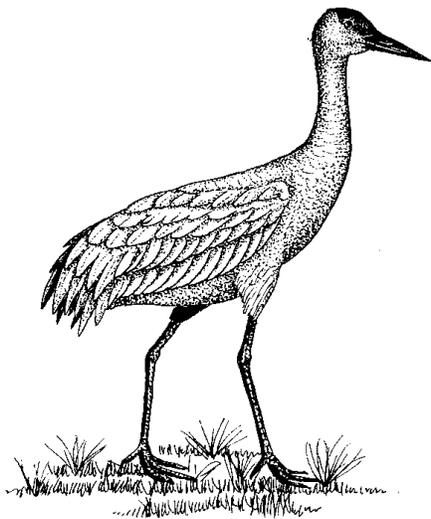
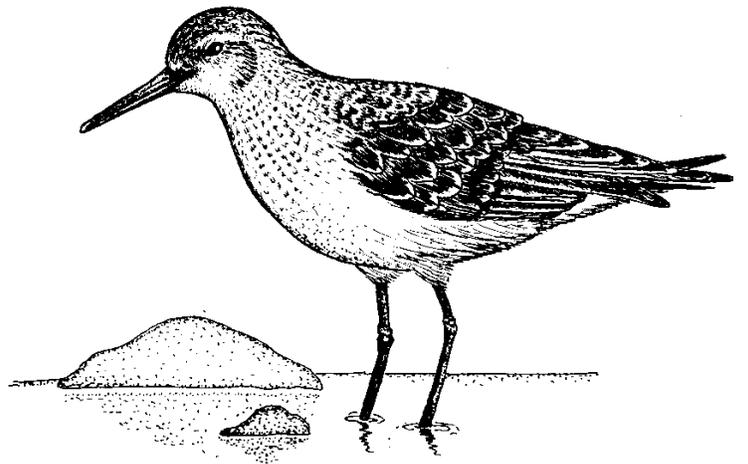
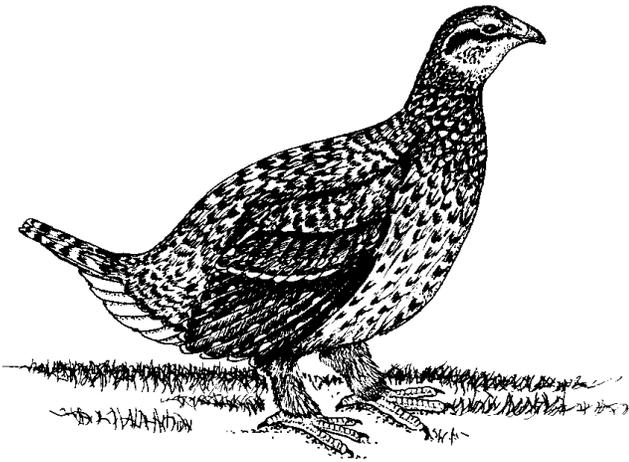
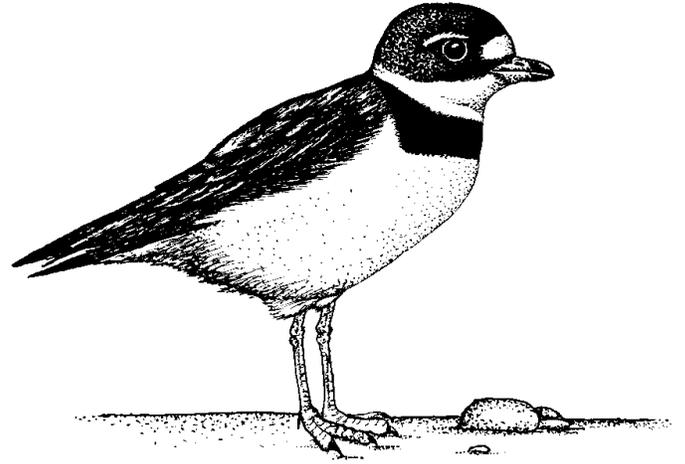
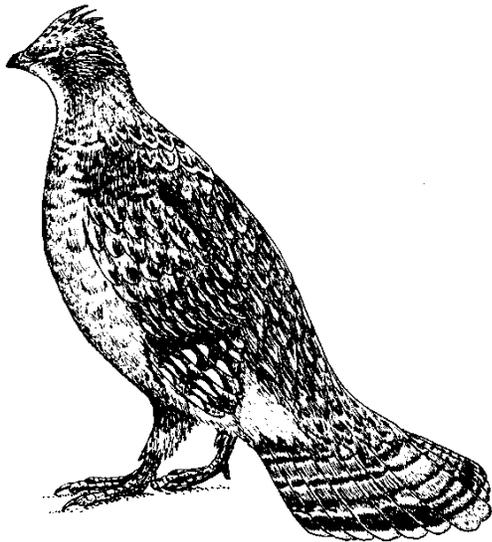
Traits: Large falcon with heavy body; pointed wings; narrow tail

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

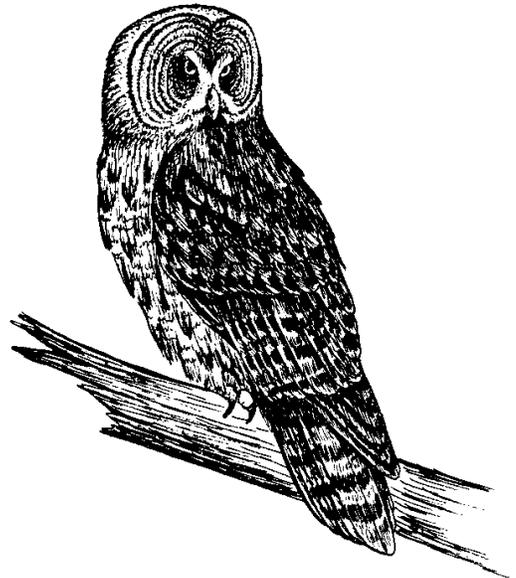
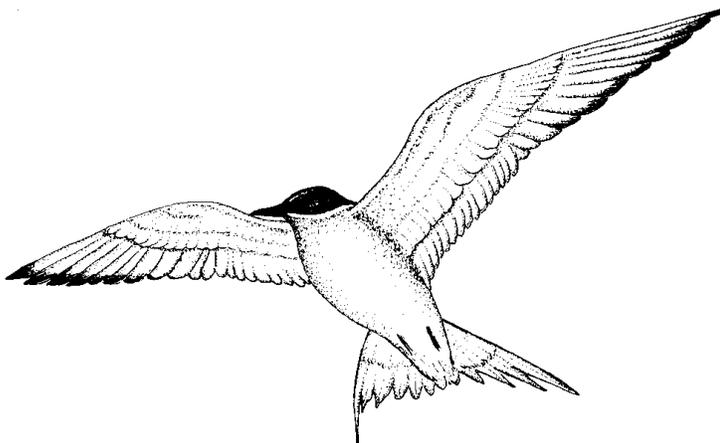
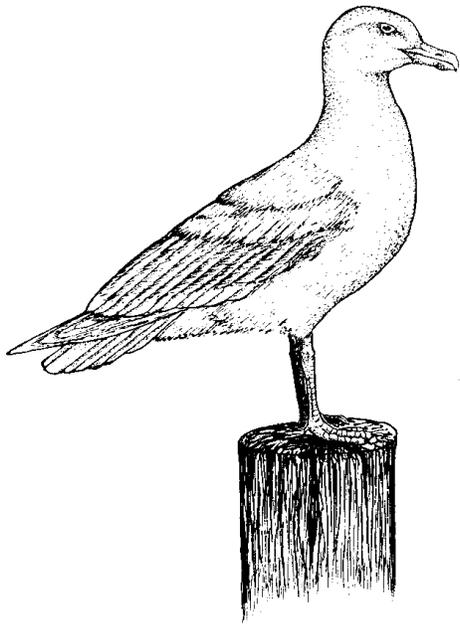
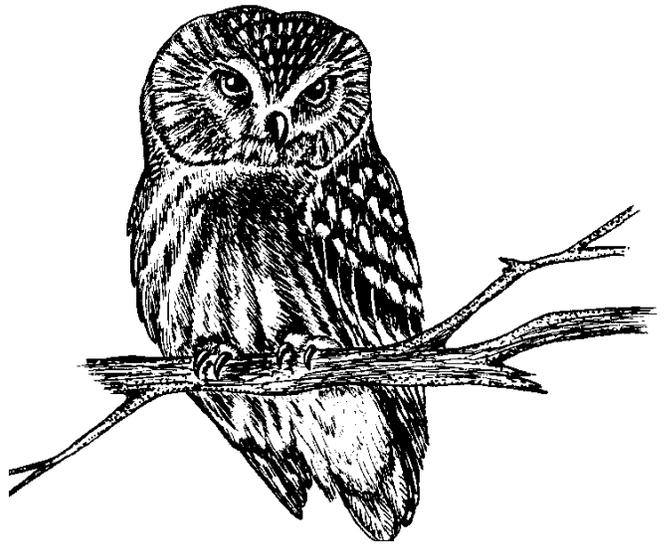
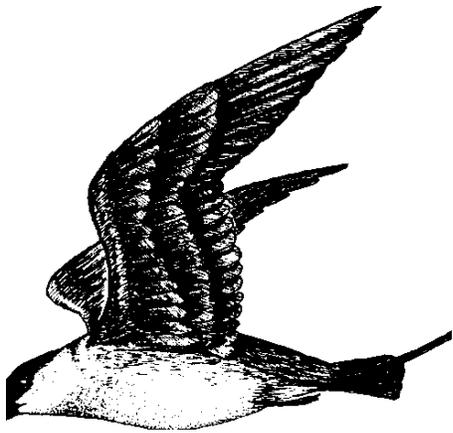
Traits: Large, gray bird with long neck, long legs, long beak; red skin on crown; whitish chin, cheek, and upper throat

