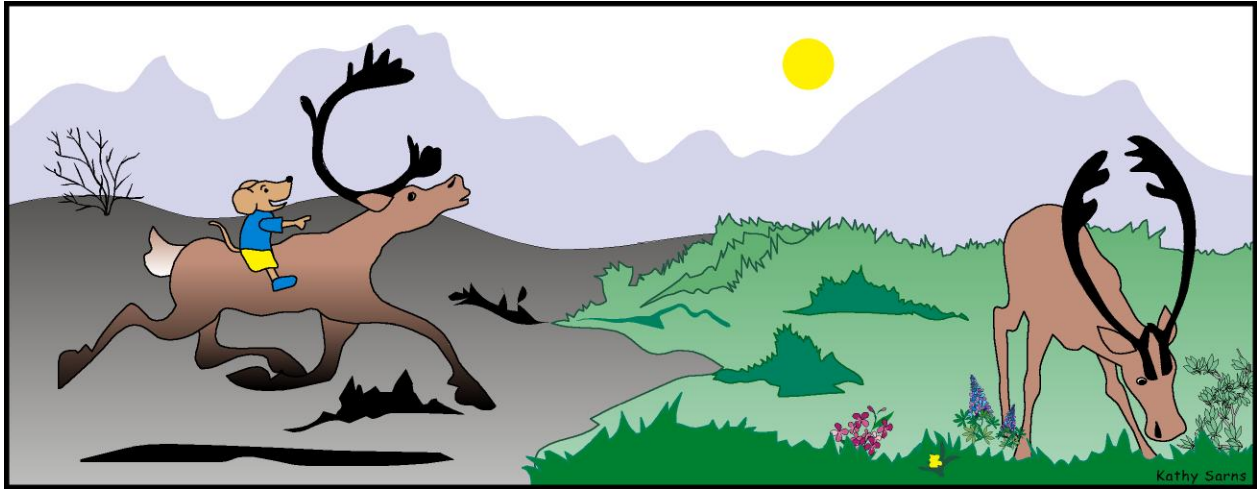


FIRE'S EFFECT ON FOREST AND TUNDRA WILDLIFE



Grade Level: 3-6

Alaska State Content Standards (2006): Art A-1, A-5; Geography C-1, C-3, E-6; Language Arts A-4, A-6; Science C-2, C-3

Subject: Science, Language Arts

Skills: Comparison, Description, Generalization

Duration: 1 class period

Group Size: 3-4

Setting: indoors

Vocabulary: successional stage

OBJECTIVE

Students will identify the habitat needs of wildlife, comparing the list of needs to the long and short-term effects of a fire.

TEACHING STRATEGY

Students will depict forest or tundra ecosystems by drawing and coloring these ecosystem habitats.

MATERIALS

- Tundra "*Alaska Ecology Cards*" or Forest "*Alaska Ecology Cards*"
- Effects of Fire on Wildlife Population
- White butcher paper
- Crayons, markers, or paints

TEACHER BACKGROUND

Tundra

While tundra areas receive little precipitation, they are often moist or wet because cool temperatures cause low evaporation rates and the water cannot seep into frozen permafrost soils. The soil also contains a high amount of organic material due to the slow rate of decay in cold climates.

Because the organic layer underneath the surface vegetation is moist and will not easily burn, fires often travel fast, burning only the grasses and other plants that are above ground. These types of fires remove the buildup of

dead material and return nutrients to the soil. Surviving roots send up new shoots and abundant regrowth occurs. In very dry years, a creeping ground fire can burn the organic layer of the tundra. This type of fire will destroy giant roots and can smolder for many months, even occasionally through the winter. When this occurs, succession progresses from seeds brought in or roots growing back from those in surrounding unburned areas.

Tundra fires may be started directly by lightning or by fires spreading from adjacent forests. They usually occur during late May, June, and early July when temperatures are warm and fuels are dry. If it has been a dry year, there may be fires later in the summer, which could develop into a creeping ground fires that burn deep into the organic layer. Fire is unique in tundra areas because there is less lightning in the northern and western parts of Alaska where tundra predominantly occurs. One area of tundra may burn almost every year, and other areas may never burn.

To evaluate the potential effects of a tundra fire on wildlife it is important to consider when the fire occurred. The tundra supports many migrant animals that may stay for a very short time and may depend on a specific food source found at a specific time of the year. If that food source is destroyed during a fire, the short-term effect may be slight if the animal is not a current resident of the tundra. However, the impact may be greater if the animal returns and cannot find the important foods needed for migration.

The following examples can be discussed with students to help them consider how wildlife use the tundra during various times of the year:

1. Many migrating birds arrive in Alaska during April and May. Waterfowl consume mosquito larvae and plants during breeding and nesting. A fire in early summer could have a detrimental short-term effect on nesting waterfowl. The birds may be forced to abandon their nest or be killed. If the fire occurs late in the nesting period, there may not be enough time to nest again. After eggs have hatched, the young birds can move into lakes or rivers where they can escape fire. Most bird species leave the tundra during August and September and would not be affected by late season fires.
2. It is also important to recognize the long-term effects of fire. In years following a fire, dense grass cover often grows around the shorelines of wetlands. This thick grass provides good nesting cover, which can increase nesting production. Fires also release nutrients back into the soil and nearby water sources. These nutrients increase mosquito larva populations and underwater plant production, providing important food for ducklings.
3. Tundra fires can have both short and long-term effects for caribou. A tundra fire (depending on its size) may have less of an impact on migrating caribou since they can move to other areas to feed. The Western Arctic herd calves and spends the summer on the North Slope feeding on young sedges and

willow shoots. In the fall they return south to Western Alaska where they over winter, eating grasses, shrubs, and lichens. The short-term effect on grasses, sedges and shrubs appears to be mostly positive because of the abundant regrowth available to caribou. However, for some species of lichens that take 30-40 years to develop, fire has a more detrimental long-term effect. There is still some question as to how essential lichens are in the winter diet of the caribou.

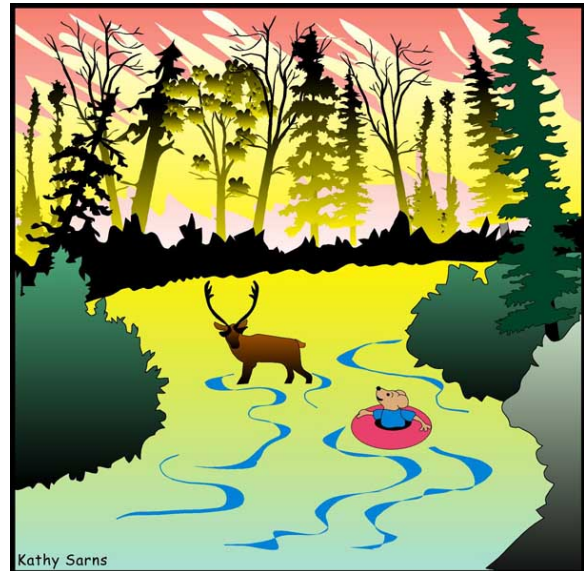
For more information see "Facts about Fire, Unit 2 --How do Tundra Fires Affect Wildlife Populations?"

Boreal Forests

Fires have occurred in the boreal forest of interior Alaska for thousands of years. This is clearly shown by charcoal layers in soil, fire scars on trees, and the mosaic pattern of the boreal forest. Scientists believe that lightning-caused fires have occurred in Alaska's boreal forest and tundra since the last ice age, 10,000 years ago. These natural fires, as well as man made fires, have helped create the boreal forests we have today. These fires both harm and help wildlife.

Certainly some animals, including nesting birds, voles, squirrels, and hares, are killed by fire. But surprisingly few dead animals are found after fires. Many birds and large mammals apparently escape the flames by flying or running away. And small mammals, such as voles and squirrels, sometimes escape fire by moving into underground burrows. Scientists think most vertebrate animals killed by wildland fires die of suffocation from the smoke rather than from the heat. Most

invertebrate organisms in the surface soil and on vegetation are killed by fire.



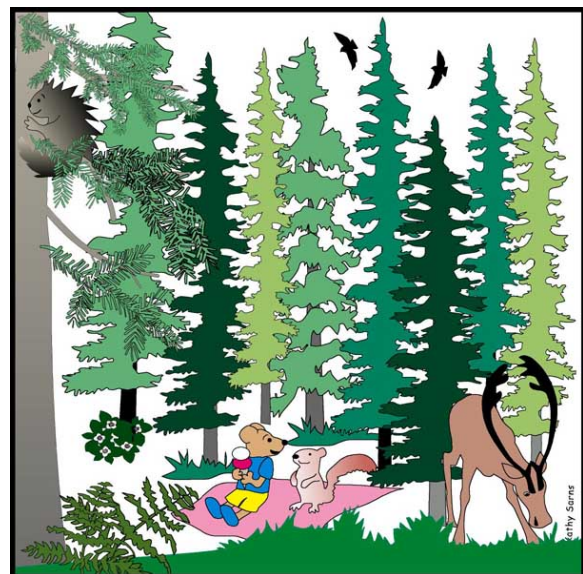
The most important effects of fire on wildlife are not the deaths caused by the flames and smoke, but the indirect effects caused by changes in plant communities. Some wildlife species are harmed by these changes, while other species benefit. By removing trees, shrubs, herbs, and lichens, fire essentially removes the food and cover (habitat) for some wildlife. These organisms cannot find homes in recently burned areas and are forced to move to other areas or die. Other species of wildlife move into and use burn sites. The species and numbers of animals that move into a burned area depend largely upon the kinds of plants that become established and the rate at which these plants grow. In general, as plants re-invade a burned area and succession proceeds, wildlife also reappears and some species flourish. The "Effects of Fire on Wildlife" handout provides more information on the effects of fire on specific species of wildlife.

A few wildlife species find food and cover in a burn site immediately after a forest fire. Bark beetles have built-in smoke detectors and heat sensors to help them locate burned areas. As growing numbers of beetles attack the burned trees, their predators, three-toed and black-backed woodpeckers, congregate in the burned areas to feed. Other predators such as foxes, coyotes, hawks, and owls often hunt in recent burns, probably because the voles and other small mammals that remain have little cover and are easy prey. As plant succession proceeds soils enriched by ashes provide the nutrients needed for a flush of plant growth. Grasses, herbs, and seedling shrubs and trees provide a rich source of food for insects and seed-eating birds and mammals. Far from devoid of life, a young burn is often alive with a wide variety of insects, along with hares, voles, shrews, sparrows, and flycatchers. These animals attract predators like foxes, coyotes, red-tailed hawks, northern hawk-owls, and American kestrels.

As the shrub stage develops wildlife begins to flourish. Young trees and tall shrubs provide new nesting and feeding sites for birds. New species, including some warblers, sparrows, thrushes, and sharp-tailed grouse, may begin using the burn site at this stage. Due to abundant herbs, grasses, shrubs, and cover provided by fallen trees, the shrub stage of succession may provide habitat for larger numbers of small mammals and certain ground-nesting birds than any other **successional stage**. This abundance of prey supports similarly high numbers of predators, including fox, weasels, and marten. In general, these species of predators are more abundant in this early stage forest than

in any other stage. If hardwood trees and shrubs are abundant, moose and snowshoe hares may also find an abundant and nutritious food supply in this successional stage. As their numbers increase, predators such as wolves and lynx may also move into the burn area.

Once the saplings have grown into trees, they shade out smaller shrubs, other saplings, and many ground cover plants like fireweed and grasses. In this maturing forest animals that needed these plants die out or are forced to move to other areas in search of appropriate food and cover. Among the affected species are moose and hares when tree branches have grown out of their reach. Many of the seed-eating and shrub-nesting birds are also displaced, including most sparrows. Other species of wildlife, including ruffed grouse, Swainson's thrushes, yellow-rumped warblers, and sharp-shinned hawks, find ideal habitat in this forest stage.



As hardwood trees are replaced by spruce, wildlife that prefers spruce trees

displace those that need hardwood forests. As this forest matures or ages, porcupines, red squirrels, caribou, white-winged crossbills, spruce grouse, boreal chickadees, goshawks, Swainson's thrushes, and Townsend's warblers become the wildlife typical of old stands of spruce trees.

Fires rarely burn evenly. They burn in patches, completely burning some parts of the forest or tundra and leaving other parts untouched. This patchy burning pattern helps maintain the vegetation mosaic of different successional stages. The areas of the mosaic where different habitat types meet are called **edges**. Because some wildlife require more than one habitat type to provide their needs, edges offer the opportunity for the greatest diversity of animals. Many wildlife species prefer the edges found between vegetation types, using these areas for feeding and travel. Many animals will feed in earlier successional stages and seek cover in old forests, particularly during winter. These include snowshoe hares, lynx, bear, marten, moose, and resident birds.

Many of the wildlife of the boreal forest depend upon repeated and sporadic fires to create and maintain the forest mosaic. Just as plant populations change through succession, so do those of wildlife. Some boreal forest wildlife find the best habitat in recent burns or the shrub-sapling stage of succession, while others fulfill their habitat needs in old forests (see "Effects of Fire on Wildlife" handout). Some species apparently require both early and late stages of succession. The abundance of wildlife in the boreal forest is largely a result of the variety of habitats and edges provided by the forest mosaic.

PROCEDURE

1. Divide the class into groups of 3 or 4.
2. Randomly distribute several Forest or Tundra "*Alaska Ecology Cards*" to each group. Have the groups discuss the habitat needs of each wildlife species.
3. Give each group a large piece of white butcher paper and something to color or draw with. Each group is to design either a forest or tundra ecosystem that provides all the necessary habitat requirements for their wildlife. Students can be creative and design habitats that they think would be more beneficial to the wildlife than a natural ecosystem might be.
4. When the students have completed their drawings, each group will present their ecosystem to the class and explain how it supports each type of wildlife included. As the presentations are completed, place the drawings in a display on the wall and tape the wildlife cards to each drawing.
5. Have each student write a paper explaining the short-term and long-term effects of fire on each wildlife species in their habitat drawings. Try to answer the following questions:
 - a. If fire burned through just one of the drawings, would there be habitat available for all the wildlife to move into the habitats provided by the other drawings?
 - b. Would the fire's impact on wildlife be different if the fire

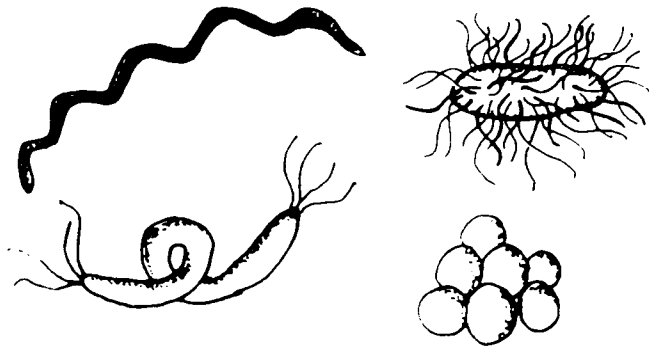
- burned early or later in the summer?
- c. In a boreal forest habitat, what would be the effect of the area developing into the next successional stage?
 - d. If there was a village on the edge of one of the drawings, how would fire affect the people? Would the fire affect subsistence?
 - e. Discuss how diversity in vegetation will support a larger diversity in wildlife. Notice that the different drawings create a vegetative mosaic.