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

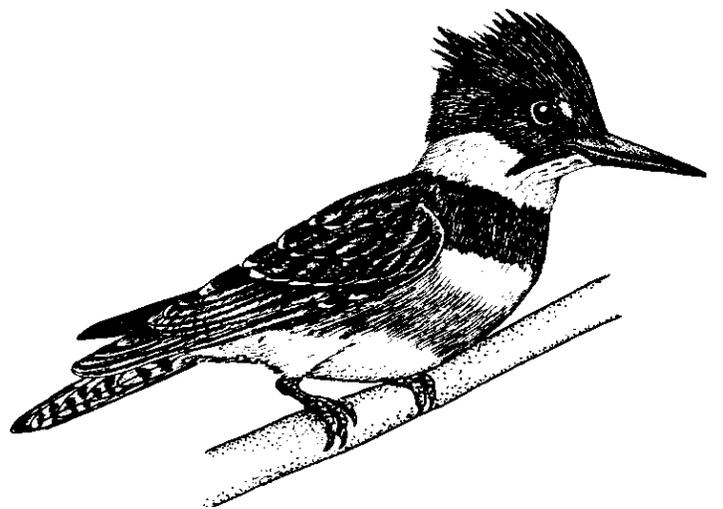
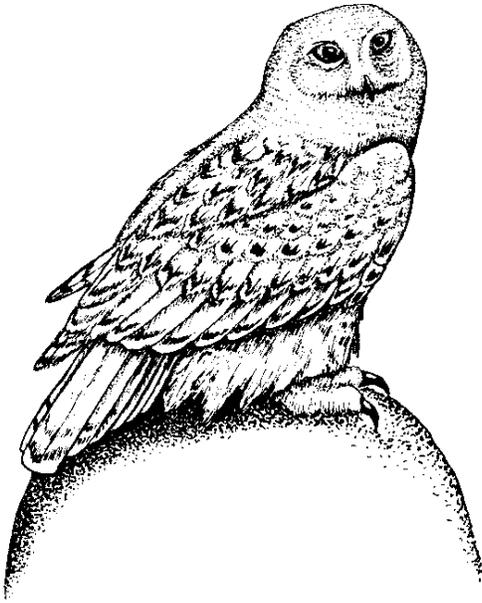
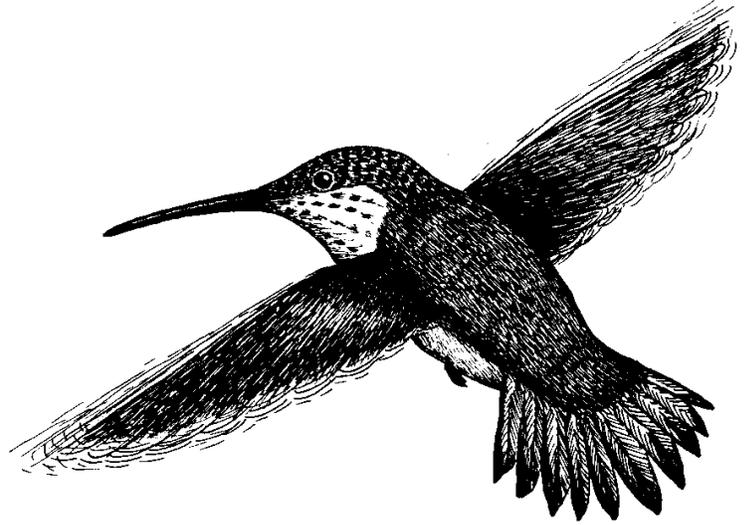
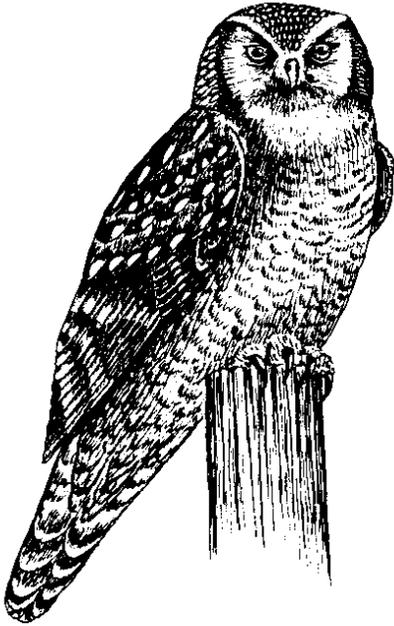
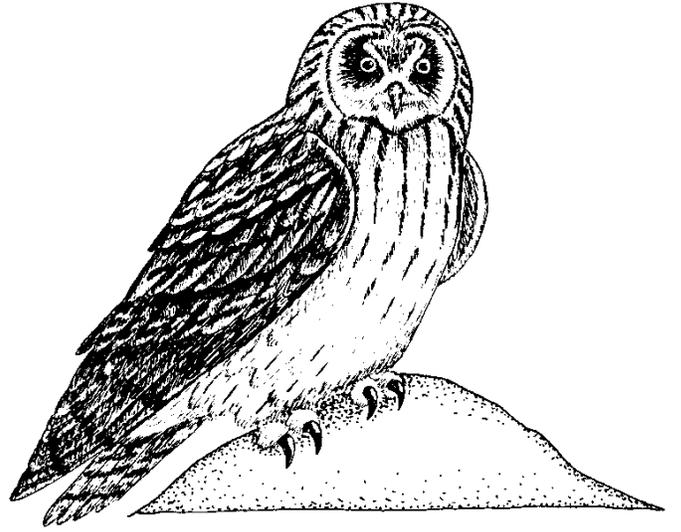
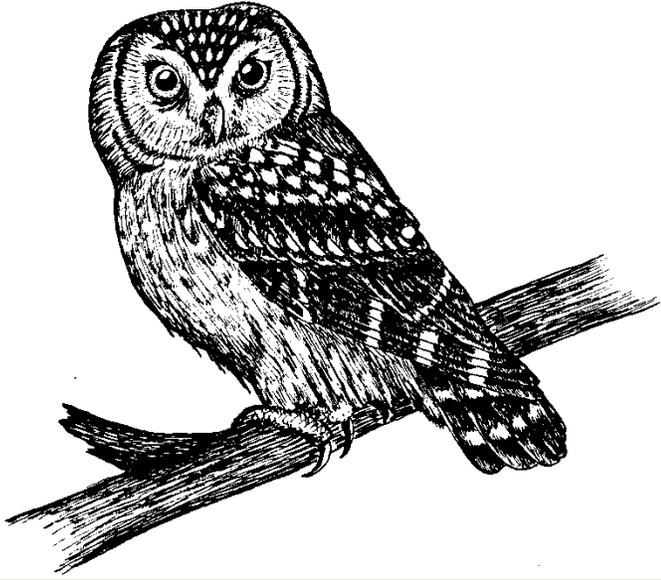
Traits: Birds with webbed feet, deeply forked tails, straight bills, and slender bodies.

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**

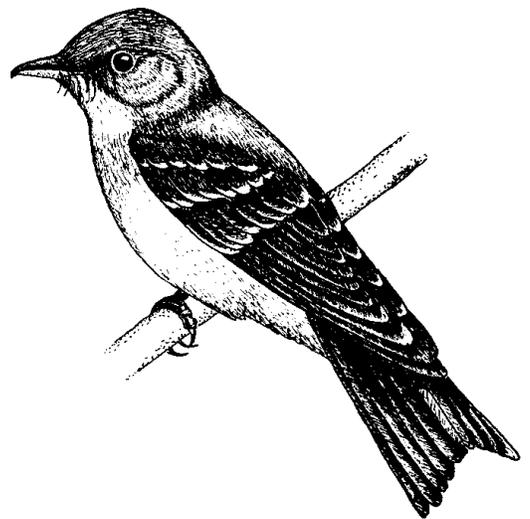
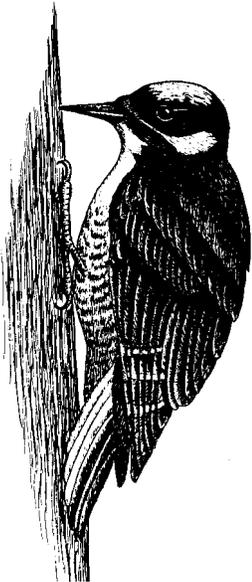
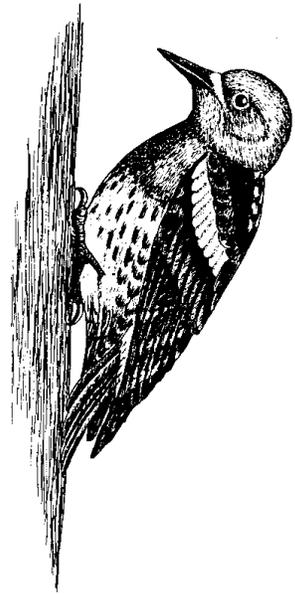
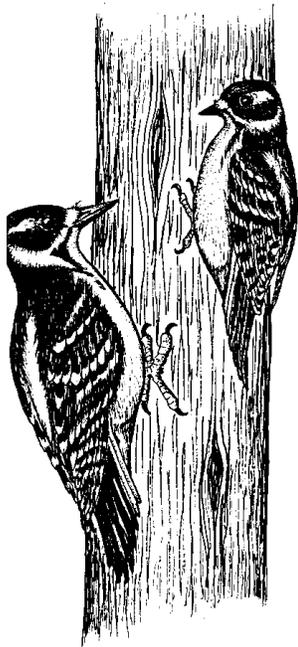
Traits: Large, white bird with a sharply hooked bill; talons; large forward-facing eyes; broad wings and tail; only all-white owl; they have varied amounts of black speckling. Nests on the ground.

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

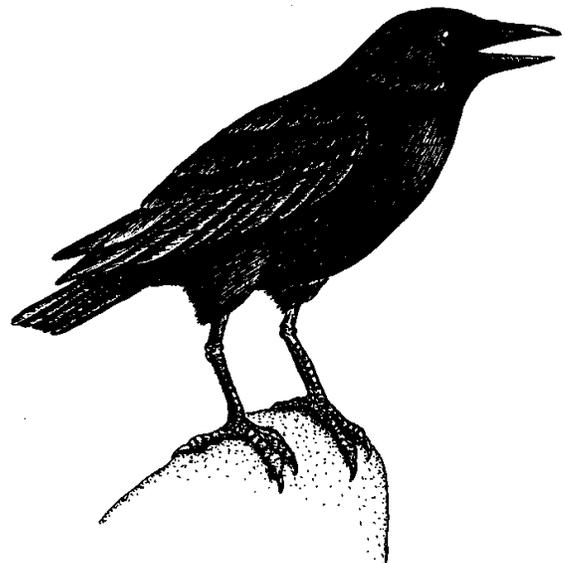
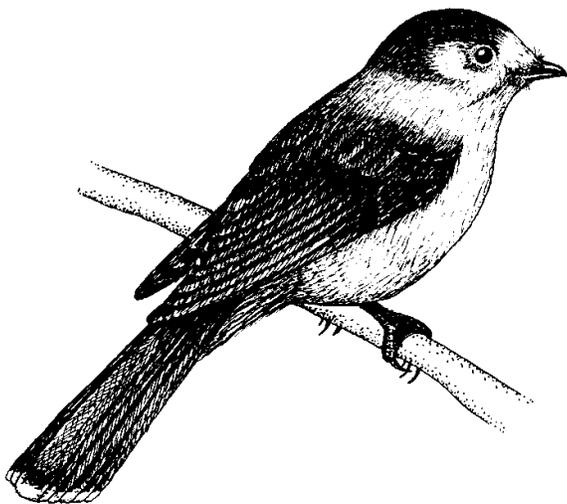
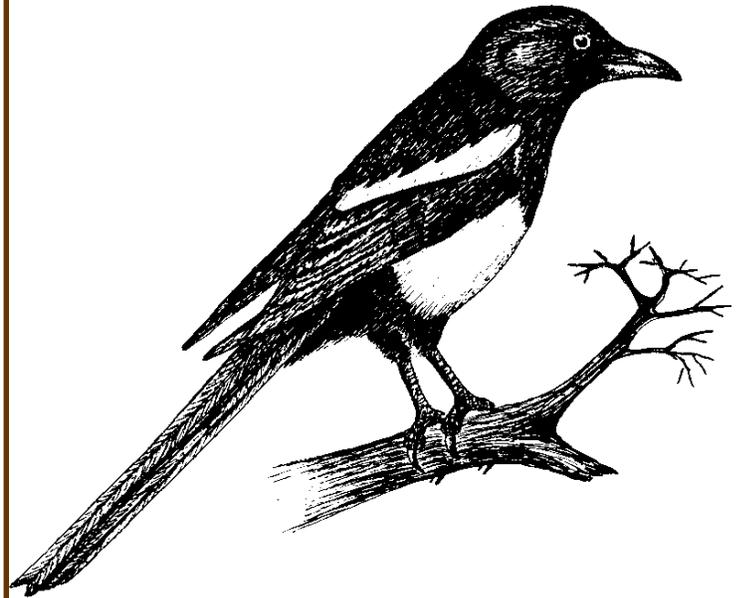
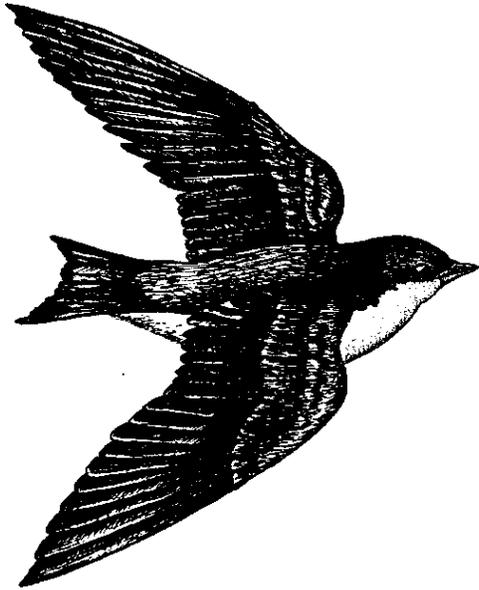
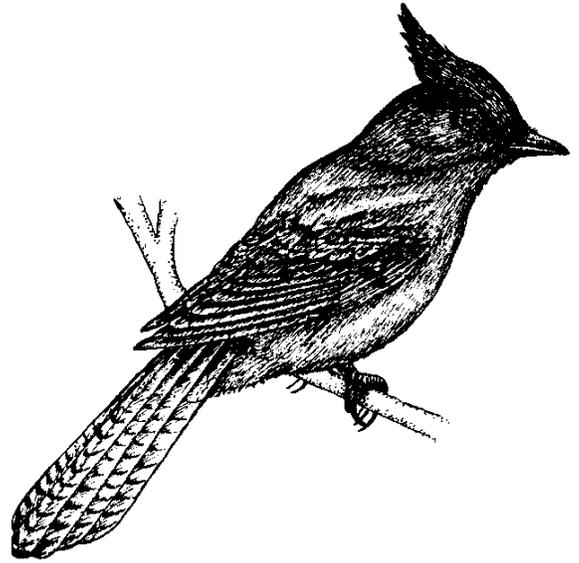
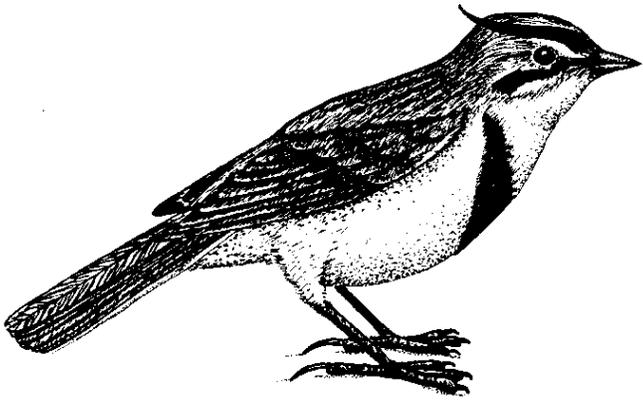
Traits: Medium-sized bird with a black back; thick, pointed bill; long, stout tail; yellow crown on males

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**

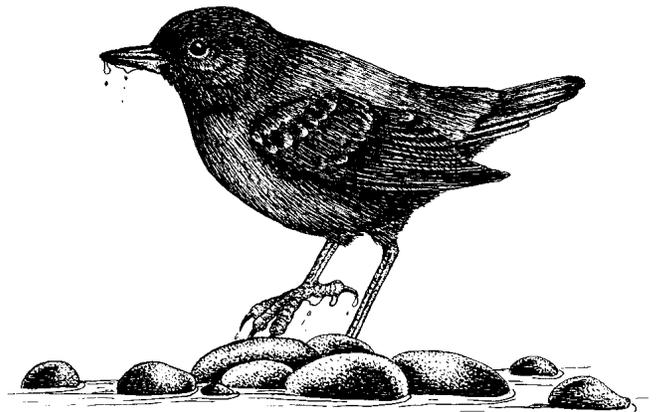
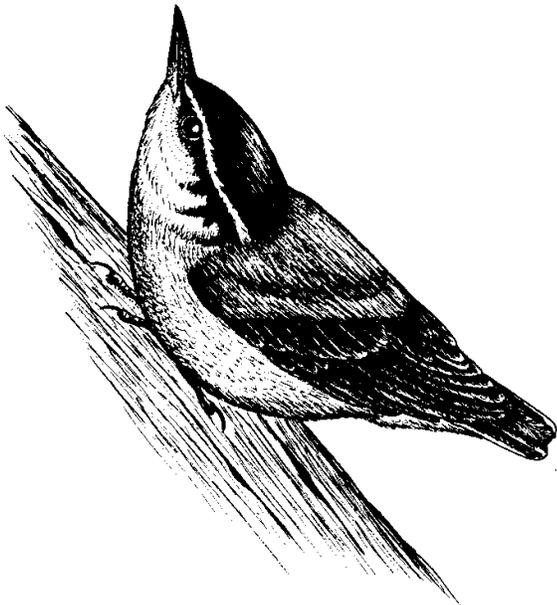
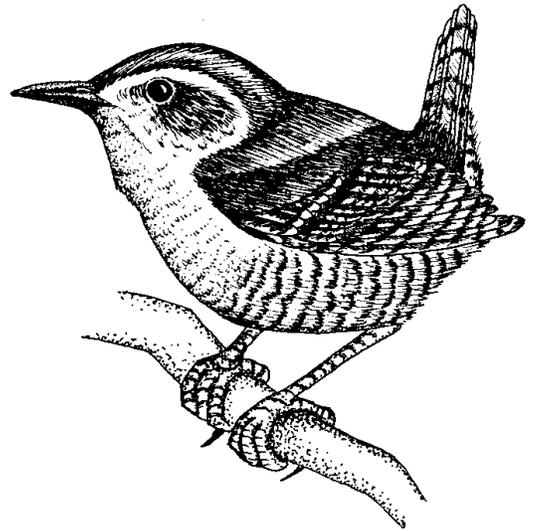
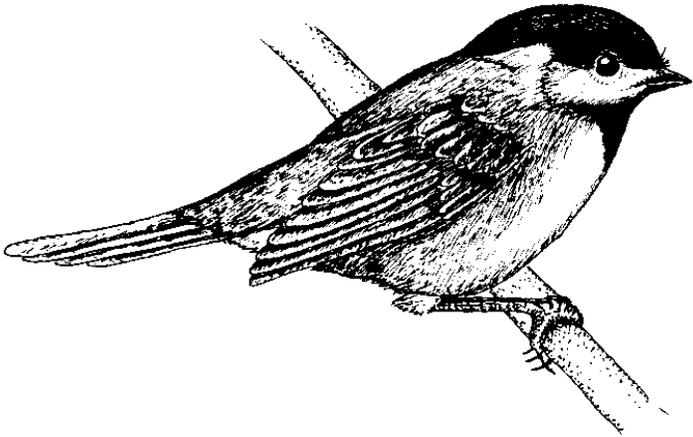
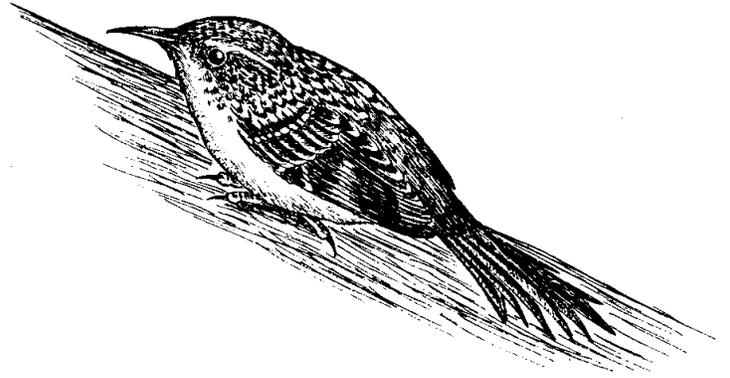
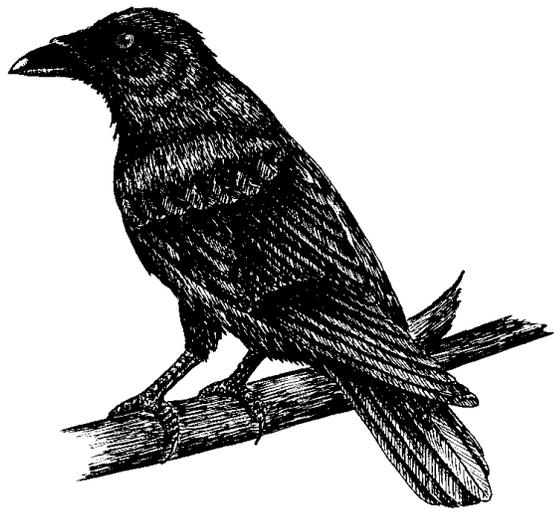
Traits: Medium-sized, gray bird with long tail; rounded wings, slightly hooked bill