EVALUATION

Have students choose one animal in their drawing and write a story about the effects of a fire from the animal's point of view.

EXTENSION

Students may wish to make diagrams of habitats needed by their wildlife.



1. Bacteria *

TRAITS: Are microscopic organisms that may be round, rod-shaped, or spiral-shaped.

HABITAT: Some types of bacteria occur in every moist environment; a tablespoon of soil may contain millions of bacteria.

FOODS: Mainly dead plant, fungi, and animal materials; some kinds of bacteria live as parasites of living things, and some are able to make their own food by photosynthesis.

EATEN BY: Some fungi and invertebrates.

"GEE WHIZ": Bacteria are the major decomposers in some ecosystems. They can survive long periods of inactivity and unfavorable conditions. Some bacteria are parasites and cause diseases of plants, animals, or fungi; others live in the digestive tracts of animals and aid digestion.



2. Crustose Lichens *

TRAITS: Crustlike, thin lichens.

HABITAT: Grow on rocks, bones, etc.

FOODS: Lichens make their own food by photosynthesis.

EATEN BY: Mites, some worms.

"GEE WHIZ": Lichens are actually made up of two living things: an alga and a fungus.



3. Fruticose Lichens *

TRAITS: Shrublike, branching lichens.

HABITAT: Grow on dry or moist ground and in trees.

FOODS: Lichens make their own food by photosynthesis.

EATEN BY: Caribou, lemmings, mites, some worms.

"GEE WHIZ": Lichens are actually made up of two living things: an alga and a fungus.



4. Foliose Lichens *

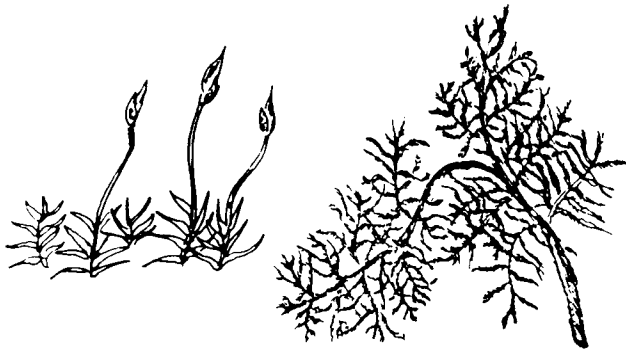
TRAITS: Scaly, flat, leafy lichens.

HABITAT: Grow on moist soil and in trees.

FOODS: Lichens make their own food by photosynthesis.

EATEN BY: Caribou, lemmings, mites, some worms.

“GEE WHIZ”: Lichens are able to survive very long periods of unfavorable conditions by becoming inactive, or dormant; some lichens have been revived after being dormant for 100 years.



5. Mosses *

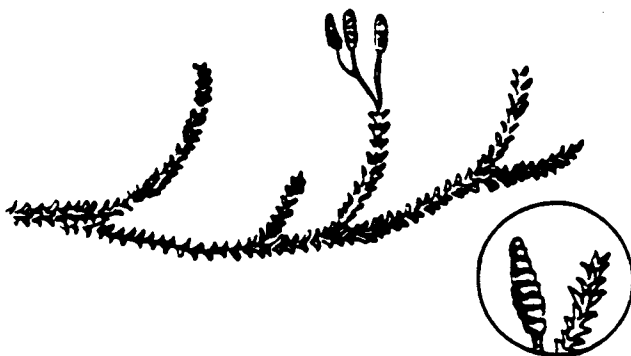
TRAITS: Mosses with feather-like leaves that soak up and hold water; includes feather mosses and *Sphagnum* spp. mosses.

HABITAT: Moist soil, rocks, and logs of the boreal forest and tundra; often form thick, spongy mats that cover large areas.

FOODS: Make their own food by photosynthesis.

EATEN BY: Springtails, mites.

“GEE WHIZ”: *Sphagnum* mosses have been used as a substitute for gauze in surgical dressings and as diaper lining by the Eskimos. *Sphagnum* moss can hold up to 20 times its dry weight in water.



6. Club Mosses *

TRAITS: Ground cover plant; stems may grow upward or along the ground; spores usually borne in cone-like structures located at the tips of upright stalks.

HABITAT: Moist ground.

FOODS: Makes its own by photosynthesis.

EATEN BY: Springtails, mites.

“GEE WHIZ”: Club mosses have the ability to 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 mosses.

7. Moss Campion T

TRAITS: A low “cushion” plant covered with small, light pink flowers.

HABITAT: Dry soil in alpine and lowland tundra.

FOODS: Makes its own food by photosynthesis.

EATEN BY: Dall sheep.

“GEE WHIZ”: Moss campion grows low to the ground in a cushion shape which helps it to avoid strong winds and hold heat.



8. Horsetails *

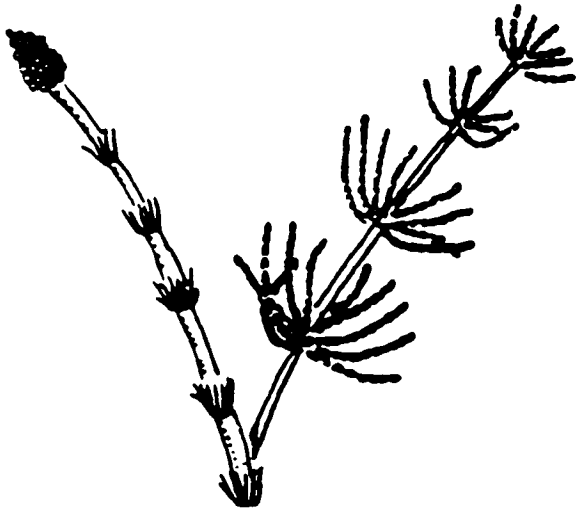
TRAITS: Horsetails have scale-like leaves and distinctly jointed stems.

HABITAT: Wet or moist soils in forests and open areas.

FOODS: Makes its own by photosynthesis.

EATEN BY: Bears, grouse, moose.

“GEE WHIZ”: Horsetail stems contain silica (the element in sand) and can be used for scouring pots and pans. They are also called “scouring rushes.”



9. Grasses *

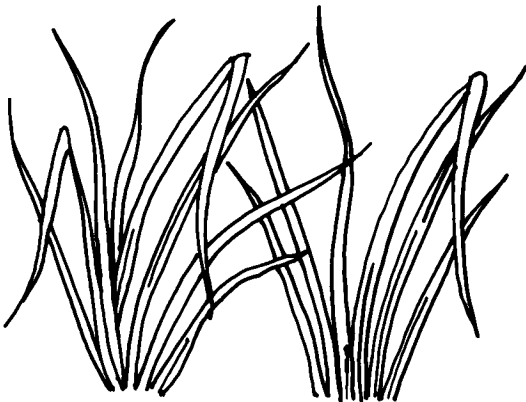
TRAITS: Ground cover with long, narrow leaves.

HABITAT: Wet, moist, and dry soils.

FOODS: Make their own food by photosynthesis.

EATEN BY: Caribou, lemmings, voles, ground squirrels, snowshoe hares, marmots; their seeds are eaten by snow buntings, longspurs, and redpolls.

“GEE WHIZ”: Grasses have long, narrow leaves which are less likely to be shredded or ripped by strong winds.





10. Sedges *

TRAITS: Herbs with long, narrow leaves and solid stems. Vary from 1 to 39 inches in height. Tiny, inconspicuous flowers grow in clusters.

HABITAT: Moist or wet ground.

FOODS: Sedges make their own food by photosynthesis.

EATEN BY: Caribou, muskox, Dall sheep, ground squirrels, pikas, marmots, lemmings, voles, geese; also seed-eating birds, such as snow-buntings, longspurs, and rosy finches, eat seeds from the sedges.

“GEE WHIZ”: The long, narrow leaf shape of sedges reduces fraying by strong winds.



11. Cottongrass *

TRAITS: Herbaceous plant with long, narrow leaves, and solid stems. This misnamed sedge has tufts of white cotton-like bristles on the seeds.

HABITAT: Grows on moist or wet ground.

FOODS: Makes its own food by photosynthesis.

EATEN BY: Caribou, muskox, lemmings, voles, geese.

“GEE WHIZ”: The cottony seeds of these plants are scattered by the wind.



12. Dryas *

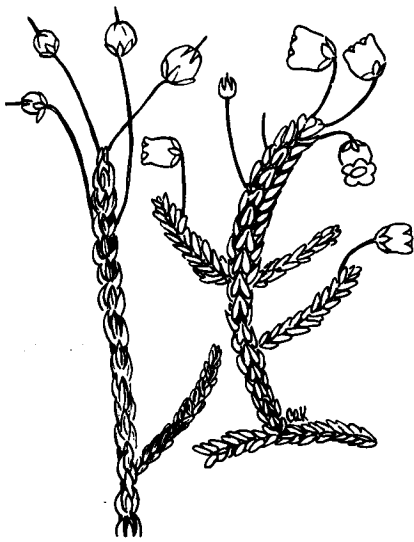
TRAITS: Often matted, low-growing, evergreen, herbaceous dwarf shrub. Leaves narrow, sometimes wavy- edged.

HABITAT: Dry soil of boreal forest and tundra.

FOODS: Makes its own food by photosynthesis.

EATEN BY: Caribou, lemmings, ground squirrels.

“GEE WHIZ”: The small, leathery leaves of dryas lose less water than other kinds of leaves and are more resistant to winds.



13. Heathers T

TRAITS: Heathers are low-growing, moss-like shrubs and have white bell-shaped flowers.

HABITAT: Dry soil of alpine and arctic tundra.

FOODS: Make their own food by photosynthesis.

EATEN BY: Lemmings, ground squirrels.

"GEE WHIZ": Heathers have small, leathery leaves which lose less water than other kinds of leaves and are more resistant to winds.

14. Lowbush Cranberry *

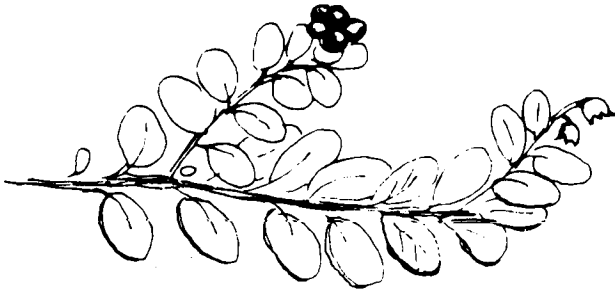
TRAITS: This low, creeping dwarf shrub is a member of the heath family; small white to pink bell-shaped flowers; fruit a small, red berry.

HABITAT: Moist soils in alpine and lowland tundra; grows best in young, mature, and old-growth forest areas.

FOODS: Makes its own food by photosynthesis.

EATEN BY: Insects, ptarmigan, spruce and ruffed grouse, plovers, pine grosbeaks, waxwings, thrushes, lemmings, voles, moose, bears.

"GEE WHIZ": This plant is also called "lingenberry." Its small leaves are coated with wax which helps keep it from drying out in the wind and cold.



15. Bog Blueberry *

TRAITS: Low shrub; oval leaves; small, bell-like flowers; blue to black berries.

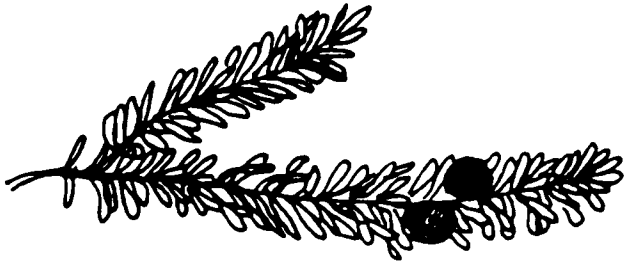
HABITAT: Heaths and bogs in the boreal forest and tundra except on the extreme northern coastal plain.

FOODS: Make their own by photosynthesis.

EATEN BY: Bears, voles, grouse, ptarmigan; moth larvae, aphids, true bugs, some flies, slugs, snails, pine grosbeaks, jays, thrushes.

"GEE WHIZ": These plants depend upon insects to pollinate their flowers.





16. Crowberry *

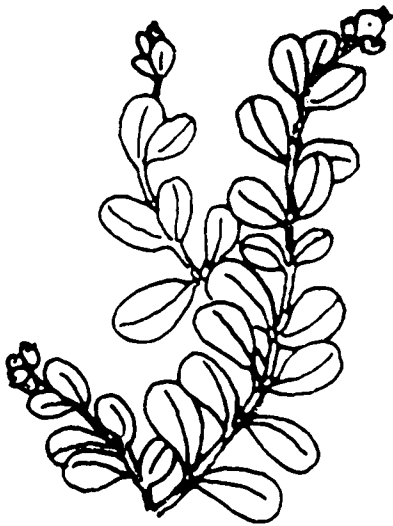
TRAITS: Small, evergreen, heather-like shrub.

HABITAT: Moist or wet ground in alpine or lowland tundra and boreal forest.

FOODS: Makes its own food by photosynthesis.

EATEN BY: Berries are eaten by grouse, ptarmigan, bears, lemmings, voles, geese, plovers, snow buntings, longspurs, and rosy finches.

"GEE WHIZ": The small, wax-coated leaves of the crowberry are resistant to drying by the wind and cold.



17. Bearberry *

TRAITS: Low-growing shrub with evergreen or persistent deciduous leaves; small, bell-shaped flowers; the fruit is an edible berry; a member of the heath family.

HABITAT: Grows on dry and moist soil in alpine and lowland tundra, forests, and muskegs.

FOODS: Makes its own by photosynthesis.

EATEN BY: Ptarmigan, bears, voles, lemmings, geese, plovers, and other birds.

GEE WHIZ: Bearberry plants depend on fungi to help them obtain nutrients from the soil. They provide sugars to the fungi in exchange.