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**

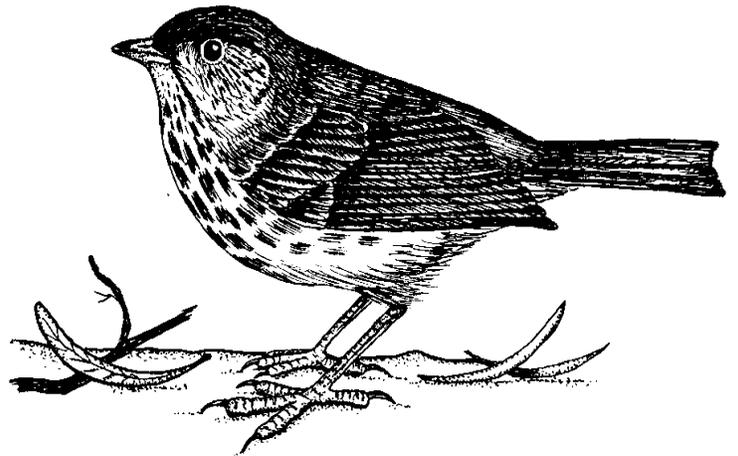
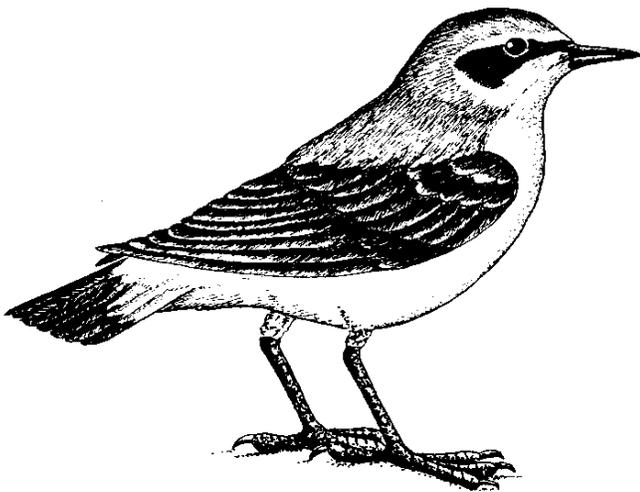
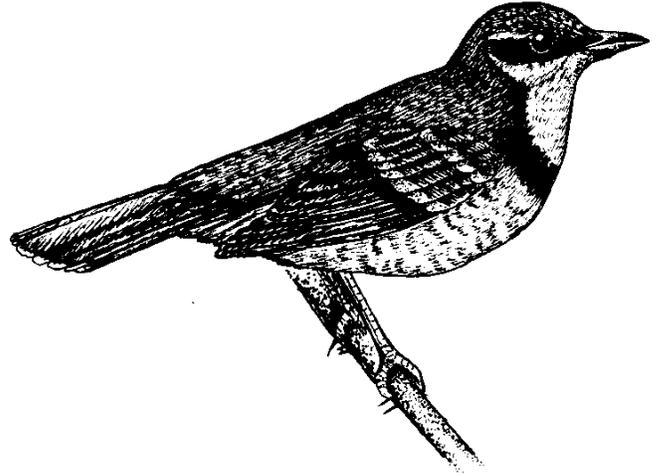
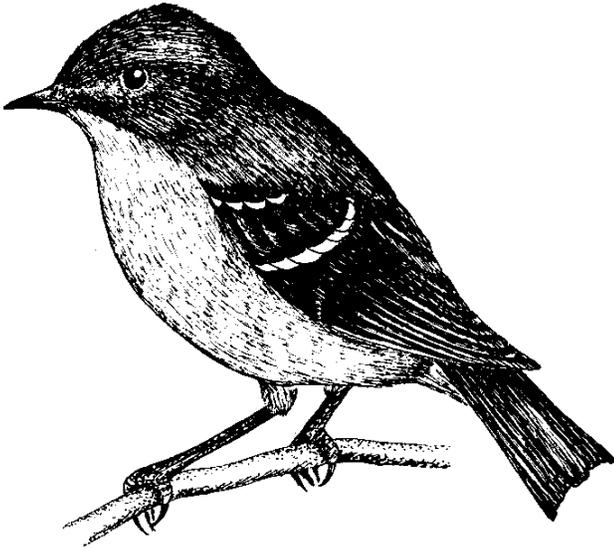
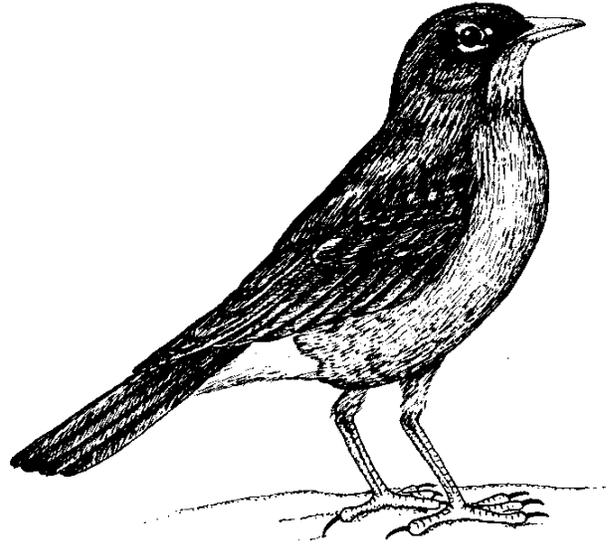
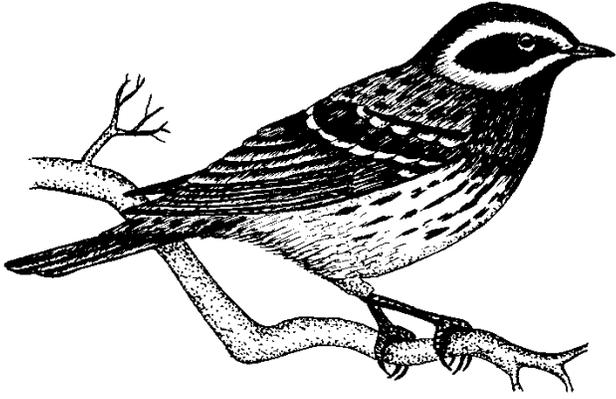
Traits: Small bird with a short tail and chunky body; long, chisel-like bill; dark gray on top, reddish underneath

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

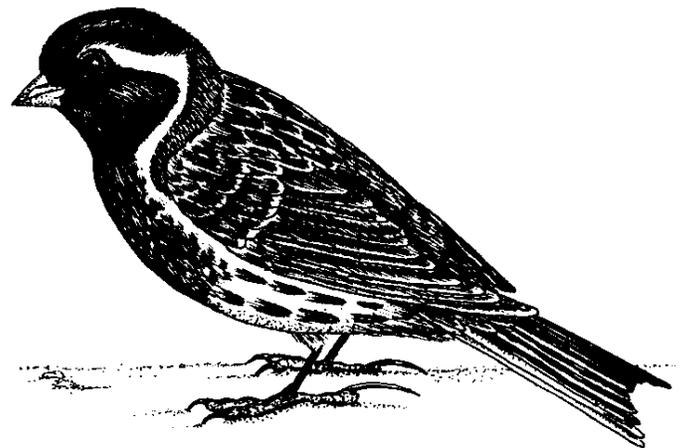
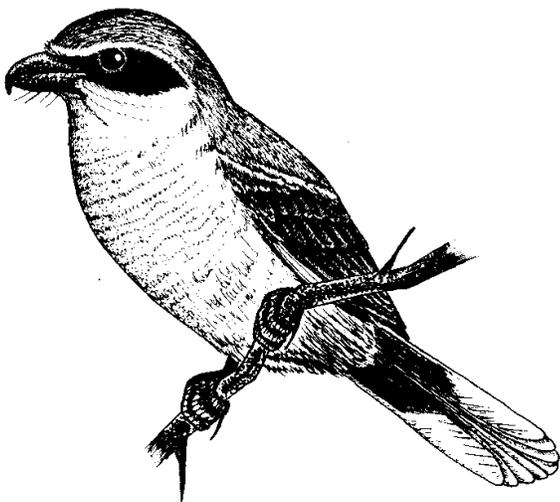
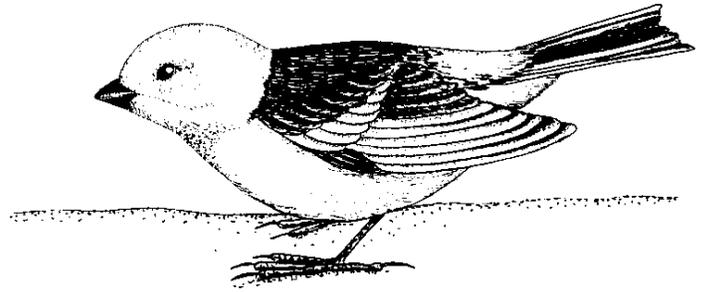
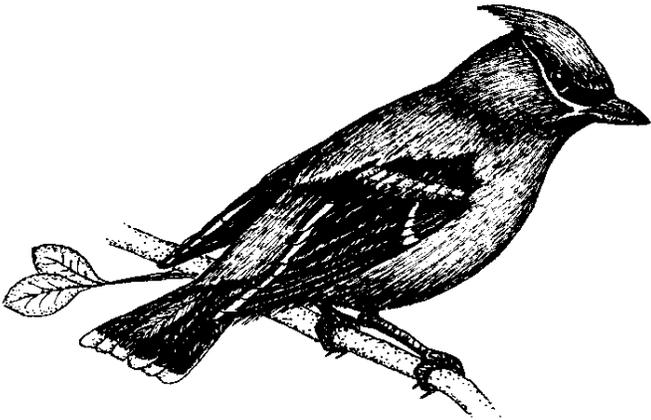
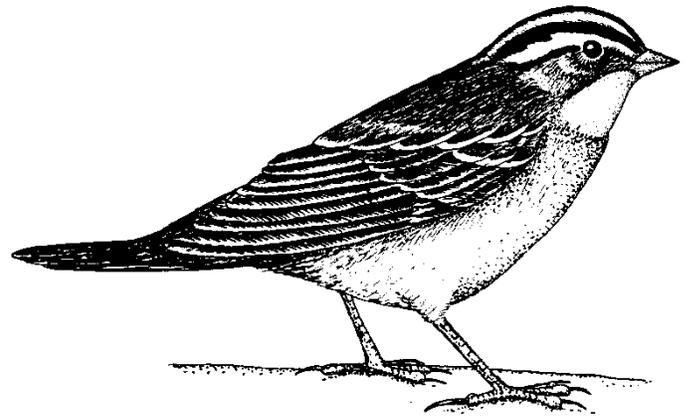
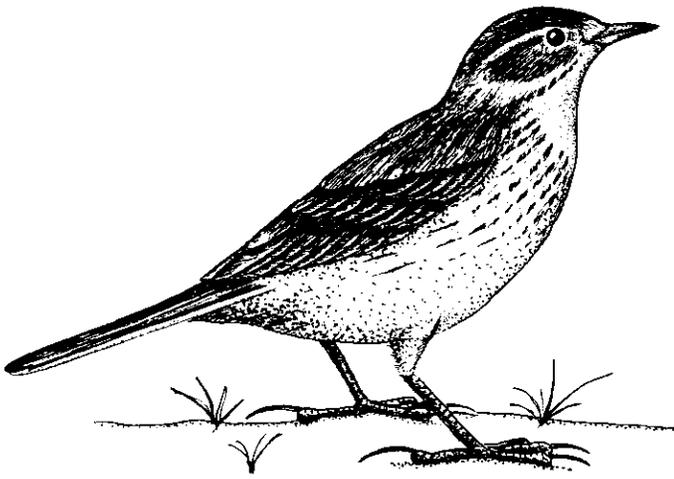
Traits: Small bird with white rump patch; black and white tail pattern like an upside-down "T"

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**

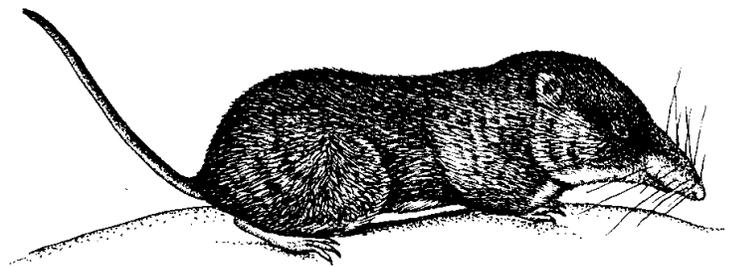
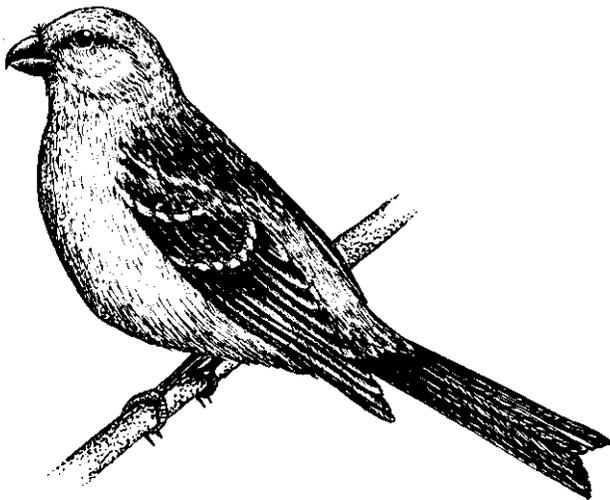
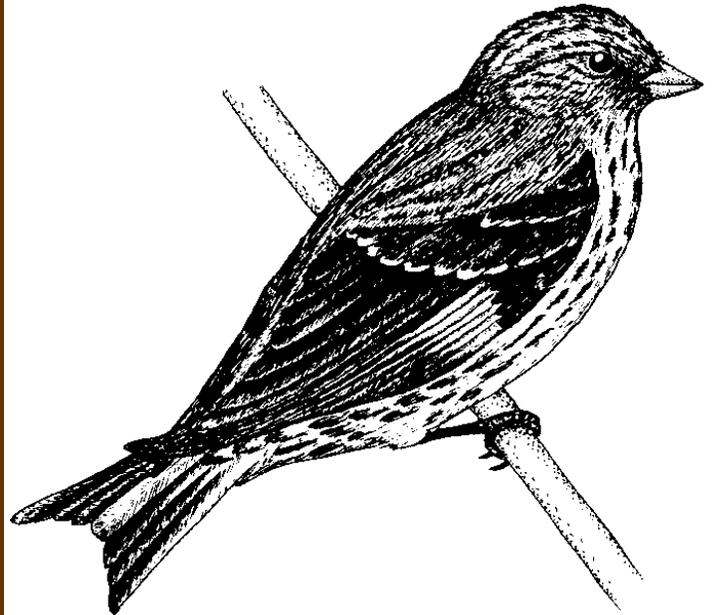
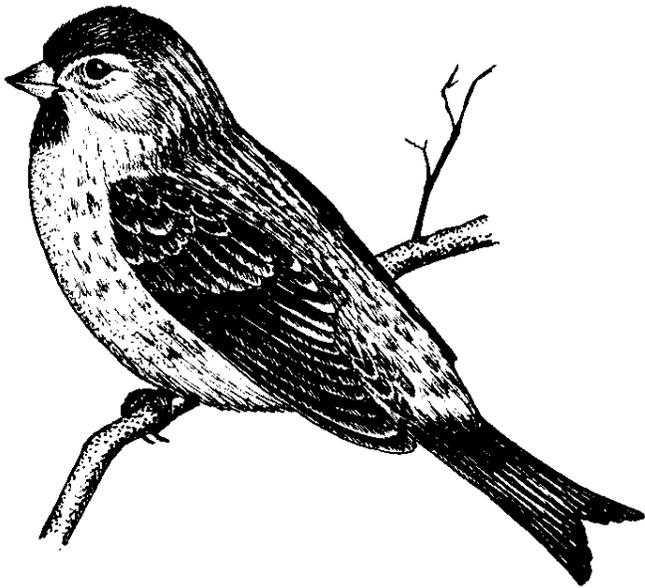
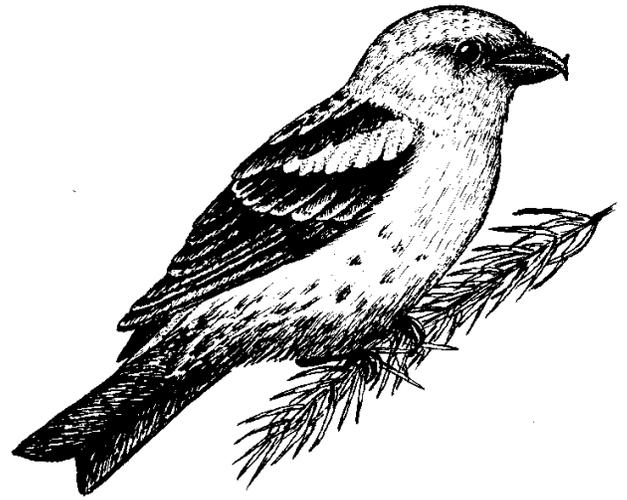
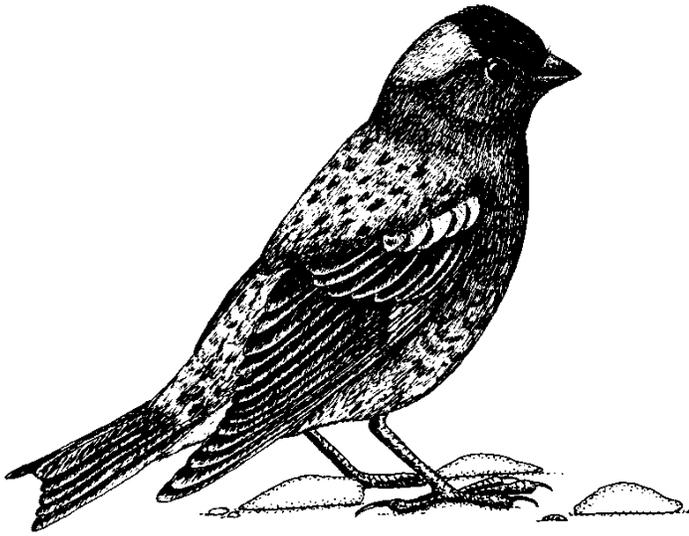
Traits: Medium-sized, gray bird with black mask; sharply hooked bill; long talons; predator