18. Fireweed F

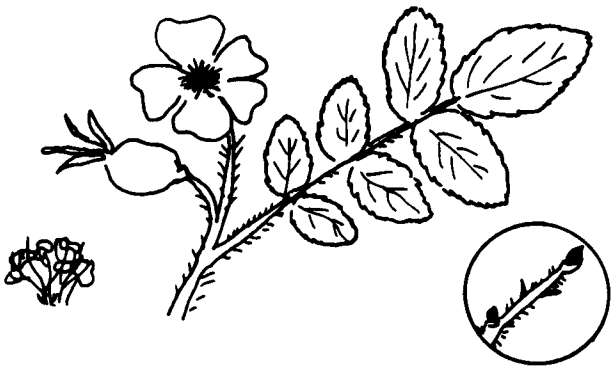
TRAITS: A tall plant, 2 1/2 to 5 feet; many reddish-purple flowers along the top of a stem; seeds are cottony.

HABITAT: Disturbed soils; forests with open canopies that allow plenty of sunlight to reach the forest floor.

FOODS: Makes its own by photosynthesis.

EATEN BY: Moth larvae, aphids, certain flies, true bugs, leafhoppers, slugs, redpolls, sparrows, moose, hares, bears.

"GEE WHIZ": Fireweed is one of the first plants to appear after a fire, sometimes just a few days after the fire is over.



19. Wild Rose F

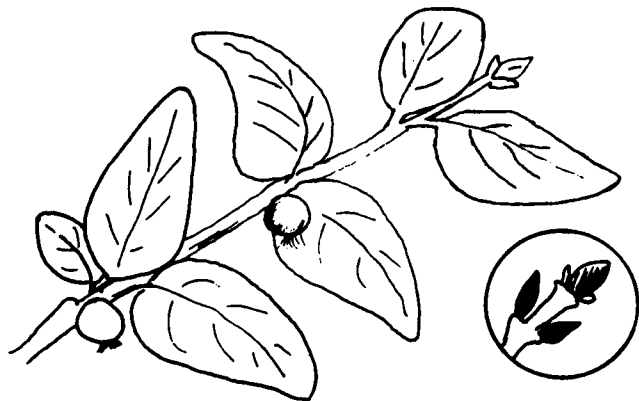
TRAITS: Spiny shrub; large flowers with pink petals; stems are covered with small thorns.

HABITAT: Shaded understory of forests, old burn areas, tall shrub thickets.

FOODS: Makes its own food by photosynthesis.

EATEN BY: Moth larvae, aphids, pine grosbeaks, ruffed and sharp-tailed grouse, thrushes, hares, mice.

“GEE WHIZ”: The reddish fruits of the wild rose are known as “rose hips”; rose hips are edible and contain high amounts of Vitamin C.



20. Soapberry F

TRAITS: Shrub; undersides of leaves are covered with reddish-brown hairs; small yellow flowers; red to yellow berries.

HABITAT: Mature boreal forest.

FOODS: Makes its own by photosynthesis.

EATEN BY: Bears, grosbeaks, waxwings, grouse, insects such as aphids and larval moths and butterflies.

“GEE WHIZ”: The soapberry is also known as “buffaloberry.”



21. Labrador Tea *

TRAITS: Low, evergreen shrub; its narrow leaves are thick and rolled under on sides and have reddish-brown, hairy undersides; many sweet-smelling white flowers cluster at the end of twigs.

HABITAT: Poorly drained soils, muskegs, old forests.

FOODS: Makes its own food by photosynthesis.

EATEN BY: Moth larvae, aphids, true bugs, leafhoppers, snowshoe hares.

“GEE WHIZ”: Labrador tea grows abundantly after fire in black spruce forests. It is a member of the heath family.



22. Raspberry F

TRAITS: Prickly shrub; showy white or pink flower; yellow to red fruit.

HABITAT: Forms thickets along borders and in openings of the boreal forest.

FOODS: Makes its own food 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.

"GEE WHIZ": Certain fungi help these plants obtain nutrients from the soil.



23. Dwarf Birch T

TRAITS: Low, spreading deciduous shrub, round leaves with wavy edges.

HABITAT: Moist and wet alpine and lowland tundra.

FOODS: Makes its own food by photosynthesis.

EATEN BY: Ptarmigan, caribou, muskox, seed-eating birds such as snow buntings, longspurs, and redpolls.

"GEE WHIZ": This shrub grows low to the ground to avoid the wind and to take advantage of higher soil temperatures.



24. Willow *

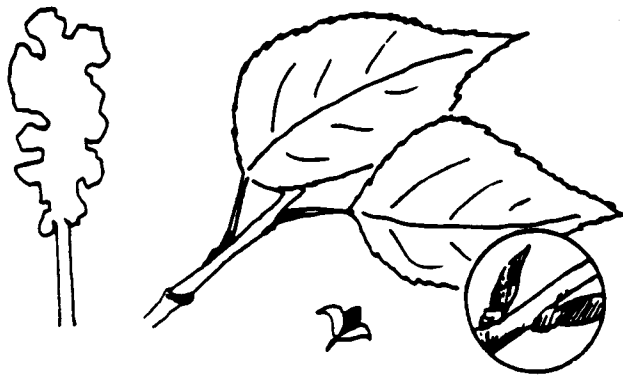
TRAITS: Deciduous tree or shrub.

HABITAT: Moist and wet areas in alpine and lowland tundra.

FOODS: Makes its own food by photosynthesis.

EATEN BY: Moth larvae, aphids, gall-making aphids, certain flies, sawfly wasps, true bugs, leafhoppers, moose, hares, muskox, caribou, ptarmigan, redpolls, pine grosbeaks.

"GEE WHIZ": Willow that grow in the tundra have branches that grow along the ground, rather than upward; this allows the willow to avoid strong winds and to take advantage of the warmer temperatures near the soil.



25. Balsam Poplar F

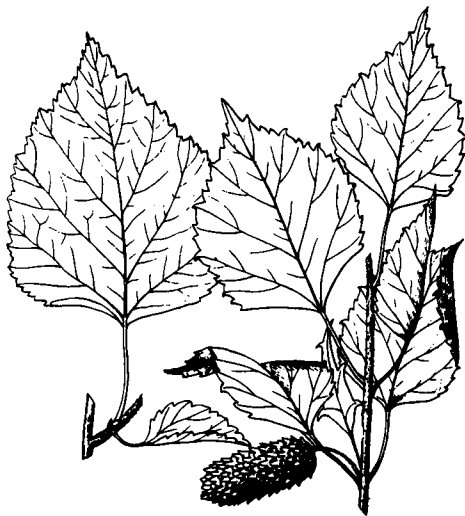
TRAITS: Medium-sized deciduous tree; gray bark with deep furrows.

HABITAT: Well-drained soils in boreal forest.

FOODS: Makes its own by photosynthesis.

EATEN BY: Aphids, gall-making aphids, moth larvae, sawflies, true bugs, leafhoppers, moose, snowshoe hares, pine grosbeaks.

"GEE WHIZ": Balsam poplar wood is used chiefly for boxes, crates, and pulpwood.



26. Paper Birch F

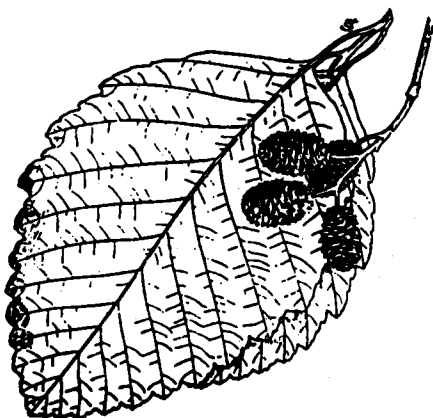
TRAITS: Small to medium-sized deciduous tree; bark is white, smooth, and separates into papery strips.

HABITAT: Boreal forests, all slopes; grows best in areas without permafrost.

FOODS: Makes its own by photosynthesis.

EATEN BY: Moth larvae, aphids, pine grosbeaks, redpolls, ruffed grouse, moose, hares.

"GEE WHIZ": Near cities and villages in interior Alaska, paper birch has been used primarily as fireplace wood.



27. Alder F

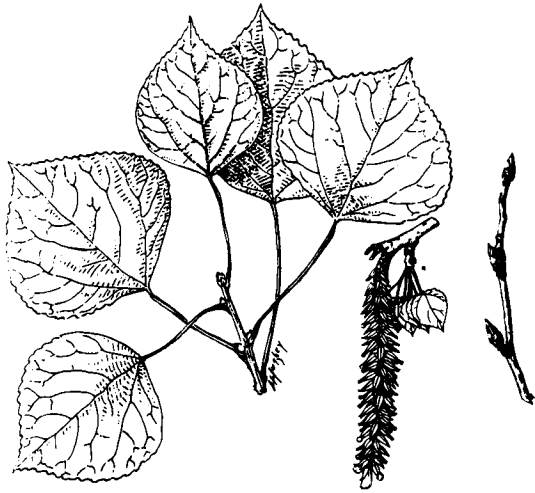
TRAITS: Deciduous tree or shrub; smooth gray bark with horizontal lines.

HABITAT: Varies by species; common in early successional stages and in mature forests.

FOODS: Makes its own by photosynthesis.

EATEN BY: Moth larvae, gall-making aphids, true bugs, leafhoppers, redpolls.

"GEE WHIZ": Certain bacteria live in the roots of the alder helping the plant obtain nitrogen from the soil in exchange for sugars made by the plant.



28. Aspen F

TRAITS: Deciduous tree; bark whitish or greenish gray with black scars and knots.

HABITAT: Well-drained soil on warm slopes.

FOODS: Makes its own food by photosynthesis.

EATEN BY: Moth larvae, aphids, gall-making aphids, true bugs, mites, pine grosbeaks, ruffed grouse, moose, snowshoe hares.

"GEE WHIZ": Aspen need certain kinds of fungi to obtain some nutrients from the soil.

29. White Spruce F

TRAITS: Conifer tree; needles are 4-angled, sharply-pointed; thin gray bark; cones are long, hang downward, and fall at maturity.

HABITAT: Well-drained soils in boreal forest.

FOODS: Makes its own food by photosynthesis.

EATEN BY: Spruce grouse, porcupines, crossbills, red squirrels, spruce bark and longhorn beetles, horntails, certain moths and flies, spruce aphids, carpenter ants.

"GEE WHIZ": White spruce is used extensively in interior Alaska for cabin logs.



30. Black Spruce F

TRAITS: Conifer tree with 4-angled, pointed needles; thin gray to black bark; cones are small and egg-shaped and remain on the tree for several years, often clustered in the tree tops.

HABITAT: Grows mainly in wet soils and on north-facing slopes in dry climates where fires occur.

FOODS: Makes its own food by photosynthesis.

EATEN BY: Red squirrels, porcupines, bark and longhorn beetles, horntails, certain moths and flies, spruce aphids, carpenter ants.

"GEE WHIZ": 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.





31. Tamarack F

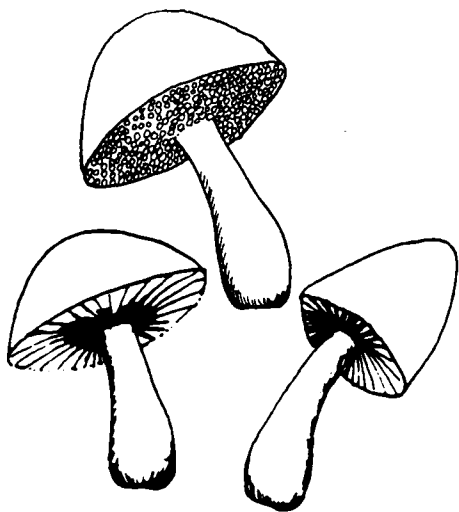
TRAITS: Conifer that sheds its leaves in the fall; needle-like leaves are borne in clusters; bark is gray to brown with shreds and fissures.

HABITAT: Wet, cool climate; sea level to high elevations on most soil types.

FOODS: Makes its own by photosynthesis.

EATEN BY: Squirrels, wood-boring insects, aphids, seed-eating birds (sparrows, redpolls).

“GEE WHIZ”: A certain species of mushroom, the yellow-pored bolete mushroom, grows only with tamaracks; tamaracks depend on certain fungi to help them obtain minerals from the soil.



32. Mushrooms *

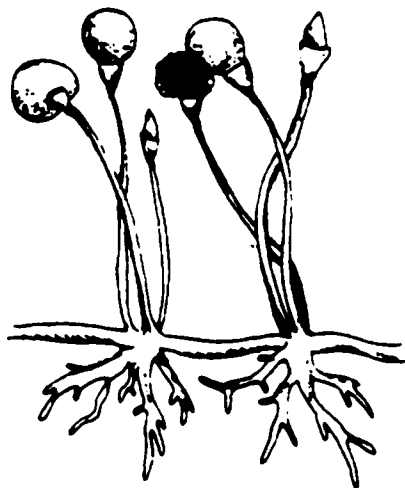
TRAITS: Fungi with fruiting bodies that consist of a stalk and a cap; the undersides of the caps are made up of many slits or tubes.

HABITAT: Soil, litter, rotting logs, and dead vegetation.

FOODS: Mainly dead plant material and animal wastes.

EATEN BY: Lemmings, ground squirrels, fungus gnats.

“GEE WHIZ”: Most fungi that occur in tundra areas, such as the gilled mushroom, are able to grow at lower temperatures than those that occur in warmer environments.



33. Molds, Mildews, and Rusts *

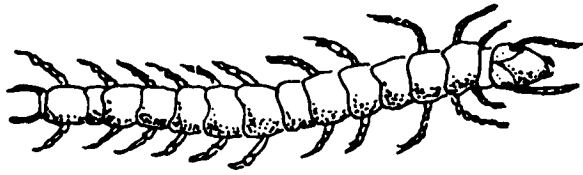
TRAITS: Apparent as a fine powder, fuzz, or furry coating on leaves or other plant parts or animal droppings; or as an abnormal growth.

HABITAT: Dead plants or waste materials, or on living plants or insects.

FOODS: Many feed on dead plant materials, while others live as parasites on plants or insects.

EATEN BY: Springtails, bacteria.

“GEE WHIZ”: Their ability to cease functioning, then resume activities when conditions are favorable, allows them to survive in harsh environments.



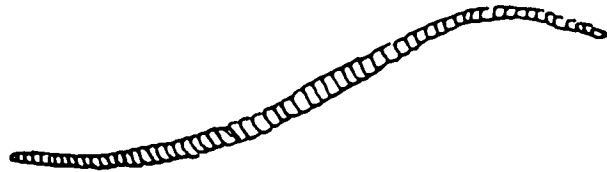
34. Centipedes *

TRAITS: A small worm-like animal with only one pair of legs on each of its body segments; all have poison claws for capturing prey.

HABITAT: In soil 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.



35. Segmented Worms *

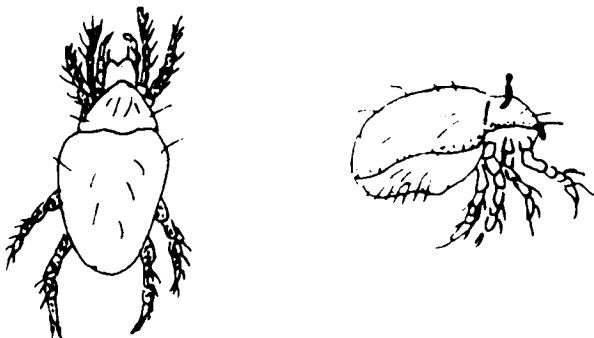
TRAITS: Slender worms with distinct segments along the body.

HABITAT: Moist soil, mosses, and decaying plants.

FOODS: Varies by species; those that live in soil eat decaying vegetation, algae, or other invertebrate animals.

EATEN BY: Thrushes, centipedes, ground beetles.

"GEE WHIZ": Some segmented worms, called leeches, are parasites on other animals, including mammals, fish, birds, insects, snails, and worms.



36. Mites *

TRAITS: Tiny to microscopic animals, with 8 legs and a pear-shaped body.

HABITAT: These tiny animals are very abundant in mosses, dead leaves, and soil of the forest and tundra.

FOODS: Many mites prey on worms, other mites, and insect larvae (such as springtails, rove beetles, and flies); others feed on plants or on dead plants and animals.

EATEN BY: Ground beetles, centipedes, lady beetles, wagtails, wheatears, sparrows, thrushes, longspurs, and other insect-eating birds.

"GEE WHIZ": 10,000-83,000 mites occur in a square meter of tundra—greater densities occur in other habitats.



37. Aphids or Plant Lice *

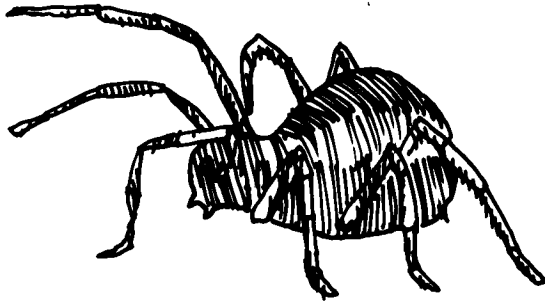
TRAITS: Pear-shaped insects; winged and wingless forms in the same species.

HABITAT: Leaves and stems of plants.

FOODS: Sap of plants; they cause plant leaves to wilt, curl, and turn yellow.

EATEN BY: Ants, wasps, warblers, chickadees, kinglets, wrens, sparrows.

"GEE WHIZ": Aphids produce a secretion, called honeydew; in order to obtain this honeydew, certain ants protect and tend aphids; some aphids carry microscopic organisms that cause plant diseases; some aphids cause plants to form galls.



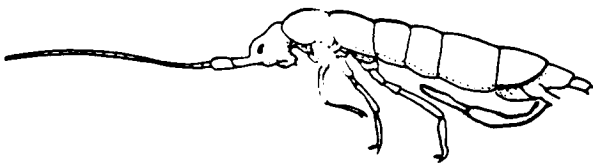
38. Spiders *

TRAITS: Small animals with 8 legs, the body appears divided into a large abdomen and a small head with large fangs.

HABITAT: In and on soil or leaf litter, mosses, or lichens.

FOODS: All spiders are predators of small animals, mainly insects, including aphids, flies, rove beetles, springtails, and others.

EATEN BY: Shrews, insect-eating birds such as plovers, sandpipers, longspurs, finches, pipits, wagtails, redpolls, thrushes, winter wrens, warblers.



39. Springtails *

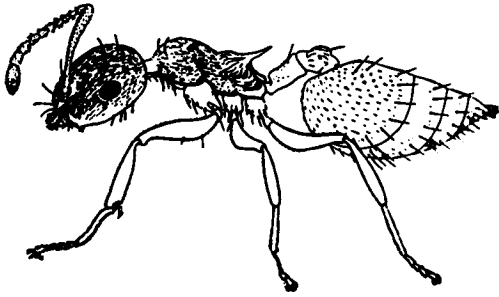
TRAITS: Small wingless insects with chewing mouthparts, a tube-like part on its front underside and a forked spring-like part on its rear underside. A springtail can spring 100 mm by using the forked part on its rear underside.

HABITAT: Lives in soil, moss, and decaying plants; a few species live in trees.

FOODS: Decaying materials, microscopic organisms, algae, lichens, pollen, and fungal spores.

EATEN BY: Centipedes, ground beetles, shrews, and insect-eating birds.

"GEE WHIZ": Springtails are able to develop slowly and resume development after long periods of cold or inactivity.



40. Ants *

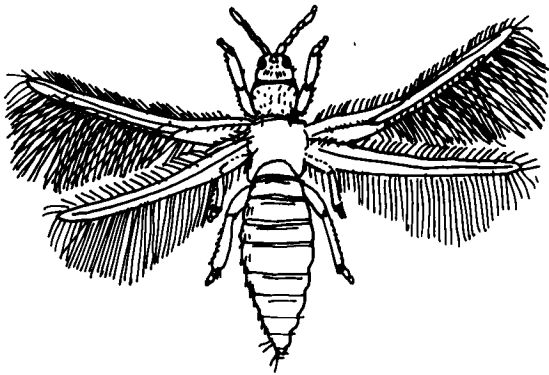
TRAITS: Body clearly divided into 3 segments by narrow constrictions; last segment forms a pointed end; only certain kinds of adults have wings.

HABITAT: In colonies in the ground or wood.

FOODS: Varies between species; some feed on flower nectar, plant juices, or aphid honeydew; others feed on seeds, leaves, or dead organisms, and some are predators on other insects.

EATEN BY: Flickers, wrens, thrushes, sparrows.

“GEE WHIZ”: Some ants protect aphids from predators, then feed on the sugary secretion (honeydew) that aphids produce.



41. Thrips T

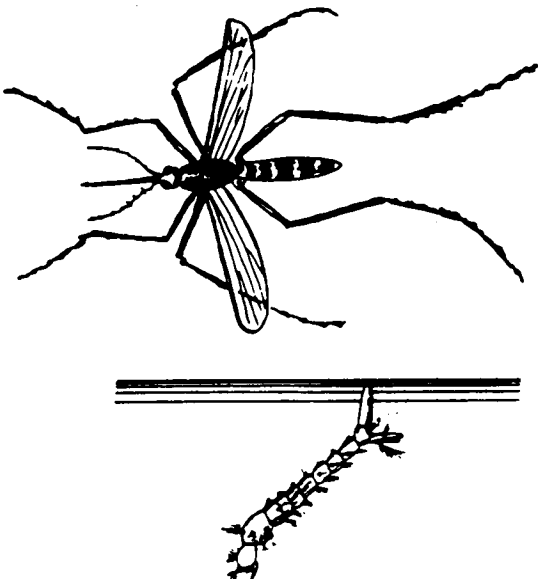
TRAITS: Tiny winged or wingless long-bodied insects; if winged, they have four narrow wings with fringes of long hairs; antennae, and tube-like mouthparts.

HABITAT: Flowers, leaves of plants.

FOODS: Most eat flowers, leaves, buds, and fruits; a few eat fungal spores or mites and small insects.

EATEN BY: Warblers, chickadees, creepers, wrens, ants, hornets, ground beetles, and lacewings.

“GEE WHIZ”: Some carry microscopic organisms that cause plant diseases.



42. Mosquitos *

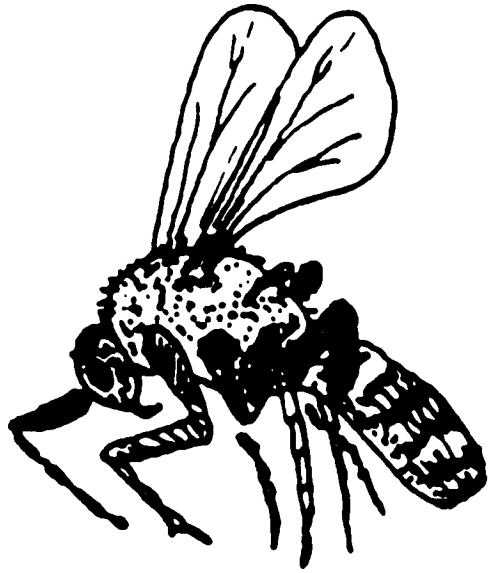
TRAITS: Small insects with long legs, one pair of clear wings, piercing and sucking mouthparts form a tube; males have feather-like antennae.

HABITAT: Larvae live in water; adults are found in most habitats; males are often found in or near flowers.

FOODS: Larvae feed on algae, protozoans, and dead plants; adult males feed on flower nectar, while adult females suck the blood of animals.

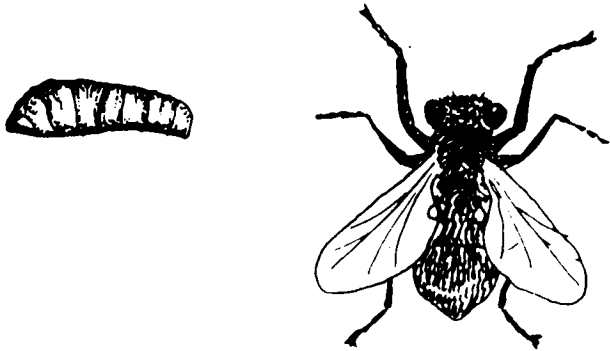
EATEN BY: Bats, dragonflies, fish, phalaropes, sandpipers, swallows, warblers, and frogs.

“GEE WHIZ”: Males pollinate flowers; females can carry certain microscopic organisms that cause diseases in mammals and birds.



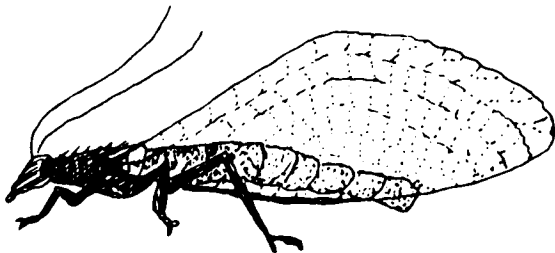
43. Fungus Gnats *

TRAITS: Small, slender, long-legged, mosquitolike insect.
HABITAT: Decaying vegetation or fungi, or moist soil.
FOODS: Fungi, decaying plants, and roots of live plants.
EATEN BY: Ground beetles, spiders, insect-eating birds.



44. Bot and Warble Flies *

TRAITS: Beelike, hairy flies.
HABITAT: Adults occur on the tundra; larvae develop inside an animal host.
FOODS: Larvae feed on the 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.
"GEE WHIZ": 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. By living under the skin of large animals, bot flies avoid the cold and the wind.



45. Lacewings *

TRAITS: Green or brown insects with large, clear wings with net-like veins, held tent-like over their body; small head with large eyes and chewing mouthparts, long antennae; some give off an unpleasant odor when handled.
HABITAT: On leaves of trees and shrubs; eggs are attached to a leaf by a thread the female forms; larvae spin a cocoon.
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.



46. Yellowjackets and Hornets *

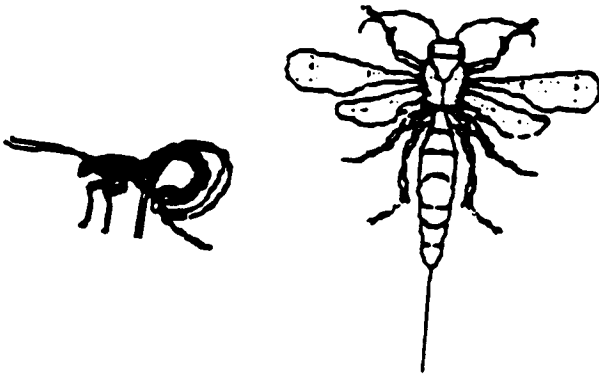
TRAITS: Insects with bright black and yellow or white markings; the third body segment is separated from the middle one by a narrow "waist"; the tip of the abdomen is pointed and has a stinger.

HABITAT: Hornets build paper nests in the ground and in or on trees.

FOODS: Adults feed on flower nectar, ripe fruit, and other insects; they feed their larvae insects, such as caterpillars and flies, meat from dead animals, and nectar.

EATEN BY: Insect-eating birds such as flycatchers and swallows.

"GEE WHIZ": Some hornets pollinate flowers.



47. Ichneumon Wasps *

TRAITS: Insects with long narrow bodies, 4 clear wings of which the hind pair is smaller; 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 host insects are available.

FOODS: These wasps lay their eggs inside larval sawflies, horntails, butterflies, moths, bees, and spiders; when the larvae hatch, they eat their host.

EATEN BY: Shrews, insect-eating birds such as plovers, sandpipers, buntings, pipits, wagtails, wheatears, flycatchers, swallows, thrushes, warblers, chickadees.

"GEE WHIZ": These wasps are important parasites of immature insects.



48. Bumblebees *

TRAITS: Insects with 4 wings, hind wings much smaller than front ones; hairy body covered with black and yellow or orange markings

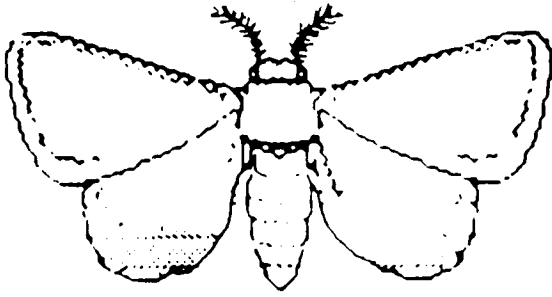
HABITAT: Any area with nectar-producing flowers, including alpine and lowland tundra; nests in the ground.

FOODS: Nectar and pollen of flowering plants.

EATEN BY: Shrews, insect-eating birds such as plovers, buntings, longspurs, wagtails, pipits, redpolls, flycatchers, swallows, warblers.

"GEE WHIZ": Bees are important plant pollinators; mites often hitch rides on bees to reach new plants. The dense fur-like hair covering the bodies of bumblebees allows them to retain some of the heat generated by their muscles; thus they can remain active at colder temperatures than other insects.

49. Moths *



TRAITS: Insects with 4 large wings with powder-like scales; large eyes, long antennae that are either feather-like or tapered at ends; most have tube-like mouths that coil up when not in use. Larvae spin cocoons; some larvae make tents of silk threads.

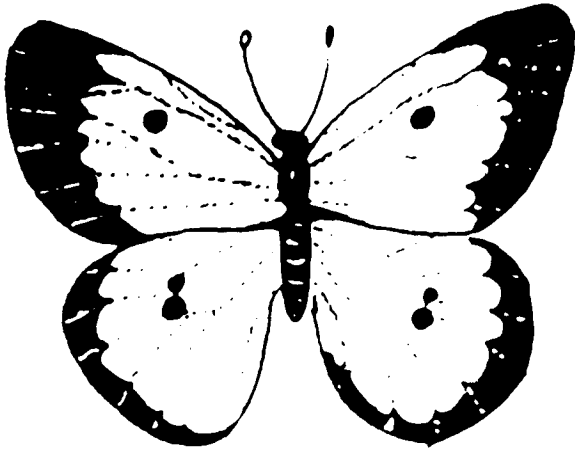
HABITAT: Adults use a variety of habitats; most larvae can only live on a particular species of plant.