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**

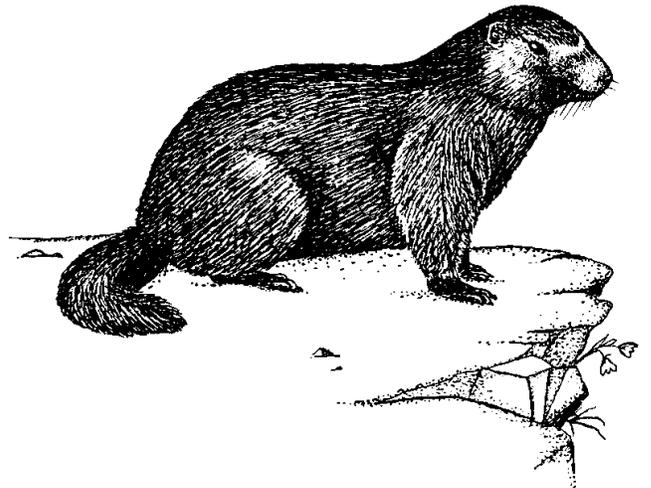
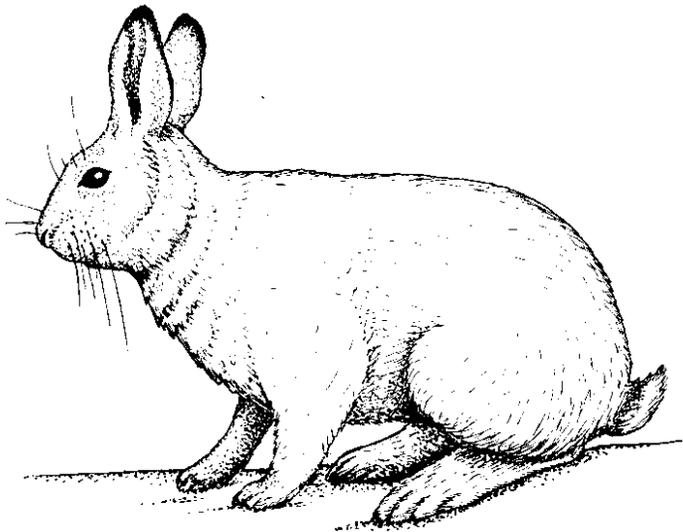
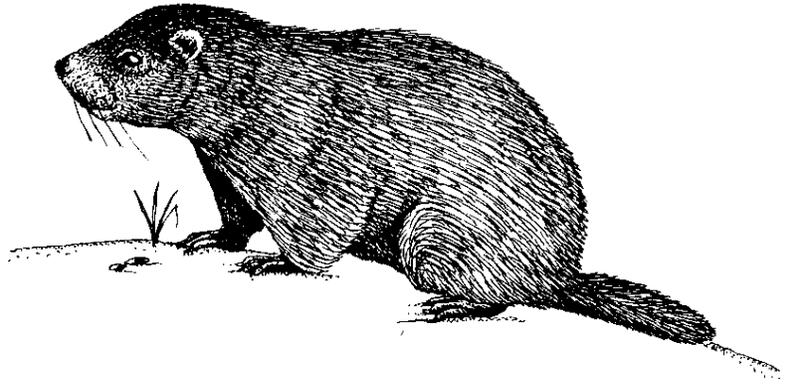
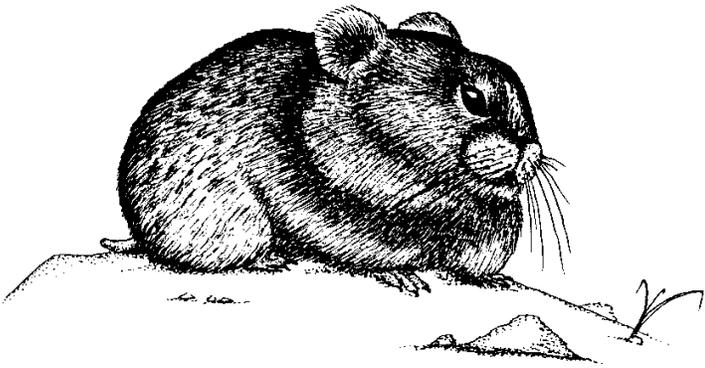
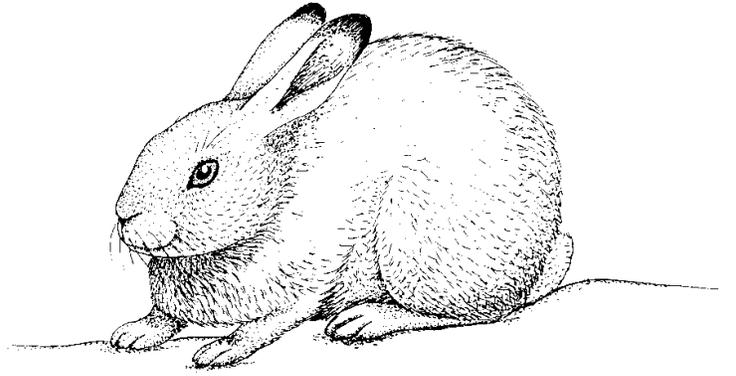
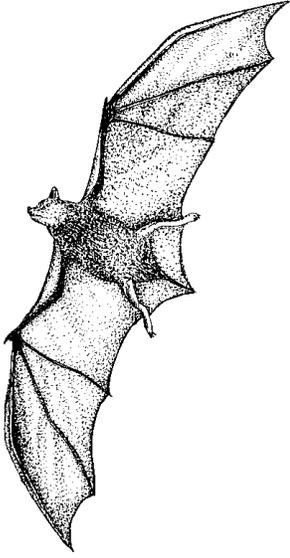
Traits: Medium-sized bird with a stout, cone-shaped bill; males are red; females are gray with gold markings.

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

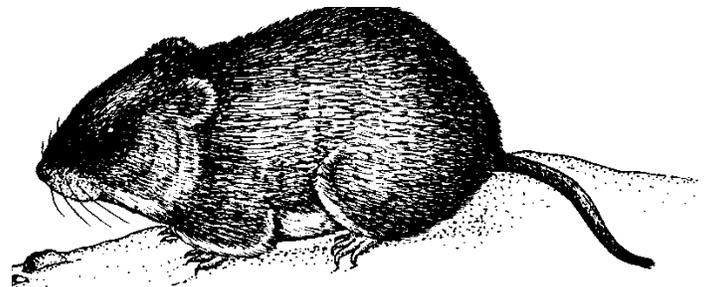
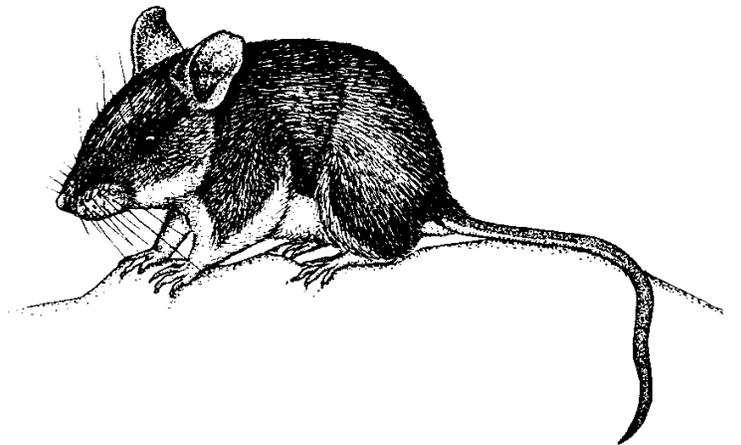
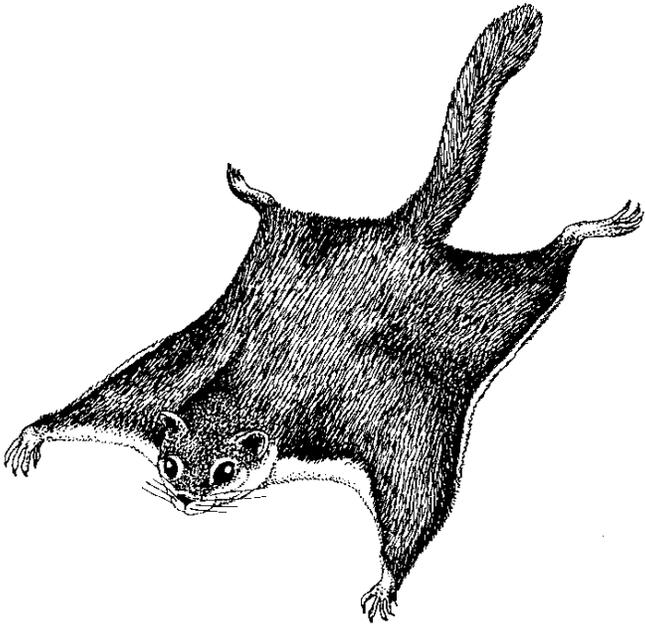
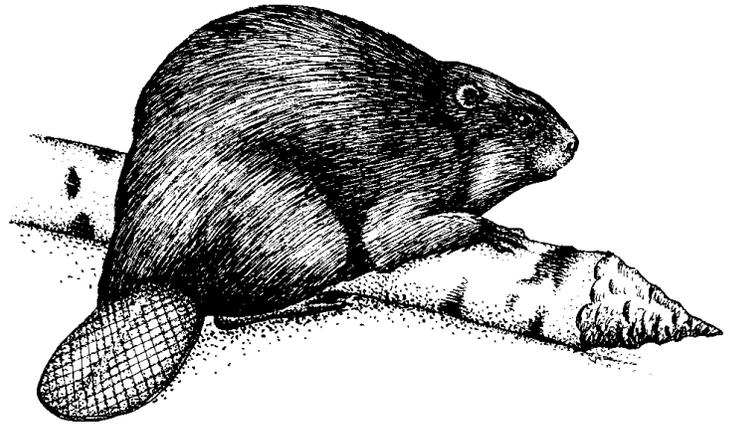
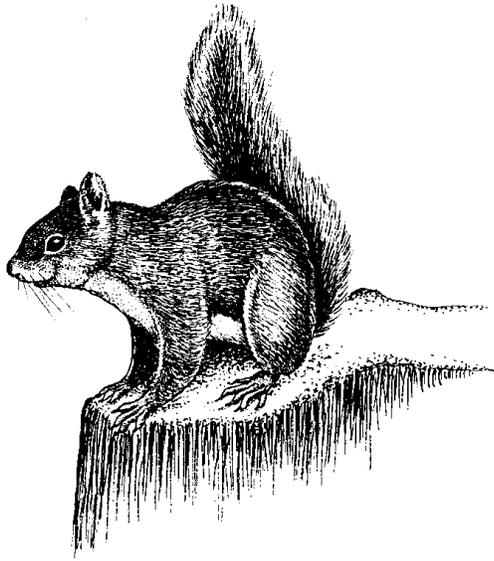
Traits: Small mammal with long front teeth for clipping twigs; large, long ears; short tail; long hind legs, and large hind feet; changes to white in winter.