FOODS: Adults feed mainly on flower nectar; most larvae feed on plant leaves, fruit, stems, and roots.

EATEN BY: Bats, shrews, ground beetles, warblers, flycatchers, swallows, chickadees, kinglets.

"GEE WHIZ": Adults pollinate flowers; larvae are parasitized by ichneumon wasps.

50. Butterflies *



TRAITS: Insects with 4 large wings with powder-like scales; large compound eyes, long antennae that have clubs at the tips, and tube-like mouths that coil up when not in use. Adults are active in the daytime.

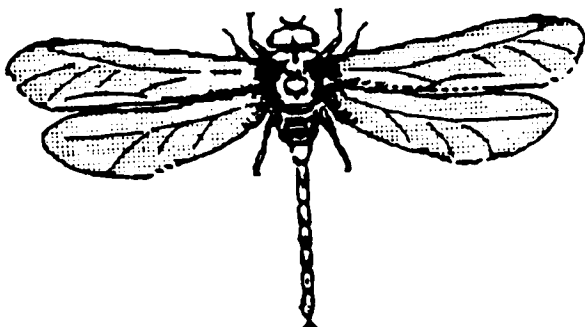
HABITAT: Adults use a variety of habitats; most larvae can live only on a particular species of plant.

FOODS: Adults feed mainly on flower nectar; most larvae feed on plant leaves, fruit, stems, or roots.

EATEN BY: Insect-eating birds such as warblers and flycatchers; ground beetles, wasps, dragonflies.

"GEE WHIZ": Adults pollinate flowers. Larvae are often parasitized by ichneumon wasps.

51. Dragonflies *

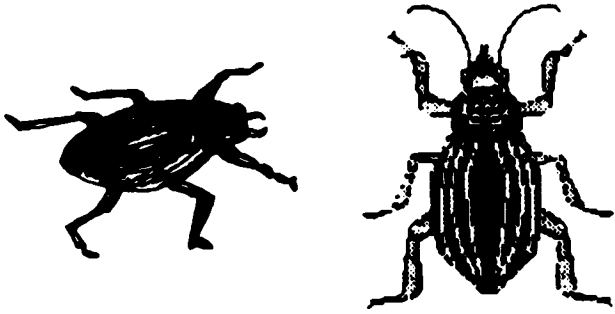


TRAITS: Insects with brightly colored bodies, large eyes, long narrow abdomen, and 2 pairs of large wings.

HABITAT: Larvae live on aquatic plants or on the bottom of streams or ponds; adults live near water in many habitats, including forests.

FOODS: Larvae prey on aquatic insects, tadpoles, and small fish; adults eat small flying insects including mosquitos, moths, lacewings, beetles, and others.

EATEN BY: Insect-eating birds such as swallows.



52. Ground Beetles *

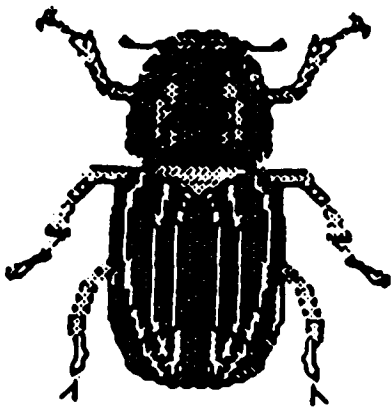
TRAITS: Dark, flattened insects with front wings thickened and shiny with grooves running from front to back; long legs, large mouthparts.

HABITAT: Most habitats on land; most are active only at night and hide during the day under logs, rocks, or leaf litter.

FOODS: Varies by species; some adults feed on dead animal remains; others prey on insects, such as caterpillars, or on slugs and snails.

EATEN BY: Jays, thrushes, wrens, sparrows, centipedes.

"GEE WHIZ": Tundra species of ground beetles produce antifreezes that allow them to survive freezing temperatures.



53. Spruce Bark Beetles F

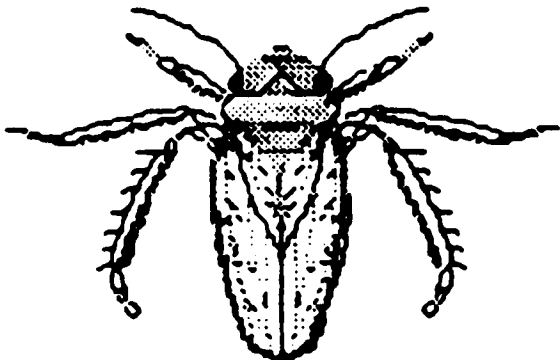
TRAITS: Small, round-bodied insects with thickened front wings; small antennae with clubs on the tips.

HABITAT: Under tree bark of dead and dying trees.

FOODS: Feeds and breeds in the underside of tree bark or wood.

EATEN BY: Woodpeckers, brown creepers, ichneumon wasp larvae.

"GEE WHIZ": Under normal conditions, small populations of spruce bark beetles are always present in white spruce forests, feeding and breeding in the dead and dying trees.



54. Leafhoppers *

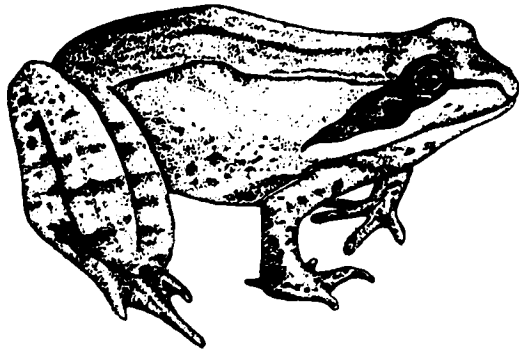
TRAITS: Front pair of wings thin and clear, or only slightly colored; held roof-like over body; beak-like mouth comes out of the rear underside of the head; 1 or more rows of spines on the hind legs.

HABITAT: Found on plants in forests and other habitats.

FOODS: Sap of plants.

EATEN BY: Warblers, thrushes, chickadees, shrews, ground beetles, centipedes.

"GEE WHIZ": Many leafhoppers carry microscopic organisms that parasitize plants from one plant to another.



55. Wood Frog *

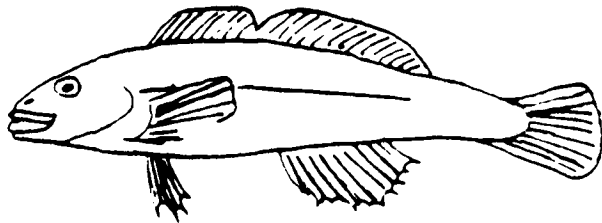
TRAITS: Small amphibian with moist skin, no scales or claws, long hind legs, short forelegs, large mouth.

HABITAT: Tundra, muskegs, and forests; eggs and tadpoles live only in water; adults live on land.

FOODS: Adults eat insects, including flies, true bugs, lacewings, dragonflies, and others; tadpoles eat algae and small aquatic animals.

EATEN BY: Tadpoles are eaten by fish, dragonfly larvae, loons, and grebes; adults are eaten by sandhill cranes, ravens, and other omnivores.

"GEE WHIZ": Wood frogs range farther north than any other amphibian. They produce antifreeze in their bodies and hibernate during winter beneath dry soil and plant litter.



56. Slimy Sculpin *

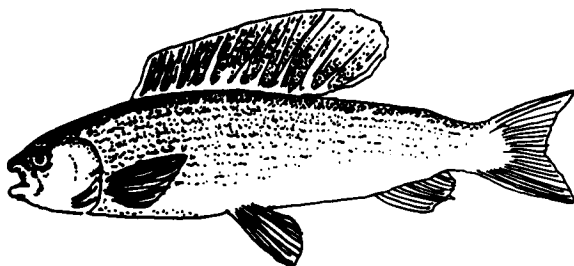
TRAITS: A small fish with a large head that grows to 3-5 inches (7.5-12 cm).

HABITAT: Adults live on the bottoms of lakes and fast moving streams; they may move into shallow water to spawn.

FOODS: Mainly larvae of flies, such as mayflies, caddisflies, midges, craneflies; also dragonflies and amphipods; small fish and aquatic vegetation.

EATEN BY: Other fish, such as lake trout, burbot, and grayling; loons, grebes.

"GEE WHIZ": The color and pattern of their skins makes them nearly invisible when motionless on river and lake bottoms.



57. Arctic Grayling *

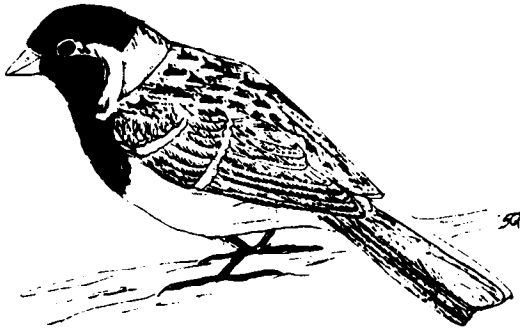
TRAITS: Graylings reach 12-14 inches (30-35 cm) and 1-1.5 lbs. (0.5-0.7 kg). They have a small mouth, and the dorsal fin is dotted with large iridescent red or purple spots.

HABITAT: Grayling live in cold, clear streams, lakes, and ponds; they spawn in streams with sandy gravel bottoms.

FOODS: Mostly insects such as midges, mayflies, stoneflies, craneflies, mosquitos, and small fish.

EATEN BY: Young are eaten by fish-eating birds and other fish; adults are eaten by humans.

"GEE WHIZ": Grayling migrate from small tributaries into deep water to spend the winter; this allows them to live in the summer in streams and ponds that freeze solid in winter.



58. Lapland Longspur T

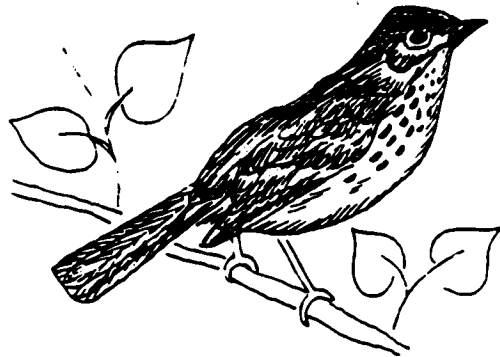
TRAITS: Small-sized bird; breeding male has black crown, face and breast and chestnut hind neck; female nondescript, like many sparrows.

HABITAT: Alpine and dry lowland tundra; nests on small clumps of grass or dry knolls.

FOODS: Mainly seeds and buds of plants; also insects.

EATEN BY: Weasels, foxes, jaegers, gulls, short-eared owls.

"GEE WHIZ": One of the most common land birds on the tundra in the summer; migrates to warmer, more southern prairies in winter; longspurs spend a lot of time on the ground and usually run or walk rather than hop.



59. Small Thrushes F

TRAITS: Small birds with long tails, short, thin bills, brown backs, spots on white breast.

HABITAT: Gray-cheeked thrushes need tall shrub thickets; hermit thrushes need forest openings and edges; Swainson's thrushes need old conifer or hardwood forests.

FOODS: Beetles, ants, wasps, moth and butterfly larvae, flies, treehoppers, millipedes, snails, and other invertebrates; also berries.

EATEN BY: Merlins, sharp-shinned hawks, goshawks, boreal owls; red squirrels prey on eggs.

"GEE WHIZ": Parasitized by certain invertebrates and microscopic organisms.



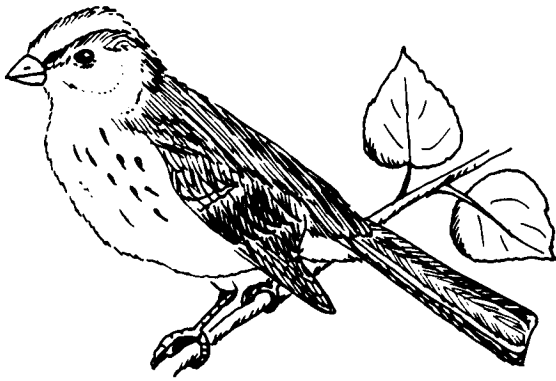
60. Warblers F

TRAITS: Small birds with thin bills, most have yellow markings.

HABITAT: Some species (orange-crowned, yellow, Wilson's, blackpoll) live in tall shrub thickets; yellow-rumped warblers live in mixed forest; Townsend's warblers require coniferous forest.

FOODS: Insects that live on leaves and twigs of trees and shrubs, including true bugs, leafhoppers, moth and butterfly larvae, aphids, flies, beetles, sawflies, spiders.

EATEN BY: Merlins, sharp-shinned hawks, shrikes.



61. Sparrows F

TRAITS: Small birds with stout, cone-shaped bills, most are brown on the back and light underneath, many have streaks on the breast.

HABITAT: Tall shrub thickets, forest edges.

FOODS: Mainly seeds of groundcover plants and tall shrubs; also, insects that live on these plants.

EATEN BY: Sharp-shinned hawks, merlins, hawk owls, shrikes; shrews, squirrels; weasels prey on eggs and young.

"GEE WHIZ": Sparrows often use hair from moose or feathers from other birds to line their nests.



62. Redpolls *

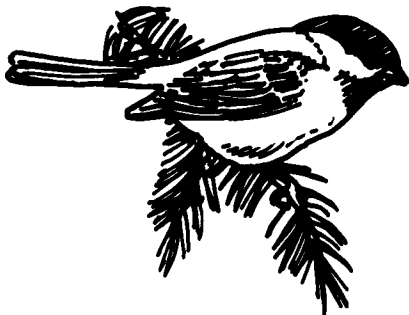
TRAITS: Small bird with red cap; stout, cone-shaped bill.

HABITAT: Tall shrub thickets, mixed hardwood-conifer forests; nest in alder or willow shrubs; also nests in alpine and lowland tundra areas with low shrubs; winters in boreal forest.

FOODS: Mainly seeds and buds of willow, aspen, birch, alder, and other tundra and forest plants; also insects.

EATEN BY: Merlins, boreal owls, short-eared owls, jaegers, sharp-shinned hawks, shrikes; weasels, foxes, and squirrels may prey on eggs.

"GEE WHIZ": Redpolls wander over large areas of tundra and boreal forest in search of places with abundant food; they often burrow into snow drifts to avoid cold and wind.



63. Black-capped and Boreal Chickadees F

TRAITS: Small gray to brown bird with thin bill, long tail, dark cap and chin.

HABITAT: Chickadees require trees with holes; boreal chickadees need mature to old boreal forest; black-capped use hardwood or mixed forest.

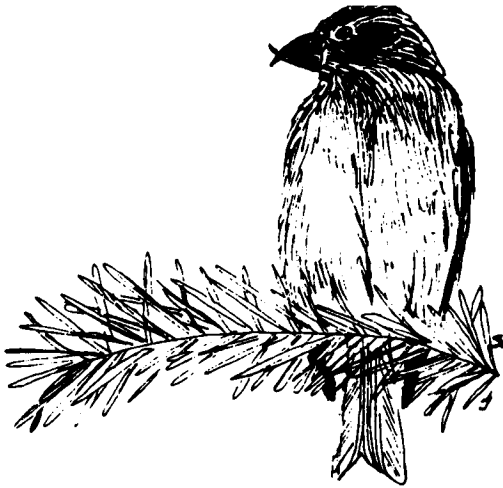
FOODS: Mainly insects from leaves, bark, or branches (thrips, moths, butterflies, lacewings, flies, wasps, spiders, etc.); also seeds and berries.

EATEN BY: Any small hawk or owl, shrikes.

"GEE WHIZ": Chickadees require dead trees with nest holes made by woodpeckers or fungi.

64. White-winged 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.
EATEN BY: Sharp-shinned hawk, boreal owl; squirrels may eat eggs and young.



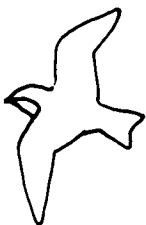
65. Pine Grosbeak F

TRAITS: Medium-sized bird with long tail; stout, cone-shaped bill; males are red, females are gray with gold markings.
HABITAT: Young to old coniferous and mixed hardwood-conifer forests; nests in conifer trees.
FOODS: Buds, seeds, and berries of trees and shrubs.
EATEN BY: Sharp-shinned hawk, merlins, goshawk.
"GEE WHIZ": May carry and spread seeds of some berry-producing plants.



66. Tree and Violet-green Swallows *

TRAITS: Small birds with long wings, slightly forked tail; fly continuously to search for and capture flying insects.
HABITAT: Both species require holes in dead trees for nesting; forage for insects in open areas, over water and moist ground; tree swallows are closely tied to human settlements in tundra areas.
FOODS: Flying insects, such as moths, beetles, flies, dragonflies, bees, wasps, and leafhoppers.
EATEN BY: Merlins, sharp-shinned hawks, hawk owls; squirrels may eat eggs.
"GEE WHIZ": These birds depend upon fungi and woodpeckers to form the holes in dead trees that they need for nesting.





67. Brown Creeper F

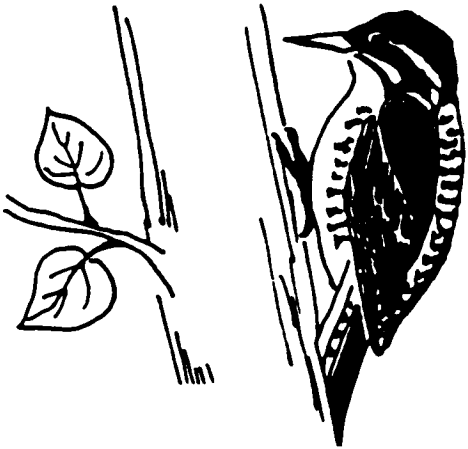
TRAITS: Small brown bird with thin, curved bill and stiff tail feathers.

HABITAT: Requires many dead and dying trees for feeding and nesting; nests behind bark that has peeled away from the trunks of dead trees.

FOODS: Insects that live in and under the bark of dead and dying trees (beetles, moths, flies, and others); inches its way up the trunk and out branches of dead trees to search crevices for insects.

EATEN BY: Sharp-shinned hawks, boreal owls.

68. Woodpeckers F



TRAITS: Medium-sized birds with chisel-shaped bills, stiff tail feathers; Alaska species include three-toed, black-backed, hairy, and downy woodpeckers.

HABITAT: Old forests and recently-burned forests with many dead and dying trees and forest openings.

FOODS: Insects that live beneath tree bark, including bark beetles, longhorned beetles, horntails, and others.

EATEN BY: Sharp-shinned hawks, goshawks, great horned owls.

“GEE WHIZ”: These birds dig holes in dead trees for nesting and roosting; the trees must first be decayed by fungi; their holes provide homes for other cavity-nesting birds and squirrels.

69. Northern Shrike *



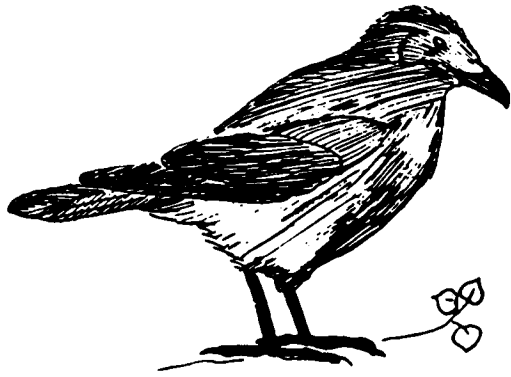
TRAITS: Medium-sized gray bird with black mask; sharply hooked bill, long claws.

HABITAT: Tall shrub thickets, forest openings and edges, shrub thickets on the tundra.

FOODS: Small birds and mammals, large insects; chickadees, warblers, small thrushes, kinglets, voles, shrews, grasshoppers, beetles, butterflies.

EATEN BY: Merlins, sharp-shinned hawks.

“GEE WHIZ”: The shrike will impale its prey on thorns, broken twigs, and barbs of barbed wire fences; it will kill and hang up more prey than can be eaten at one time, earning it the name “butcher bird”.



70. Common Raven *

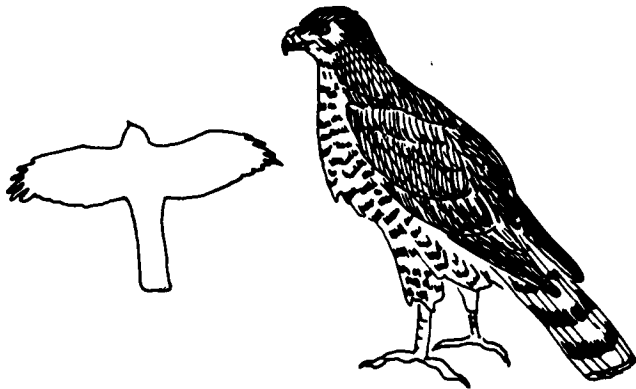
TRAITS: Large black bird with wedge-shaped tail, broad wings; sharp talons and heavy bill.

HABITAT: Forests, shrublands, tundra, wetlands; builds a stick nest on cliffs or in trees.

FOODS: Scavenges meat from kills of large predators; eggs and young of other birds, hawks and owls; small mammals, berries.

EATEN BY: Eggs may occasionally be taken by eagles, crows, marten, jays, or other predators.

"GEE WHIZ": May follow other predators around to feed on scraps left after their kills; sometimes nests in old nests of magpies, goshawks, peregrine falcons, red-tailed hawks, eagles, great horned owls, or other large birds.



71. Sharp-shinned Hawk F

TRAITS: Medium-sized bird with long tail and rounded wings; sharp talons and hooked bill.

HABITAT: Mature and old mixed hardwood-conifer forests.

FOODS: Small birds, including chickadees, warblers, sparrows, thrushes, and woodpeckers.

EATEN BY: Eggs and young may be eaten by squirrels.

"GEE WHIZ": This hawk is difficult to see because of its small size and its habit of hunting close to the ground and perching in thick conifers.

72. Bald Eagle F

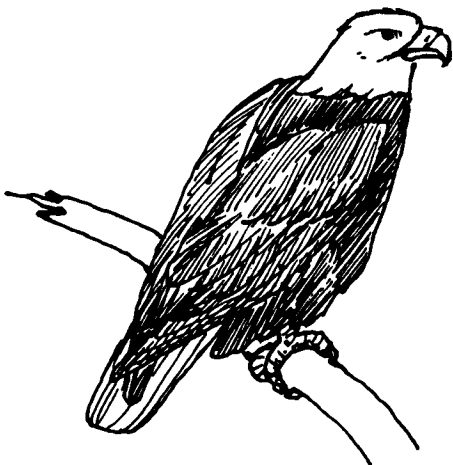
TRAITS: Large brown bird with rounded tail and wings; sharp talons and hooked bill; adults have a white head and tail.

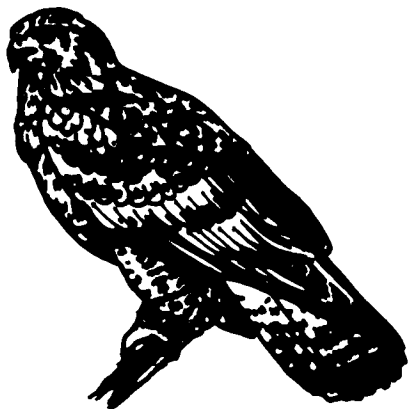
HABITAT: Old forests along rivers, lakes, and ocean; usually nests in large old trees, but feeds mainly near water; also nests on the ground or cliff ledges on islands where predators are absent.

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.

"GEE WHIZ": There are more Bald Eagles in Alaska than in all other states combined.





73. Rough-legged Hawk T

TRAITS: Large bird with whitish tail with dark terminal band, dark back, light breast and belly, pale head.

HABITAT: Alpine and dry lowland tundra near cliffs or river bluffs; nests in cliffs or trees.

FOODS: Lemmings, voles, hares, shrews, ground squirrels; occasionally small birds and insects.

EATEN BY: No predators known.

“GEE WHIZ”: Migrates from tundra regions to areas with milder winter climates; winters in open habitats throughout the Lower 48.

74. Merlin *

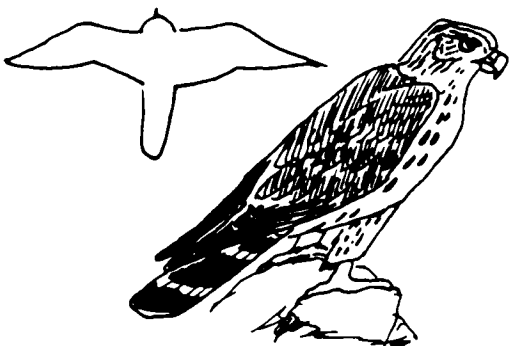
TRAITS: Medium-sized bird with long tail and sharply-pointed wings; sharp talons and hooked bill.

HABITAT: Open coastal and boreal forests; uses stick nests in spruce trees, or less commonly, nests on the ground.

FOODS: Songbirds, including thrushes, juncos, swallows, waxwings, sparrows, woodpeckers, and warblers.

EATEN BY: Squirrels and marten may eat eggs.

“GEE WHIZ”: These small falcons often place their nests in abandoned magpie nests.



75. Short-eared Owl T

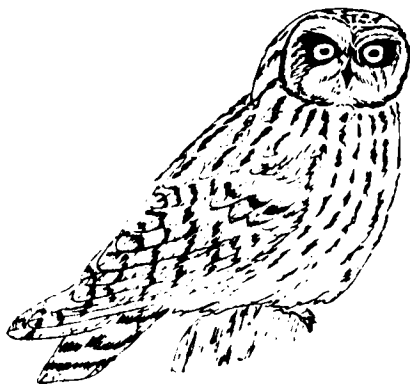
TRAITS: Large owl, light brownish color, moth-like flapping flight.

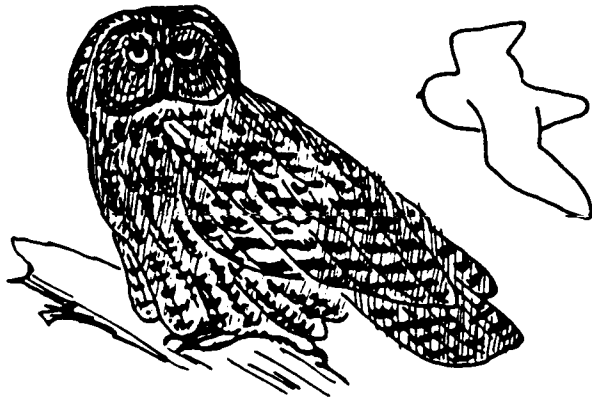
HABITAT: Open country, tundra and wetlands throughout Alaska; nests on ground in grass-lined depressions.

FOODS: Small mammals and birds, including voles, shrews, lemmings, young hares, weasels, sparrows, and shorebirds; also large flying insects.

EATEN BY: Eggs and young may be eaten by foxes or bears.

“GEE WHIZ”: Migrate south to winter in prairies and coastal wetlands of the lower 48.





76. Great Gray Owl F

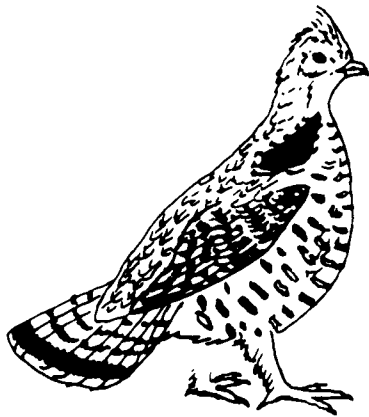
TRAITS: Large gray owl; forward-facing eyes, rounded head, sharp talons and hooked bill.

HABITAT: Boreal forest mosaic; nests in old trees but feeds in open areas including early successional stages, muskegs, and along rivers.

FOODS: Snowshoe hares, voles, squirrels.

EATEN BY: No predators known.

"GEE WHIZ": The great gray owl is the largest owl in Alaska, although the great horned owl and snowy owls are heavier and stronger.



77. Ruffed Grouse F

TRAITS: Chicken-like bird with a ruff of black feathers on the sides of neck; dark band at edge of gray tail.

HABITAT: Hardwood forests, also thickets of willow and alder.

FOODS: Leaves, shoots, seeds, and berries of trees, groundcover and understory plants; chicks eat mainly insects.

EATEN BY: Goshawks, great horned owls, great gray owls, foxes, lynx, humans.

"GEE WHIZ": May help transport seeds of some forest plants.



78. Ptarmigan *

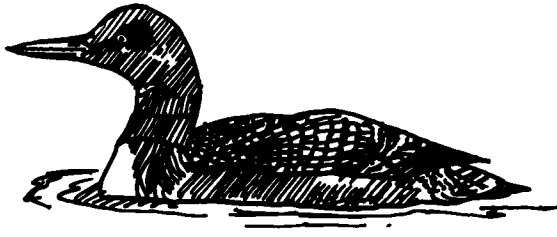
TRAITS: In winter ptarmigan are all white; in summer their plumage is barred, grayish-brown.

HABITAT: Alpine and lowland tundra and forest.

FOODS: Mainly buds and twigs of willow, dwarf birch, and other shrubs, also seeds, berries, and some insects.

EATEN BY: Foxes, weasels, gyrfalcons, golden eagles, humans.