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**

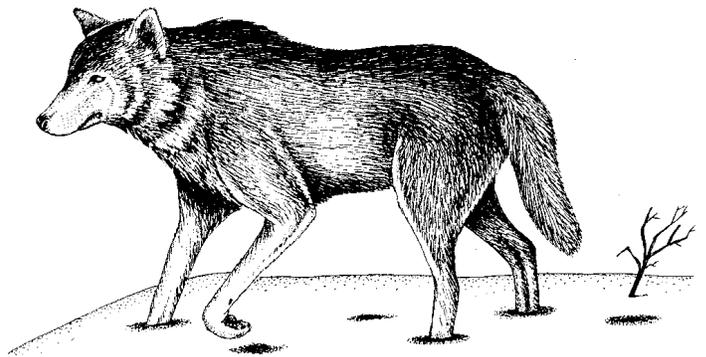
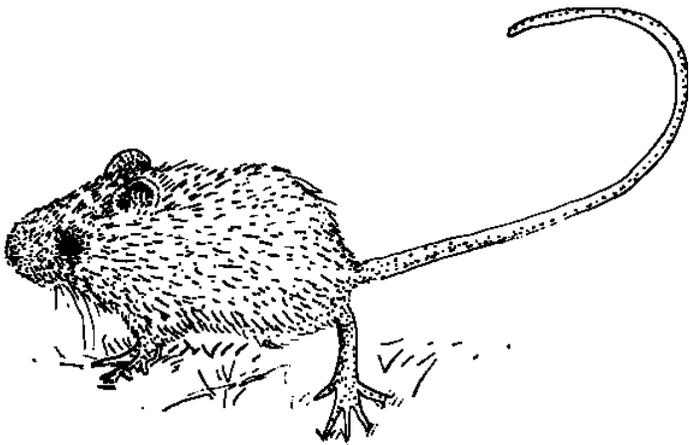
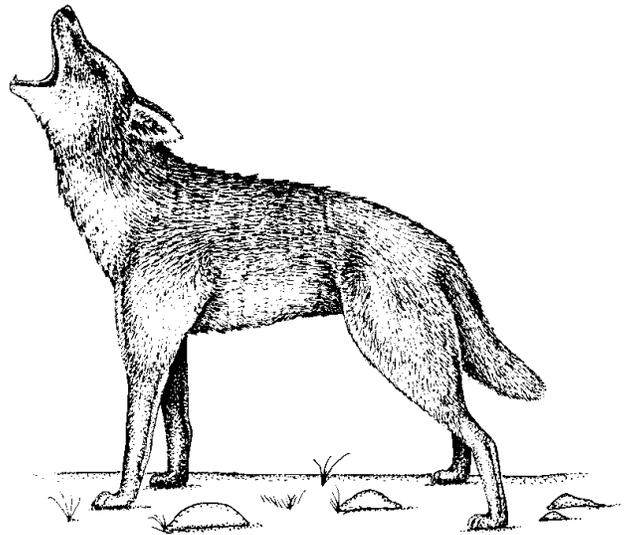
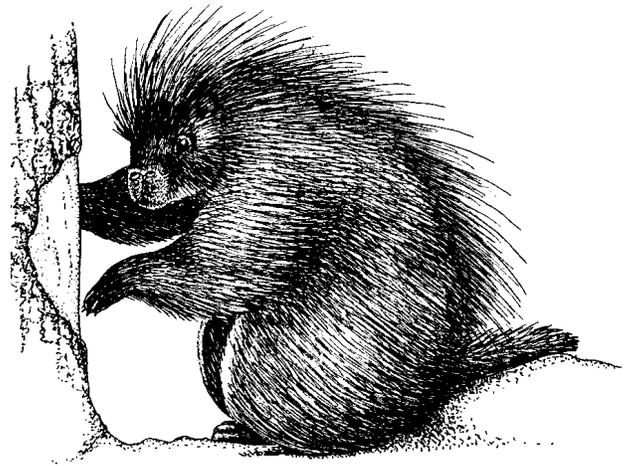
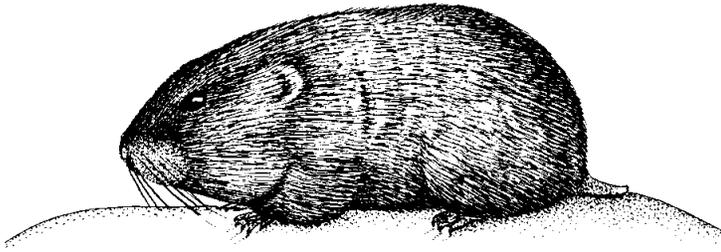
Traits: Large, reddish ground squirrel flecked with white; has a very small tail

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**

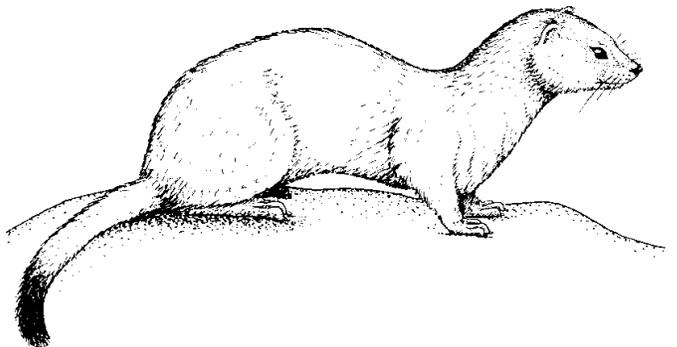
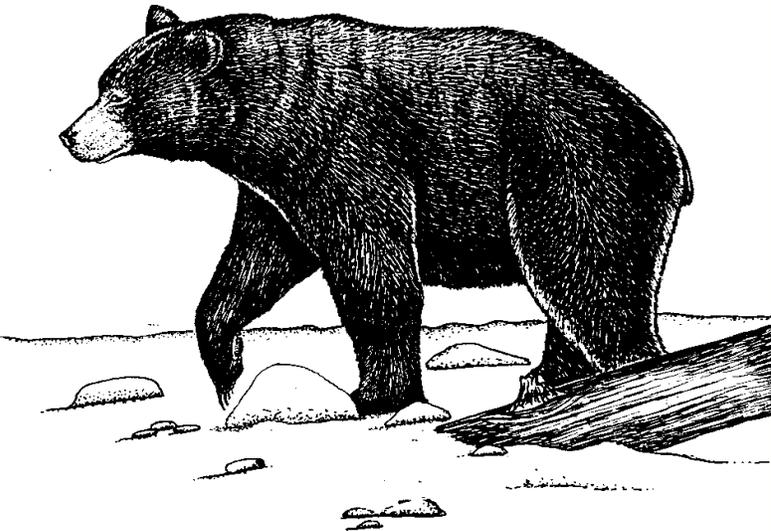
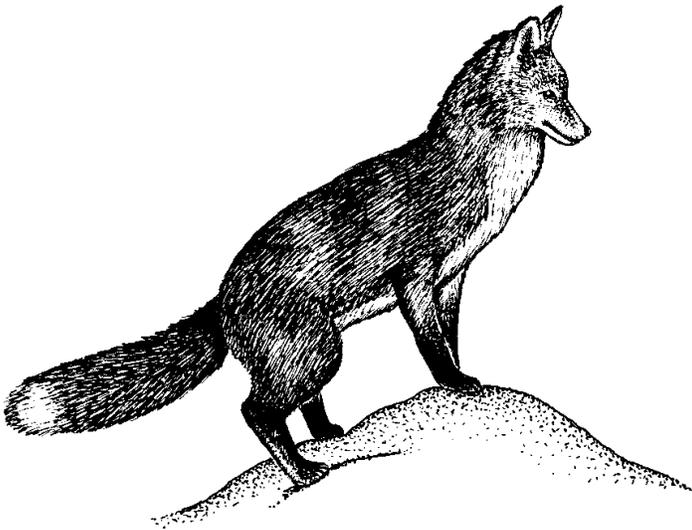
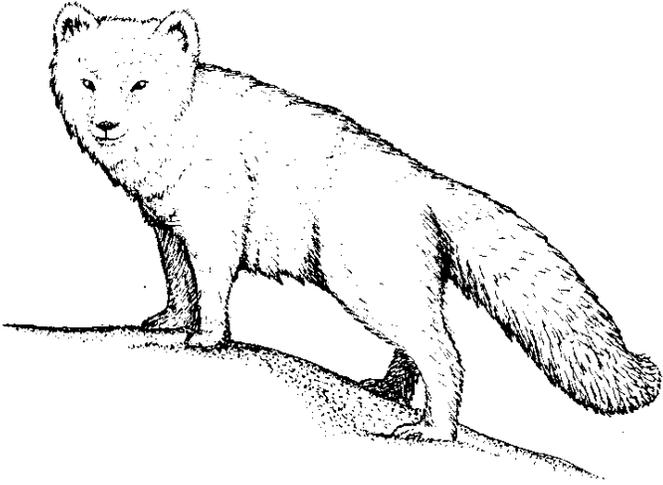
Traits: Small mammal with very long tail, large hind feet, small ears, and large front teeth for gnawing; hibernates during the winter and is primarily nocturnal.