"GEE WHIZ": Ptarmigan have fully feathered feet; these provide insulation and "snowshoes" that allow ptarmigan to walk on the snow surface; ptarmigan often roost in snow banks to keep warm; their dense feathers and down provide excellent insulation against the cold.



79. Loons *

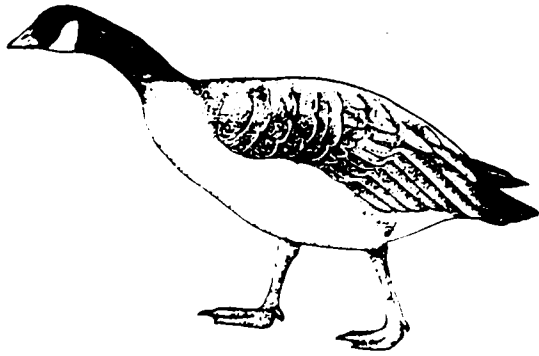
TRAITS: Large, long-bodied swimmers; dagger-like bills and webbed feet.

HABITAT: Ponds and lakes in tundra and forest areas

FOODS: Mainly small fish.

EATEN BY: Eggs and young are eaten by foxes, weasels, bears, and jaegers; young may also be eaten by northern pike.

"GEE WHIZ": Loons dive from the surface of water or sink to chase after fish; they are able to disappear quietly below the water surface, barely making a ripple.



80. Geese *

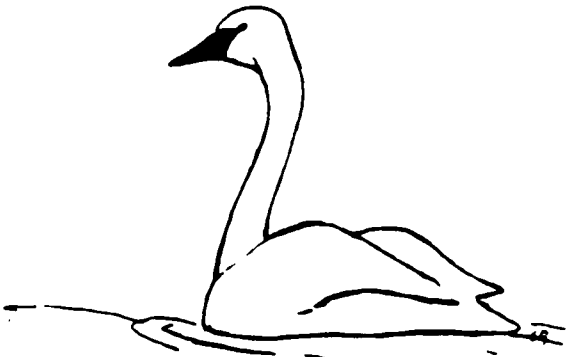
TRAITS: Large waterfowl; heavier-bodied and longer-necked than ducks; bill thick at base; noisy in flight, often flying in "V" formations.

HABITAT: Nests on islands and shores of lakes and estuaries particularly in lowland tundra.

FOODS: Leaves, stems, seeds, and roots of grasses, sedges, mosses, and aquatic plants; brant and emperor geese feed on eelgrass and algae in the winter.

EATEN BY: Eggs and young may be eaten by foxes or bears; humans.

"GEE WHIZ": In winter, migrate south to ice-free wetlands and coastal areas of North America.



81. Swans *

TRAITS: Very large, all-white waterfowl; long neck, all-black bill; species include the Tundra Swan and the Trumpeter Swan.

HABITAT: Forest wetlands, lakes, marshes, rivers with dense vegetation; coastal, lowland tundra.

FOODS: Grasses, sedges, aquatic plants.

EATEN BY: Eggs and young by bears, foxes; adults eaten by humans.

"GEE WHIZ": The Trumpeter Swan is the largest swan in the world, sometimes weighing as much as 40 pounds; 80% of the world's Trumpeter Swan population nests in Alaska.

82. Voles *

TRAITS: Small mammal with rounded nose, short tail, short legs; long front teeth for gnawing.

HABITAT: Forests, shrublands, and grassy areas, lowland and alpine tundra.

FOODS: Fresh green vegetation, seeds, roots, berries, mushrooms, and other fungi; alpine plants and lichens.

EATEN BY: Foxes, marten, weasels, boreal and hawk owls, jaegers, hawks.

"GEE WHIZ": Some species of voles gather and dry large amounts of green vegetation during summer to serve as their winter food supply.



83. Lemmings T

TRAITS: Small mammal; thick fur, short legs, tail, and ears.

HABITAT: Alpine and lowland tundra.

FOODS: Shoots of grasses, sedges, and other plants in summer; bark and twigs of willow and dwarf birch and roots of various tundra plants in winter; occasionally insects, berries, and fungi.

EATEN BY: Owls, jaegers, gulls, arctic foxes, weasels.

"GEE WHIZ": Some species of lemmings turn white in winter and grow shovel-like claws for digging through snow and ice.



84. Red Squirrel F

TRAITS: Small mammal with long front teeth; short legs, large bushy tail; red brown on back, whitish underneath.

HABITAT: Coniferous forests.

FOODS: Mainly seeds of spruce and other conifers; berries, mushrooms; less often, bird eggs and young.

EATEN BY: Marten, goshawks, great horned owls.

"GEE WHIZ": When carrying and caching its food, this animal helps scatter seeds of spruce and berry-producing plants.





85. Northern Flying Squirrel F

TRAITS: Small mammal with long front teeth; long bushy tail, short legs connected by a folded layer of loose skin used for gliding ("flying") between trees.

HABITAT: Requires old trees with holes for its den sites; small forest openings.

FOODS: Mainly mushrooms, truffles, and other fungi; lichens, berries, green vegetation, seeds, buds; also insects, and small, live or dead mammals and birds.

EATEN BY: Owls, goshawk, marten.

"GEE WHIZ": Nests and roosts in abandoned woodpecker holes in dead trees.



86. Arctic Ground Squirrel T

TRAITS: Large reddish ground squirrel, flecked with white.

HABITAT: Well-drained soil of lowland and alpine tundra.

FOODS: Mainly shoots and leaves of tundra plants, but also berries, insect larvae, bird eggs, and dead animals.

EATEN BY: Foxes, wolves, wolverines, brown bears, golden eagles, rough-legged hawks, snowy owls.

"GEE WHIZ": Hibernates for 7 months every year.



87. Tundra Hare T

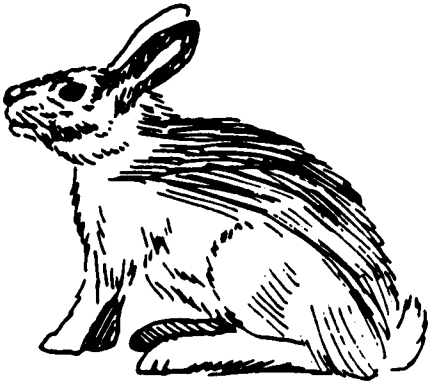
TRAITS: Relatively short ears, dense fur, and white winter fur.

HABITAT: Windswept rocky slopes and dry lowland tundra of western and parts of northern Alaska.

FOODS: Willow shoots, and the leaves, flowers, and shoots of other tundra plants.

EATEN BY: Wolves, snowy owls, golden eagles.

"GEE WHIZ": The young of tundra hares are covered with fur at birth and have their eyes open; other rabbits give birth to young that lack fur and have their eyes closed.



88. Snowshoe Hare F

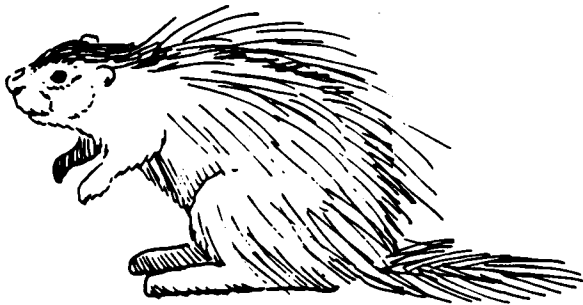
TRAITS: Small mammal with long front teeth for clipping twigs; large, long ears; short tail; long hind legs and large hind feet; changes to white in winter.

HABITAT: Requires a forest mosaic that includes early successional forest where branches of willows, birch, and aspen are at heights it can reach.

FOODS: Buds and twigs of birch, willow, and aspen.

EATEN BY: Lynx, goshawks, great horned owls, red fox, coyote.

"GEE WHIZ": These animals depend upon microscopic organisms that live in their intestines to produce certain vitamins needed for survival.



89. Porcupine F

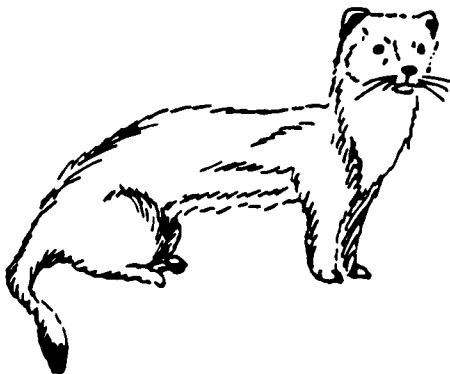
TRAITS: Small mammal; large front teeth for gnawing, short legs, back and tail covered with quills.

HABITAT: Coniferous forests that include large hollow trees or small caves under rocks or logs that it can use for denning.

FOODS: Green vegetation in spring and summer; the inner bark of spruce and birch trees in the winter.

EATEN BY: Lynx, coyotes, wolves, wolverine.

"GEE WHIZ": The wounds this animal inflicts on tree bark allow fungi, insects, and other small animals to enter trees.



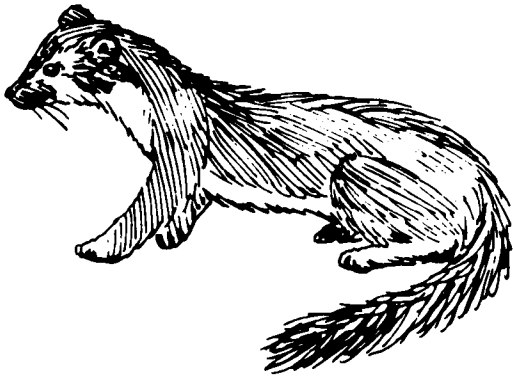
90. Ermine (Short-tailed Weasel) *

TRAITS: Small furbearing mammal; sharp teeth, black tip on tail; turns white in winter.

HABITAT: Open areas, including early successional stages of boreal forest, wetlands, and tundra where water is available for drinking.

FOODS: Voles, shrews, jumping mice, deer mice, and other small mammals are the main foods; birds, insects, and plants are also eaten.

EATEN BY: Great horned owls, hawks, red foxes, goshawks.



91. Marten F

TRAITS: Small mammal; sharp teeth, short legs, yellow to brown fur, long tail.

HABITAT: Coniferous forests; requires a high population of voles near forest.

FOODS: Meadow and red-backed voles are their primary prey; berries, small birds, bird eggs, squirrels, and dead animals are occasionally eaten.

EATEN BY: Foxes, coyotes, lynx, eagles, great horned owls.

“GEE WHIZ”: Uses squirrel middens (piles of scraps left by squirrels) for winter den sites.



92. Beaver F

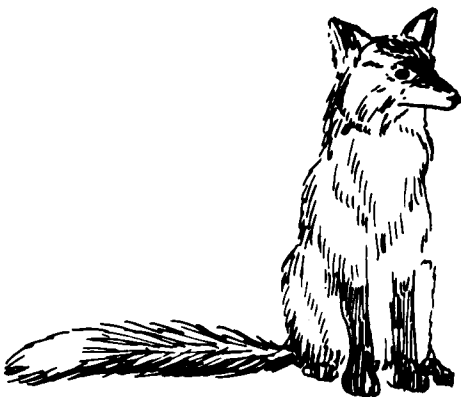
TRAITS: Small mammal with long front incisors, webbed feet, and long, flat tail.

HABITAT: Forests and shrublands along streams, rivers, and lakes where there are adequate stands of willows, birch, or aspen for food; not found north of the Brooks Range.

FOODS: The inner bark of willow, aspen, cottonwood trees and shrubs; also aquatic plants.

EATEN BY: Wolves, lynx, wolverine, bears, humans.

“GEE WHIZ”: Ponds made by these animals provide habitat for a variety of pond-dwelling wildlife; the trees beavers kill provide habitat for beetles, fungi, and woodpeckers.



93. Red Fox *

TRAITS: Dog-like mammal with long tail, sharp teeth, red to black fur, long legs.

HABITAT: Early successional stages of boreal forest, or tundra areas where their prey are abundant.

FOODS: Voles and lemmings are their preferred foods; muskrats, squirrels, hares, birds, eggs, insects, berries, and dead animals are also eaten.

EATEN BY: Wolves, coyotes, lynx, wolverine, bears.

94. Wolf *

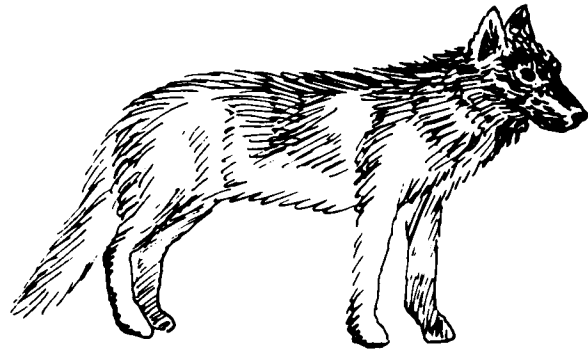
TRAITS: Large, dog-like mammal, sharp teeth, long bushy tail, long legs; lives and hunts in packs.

HABITAT: Alpine and lowland tundra and forests throughout Alaska.

FOODS: Moose, deer, caribou, goats, and Dall sheep (adults and young); also marmots, voles, hares, birds, and fish during summer.

EATEN BY: Other wolves occasionally.

"GEE WHIZ": Smaller animals such as foxes, weasels, ravens, and jays often feed on scraps left by these large predators; social hunting behavior—hunting in packs—allows them to prey on large animals such as moose and caribou.



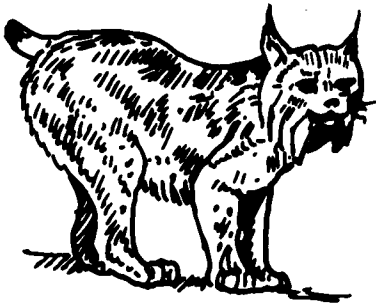
95. Lynx F

TRAITS: Medium-sized mammal in the cat family; tufted ears, long legs, large feet and short tail; sharp teeth.

HABITAT: Requires a mosaic of old conifer forest and early successional stages where prey are abundant.

FOODS: Eats snowshoe hares almost exclusively; when hare populations are low, lynx may also eat small mammals, birds, and rarely moose or caribou.

EATEN BY: Young may be eaten by great horned owls or wolverines.



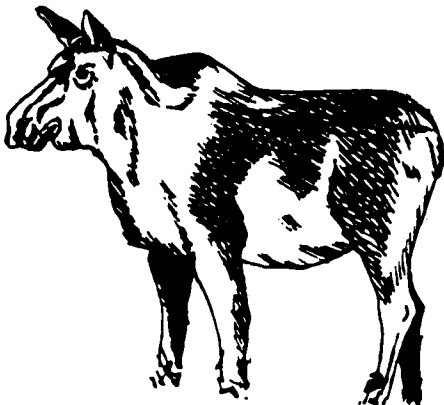
96. Moose *

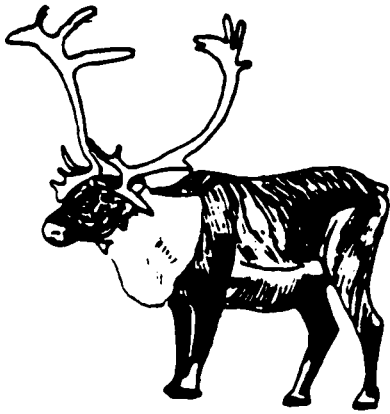
TRAITS: Large, hoofed mammal; long legs, drooping nose, large palmate antlers on male in fall.

HABITAT: Prefers tall shrub thickets found 10-30 years after a forest fire or other disturbance and thickets along rivers; also seeks shelter in forest, particularly during winters with heavy snowfall.

FOODS: Browses on woody vegetation, especially willow, birch, and aspen year-round; in spring, grasses, sedges, horsetails, and aquatic plants are eaten.

EATEN BY: Wolves, brown bears, and humans.





97. Caribou *

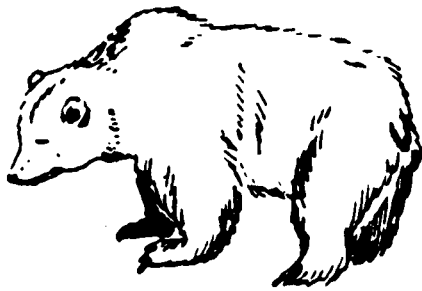
TRAITS: Large size, long dense fur, short tail.

HABITAT: Lowland and alpine tundra and boreal forest, mainly in northern, central, and northwestern Alaska; requires cool windblown sites or snow fields to escape summer insect harassment.

FOODS: Grasses, sedges, herbs, and woody plants in summer; during winter, lichens are an important food.

EATEN BY: Wolves, brown bears, wolverines, humans; calves may be eaten by golden eagles.

"GEE WHIZ": Depends on microscopic organisms in its digestive system to help it digest its food.



98. Brown Bear (Grizzly) *

TRAITS: Large mammal; sharp teeth, long claws on feet, large hump over shoulders, dish-shaped face.

HABITAT: Tundra and forest throughout Alaska; each individual may use 104-390 sq km of these habitats.

FOODS: In spring, over-wintered berries, roots, and fresh green vegetation; salmon and berries in fall; also young of moose, caribou, and deer; ground squirrels and any dead animal.

EATEN BY: Brown bears.

"GEE WHIZ": Brown bears survive winter by remaining dormant in an underground den.



99. Dall Sheep T

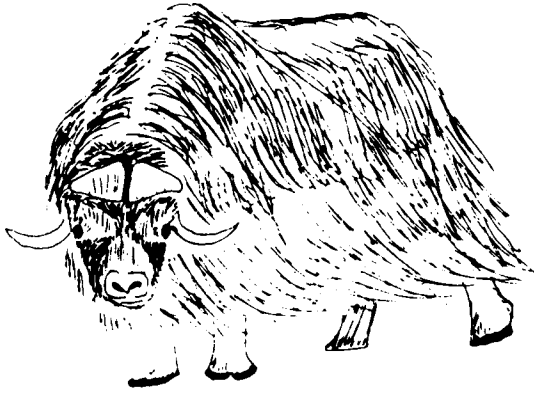
TRAITS: White color, dense fur, sharp hooves specially designed for climbing.

HABITAT: Uses separate summer and winter ranges in alpine tundra in much of Alaska; requires cliffs for escape cover and windblown ridges where food is available during winter.

FOODS: Mainly alpine grasses and sedges, but also flowering herbs, willows, and mosses of alpine tundra.

EATEN BY: Wolves, wolverines, bears, humans; golden eagles will eat lambs.

"GEE WHIZ": Depends on microscopic organisms in its digestive system to help digest its foods.



100. Muskox T

TRAITS: Large size, long dense fur, short legs and

HABITAT: Lowland tundra of northern and western Alaska; prefers floodplains and river bottoms in summer. Requires windblown, snow-free areas in winter.

FOODS: Grasses, sedges, herbs, and woody plants such as willows.

EATEN BY: Wolves and humans.

"GEE WHIZ": Depends on microscopic organisms in its digestive system to help it digest its food.



101. Humans *

TRAITS: Large mammals that walk erect on two legs. Have forearms with opposable thumbs. Have little body hair in comparison to other mammals.

HABITAT: Humans use tools to make clothing, build shelters, and catch or grow food, and thus are able to live in a wide variety of environments around the world.

FOODS: Moose, caribou, salmon, geese, many other wild and domesticated animals.

EATEN BY: Bears and other large, wild animals kill humans on rare occasions, but humans have no natural predators.

"GEE WHIZ": Humans have the ability to cooperate together to accomplish big jobs.

EFFECTS OF FIRE ON WILDLIFE POPULATIONS

While fires kill some individual animals, the most important effects of fire on wildlife populations are due to changes in the vegetation. In tundra most of these changes last for less than 10 years, but in the boreal forest fire begins a series of changes that may last from 50 to 200 years. The most important effect of fire on wildlife in the boreal forest is that it creates and maintains the mosaic of forest ages and types. The fire-maintained mosaic provides habitat for a greater abundance and diversity of wildlife than would otherwise occur.

The following lists the effects of fire on the animals found in boreal forests or tundra ecosystems.

- | | |
|------------|--|
| Moose | Moose generally benefit from fire because their preferred foods are shrubs and saplings. These plants are most abundant and most productive in burned areas. Habitat for moose is generally improved for about 1 to 30 years following fire depending on the impact of the burn and other factors affecting plant succession. However, fires in stands that lack aspen, birch, willow or other browse plants do not benefit moose. |
| Caribou | Scientists disagree about the effects of fire on caribou. Since caribou rely on lichens for winter food some scientists are concerned that fires may reduce the amount of winter habitat for them. Lichens are slow growing and may require 50 to 100 years to recover from a fire. However research into the effects of fire on the size of various caribou herds has not shown any clear pattern. Some herds have increased following large fires while others have declined. At present most caribou biologists think that fire is less important than other factors in determining the size and health of caribou populations. |
| Dall Sheep | Unknown. Sheep may temporarily benefit from increased nutrient-rich plant growth in the few years following fire if a fire occurs in alpine tundra or a forested area near treeline. |
| Muskox | Unknown. Muskoxen could potentially benefit from increased nutrient-rich plant growth in the few years following fire. |
| Bear | Fires generally benefit bears by increasing plant growth and berry crops, and possibly by increasing numbers of prey animals. Heavily burned sites that clear large areas of forest may reduce black bear numbers but are unlikely to affect |

brown bear populations. A severe burn may adversely affect salmon streams and reduce bear populations.

Wolf	Research on the effects of fires on wolves has not been conducted.
benefit from	Wolves are known to hunt in burn areas and they could increased populations of moose and other prey.
Coyote and Fox	The effects of fires on coyotes and foxes have not been thoroughly researched. However these animals often hunt in burned areas and likely benefit from increased populations of small mammals such as voles and lemmings.
Weasel	Weasels prey on small mammals and their numbers are likely to reflect the availability of prey. Since voles are generally more abundant in early successional stages, weasels likely benefit from fire.
Marten	Scientists once thought that fires reduced marten habitat but research on this subject has revealed that marten often benefit from fire both in the short-term and long-term. Marten may benefit from fire in the short-term due to increased populations of voles, their primary prey. Research indicates that marten numbers generally return to or exceed preburn levels within 10 years following fire. While marten do appear to need mature forest for denning sites, small islands of unburned forest within a large burn can provide adequate cover. Marten thus benefit from sporadic fires that create or maintain the forest mosaic. Large fires that completely clear out forests from extensive areas may be harmful to marten but such fires are more likely to result from fire suppression which allows accumulation of fuel. Thus complete fire suppression must be considered detrimental to marten populations in the long-term.
Wolverine	Unknown.
Lynx	Fires are considered generally beneficial to lynx because they increase food for snowshoe hares, the primary prey of lynx. In one study by the Alaska Department of Fish and Game, scientists found that the harvest and evidence of lynx were higher in a recently burned area than in nearby mature forest. Some biologists think that lynx may require mature forests for cover. If so lynx would benefit most from fires that maintain the forest mosaic.

Voles	The effects of fire on vole populations depend upon the impact of the fire and the rate at which plant succession occurs. In lightly burned areas where plant regrowth occurs quickly and where adequate ground cover exists, voles may quickly repopulate a burn site and numbers inside burn areas may eventually exceed those in unburned areas. However, in heavy burns where little cover remains and where vegetation is slow to recover, small mammals may not re-invade burn sites for several years. Also different species of small mammals may respond differently to fire. Research indicates that red-backed voles quickly re-invade burn areas (where conditions are suitable) while tundra voles may not use burned areas for several years. Information on other species is lacking.
Lemming	The effects of fire on lemming populations are unknown.
Porcupine	Porcupines need mature forest for winter habitat but use burned areas for feeding in spring and summer. They are likely to benefit from small burns but be harmed by large fires. No research has been done on the effects of fire on porcupine populations.
Beaver	Beaver benefit from fire because they require young forest or earlier stages of succession where birch aspen and willow predominate. Beaver cannot survive well in forests dominated by spruce.
Muskrat	Research on the effects of fire on muskrats in Alaska is lacking. Elsewhere fire has been shown to benefit muskrats by helping maintain marshlands and increasing growth of plants used by muskrats. In permafrost areas fire may lead to thawing of permafrost and the formation of wetlands and ponds. The value of such ponds to muskrats has not been researched but they may provide additional habitat.
Red and Northern Flying Squirrels	Red and northern flying squirrels live in mature forests, which suggests that fire would be harmful to them. Fire is more likely harmful to red squirrels since they require large stands of spruce to get adequate seeds for winter. Northern flying squirrels feed on mushrooms and berries that may be more abundant in early post-fire successional stages. Large burns that remove extensive forest areas are undoubtedly

harmful to flying squirrels but smaller fires that help maintain the forest mosaic likely improve habitat for them.

Ground Squirrel
primary

No research is available. However some scientists think that fires benefit ground squirrels by promoting lush growth of their food plants.

Woodchuck and Marmot

No information is available. Lush plant growth following fire could provide short-term benefits.

Hare

Snowshoe hares benefit from fires that maintain the forest mosaic. They feed on young willow, aspen and birch shrubs and saplings. Since these are more abundant and productive in burn areas, hares generally benefit from the increased food created by fires. However, hares also require dense black spruce or willow and alder thickets for cover, particularly during winter. Thus large fires that remove extensive areas of forest can reduce hare numbers. Fire suppression that leads to fuel accumulation and the potential for large fires pose a threat to hare habitat.

Loons and Grebe

No research is available. Fires that blacken the soil surface and remove some, or all, of the insulating organic mat can lead to the formation of ponds from the thawing of permafrost in some areas. These wetland areas could potentially provide habitat for these birds if the ponds were large enough and productive enough to support populations of small fish.

Ducks, Geese, and Swans

Little research information is available for Alaska but elsewhere fires are used to maintain wetland habitat for wildlife. Some biologists think fires may benefit Alaskan waterfowl by helping maintain marshlands and/or increasing plant and invertebrate productivity in wetland areas. Fires that blacken the soil surface and remove some or all of the insulating organic mat can lead to the formation of ponds from the thawing of permafrost in some areas. These wetland areas could potentially provide habitat for waterfowl if the ponds supported suitable aquatic vegetation and insect populations.

Shorebirds	Although no information is available it can be speculated that fire is beneficial for the same reasons as with waterfowl.
Owls	No research has been done on the effects of fires on owls. Several species of owls would likely benefit from fires because they feed on small mammals in open habitats. These include northern hawk owl, short-eared owl, great-horned owl, and great gray owl. Boreal owls, great-horned owls, and great gray owls nest in mature trees so fires that remove large forest areas may be harmful to them. Sporadic fires that maintain the forest mosaic should be beneficial.
Grouse	The effects of fire on grouse vary by species. Spruce grouse, which live mainly in mature, white spruce forests, are likely harmed by fire in the short-term. On the other hand, sharp-tailed grouse that need shrub lands and ruffed grouse which live in young deciduous forest benefit from occasional fires that maintain their habitat. Willow ptarmigan also benefit from fire; during winter they feed mainly on buds of birch, aspen and willow along forest edges or in young forest.
Hawks and Falcons	The effects of fire on hawks vary by species. Some species, including rough-legged hawks, red-tailed hawks, and American kestrels feed on small mammals in open habitats. They benefit from increased feeding areas that result from fire. Sharp-shinned hawks and goshawks feed and nest in mature deciduous or mixed forests; in the short-term, fires likely reduce their populations. However, complete fire suppression could lead both to a reduction in the extent of deciduous forests (as these are replaced by spruce forests) and to large heavily burned areas that would clear out extensive areas of mature forest. Sporadic fires that maintain the vegetation mosaic are beneficial to these species.
Woodpeckers	Black-backed woodpeckers, three-toed woodpeckers and hairy woodpeckers quickly respond to the increase in bark beetle populations that occur immediately following fire. Scientists think that black-backed woodpeckers may be nomadic and depend upon fires in the boreal forest to create suitable feeding and nesting habitat. Northern flickers benefit from fires as they nest and feed in open deciduous or mixed

forests or recent burns. Downy woodpeckers do not use recently burned forests, but they depend upon sporadic fires to maintain their habitat - areas of young deciduous forest.

Swallows	Swallows feed in open areas and two species (tree swallows and violet-green swallows) nest in old woodpecker holes in dead trees. Fires likely benefit these species by clearing out forests and improving woodpecker habitat.
Thrushes	The effects of fire on thrushes vary by species. Robins and gray-cheeked thrushes use early successional stages and benefit from fire. The effects on hermit thrushes are unclear as they are found both in mature forests and in forest openings. Varied thrushes and Swainson's thrushes prefer mature or old mixed forests.
Chickadees and Creepers	Black-capped and boreal chickadees and brown creepers prefer old mature forests for feeding and nesting and may be adversely affected by fire.
Warblers	Fires benefit some species of warblers including yellow warblers, orange-crowned warblers, and Wilson's warblers, as these species prefer shrub habitats. Yellow-rumped warblers and Townsend's warblers prefer mature forests. Populations of these species may decline as a result of fire.
Crossbills	Fires reduce habitat for crossbills as these birds feed mainly on the seeds of mature spruce trees.
Sparrows	Most sparrows, including white-crowned, golden-crowned, Lincoln's and Savannah sparrows prefer the early successional stages resulting from fire. Dark-eyed juncos nest in all ages of forest but are also most abundant in early successional stages.