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**

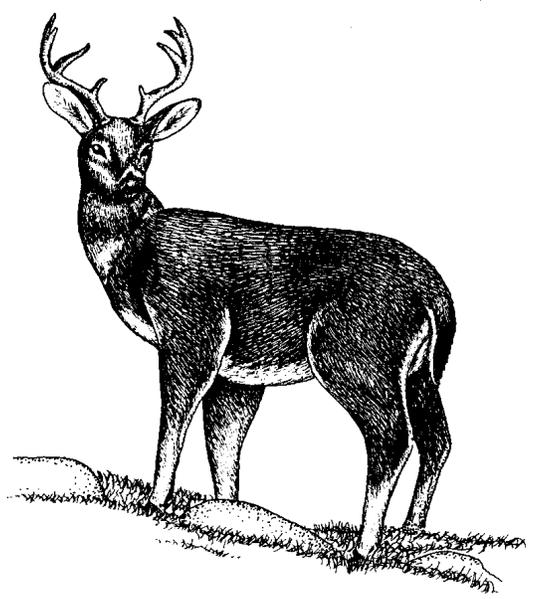
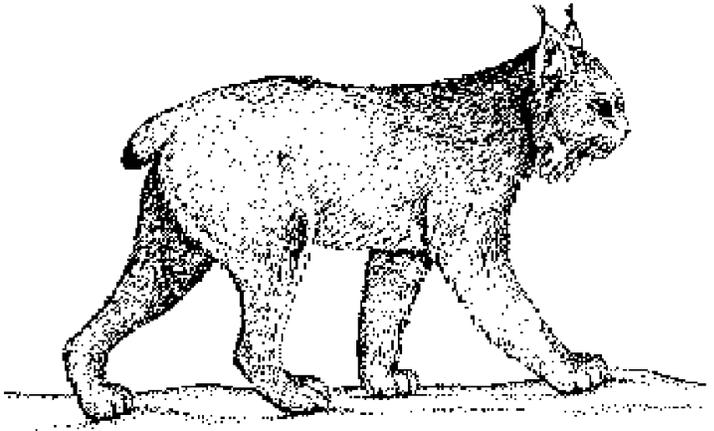
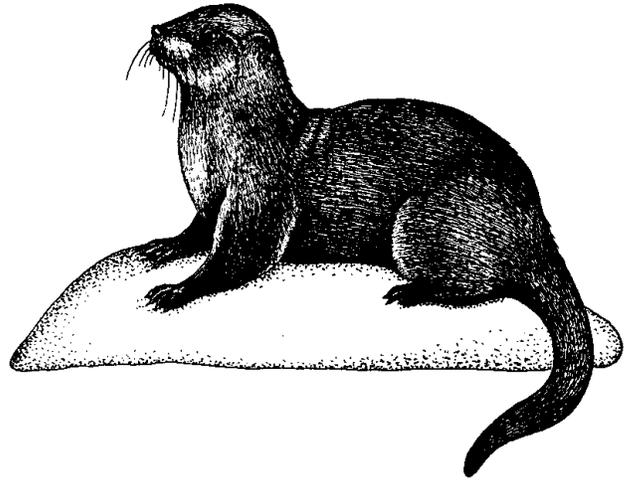
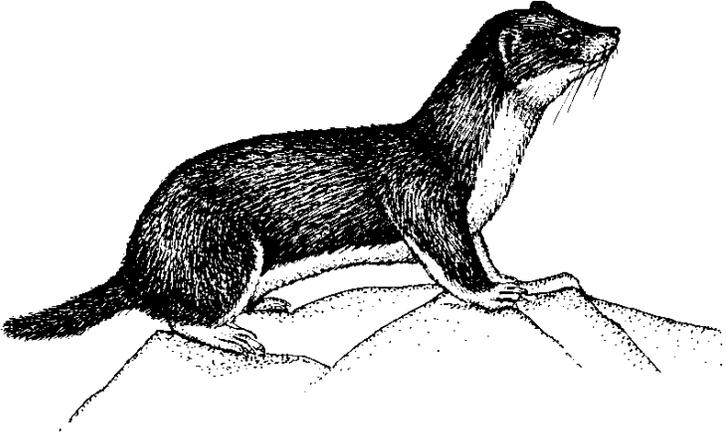
Traits: Large mammal with brown, black, or blue-gray fur; brown muzzle; short claws; sharp teeth

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**

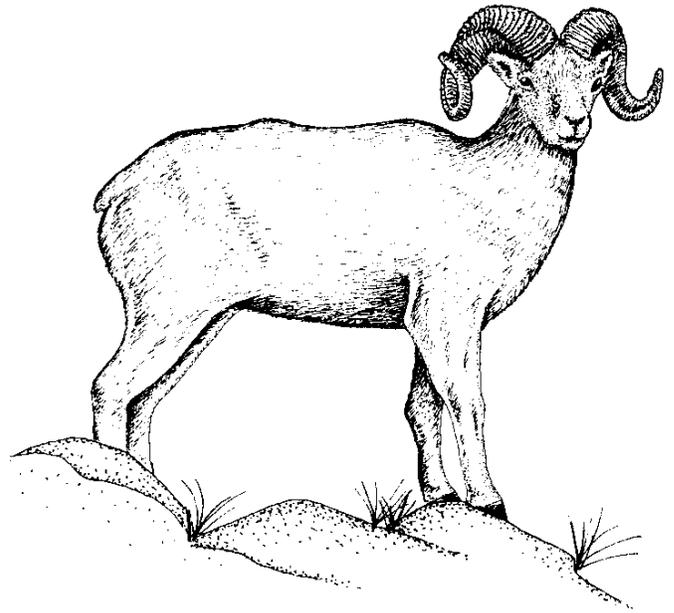
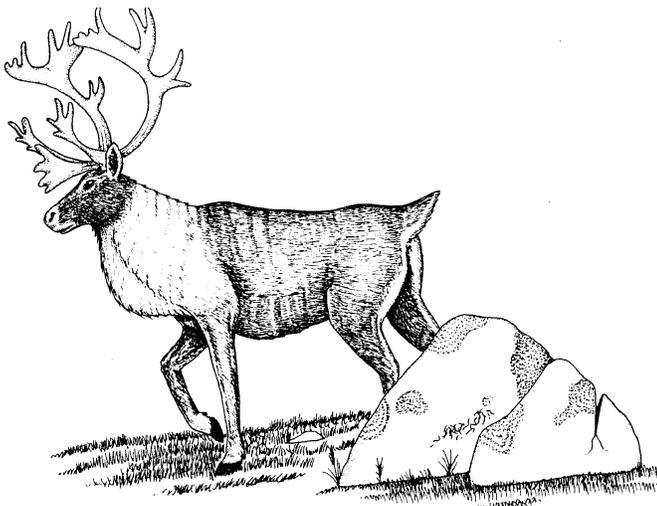
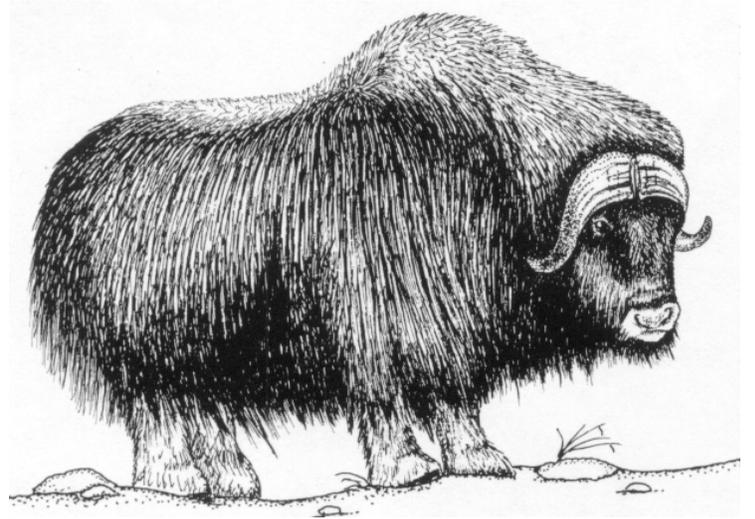
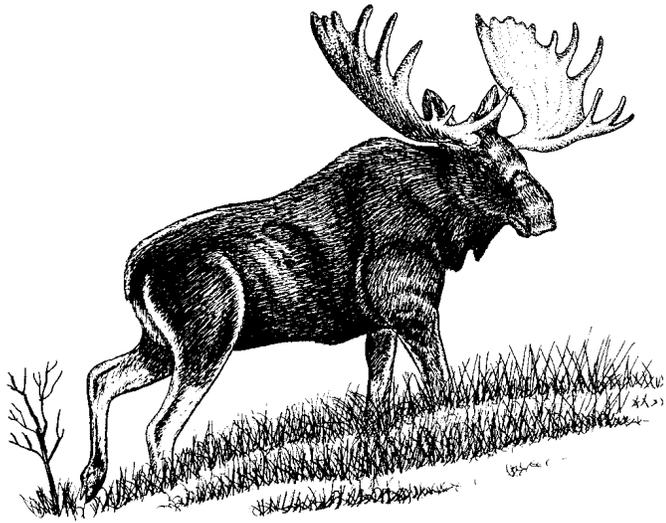
Traits: Furbearing mammal; brown with white stripes on sides; strong, well-developed teeth

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.