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GUIDE TO ALASKA TREES

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Agriculture Handbook No. 472

GUIDE TO ALASKA TREES

by

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Agriculture Handbook No. 472

**Supersedes Agriculture Handbook No. 5
Pocket Guide to Alaska Trees**

**United States Department of Agriculture
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Alaska's native trees, 32 species, are described in nontechnical terms and illustrated by drawings for identification. Six species of shrubs rarely reaching tree size are mentioned briefly. There are notes on occurrence and uses, also small maps showing distribution within the State. Keys are provided for both summer and winter, and the summary of the vegetation has a map. This new Guide supersedes "Pocket Guide to Alaska Trees" (1950) and is condensed and slightly revised from "Alaska Trees and Shrubs" (1972) by the same authors.

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Cover: Sitka Spruce (*Picea sitchensis*), the State tree and largest in Alaska, also one of the most valuable.

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¹ Size is indicated by letters: LT, large tree; MT, medium tree; ST, small tree; LS, large shrub; MS, medium shrub; SS, small shrub; PS, prostrate shrub. General distribution is given as I, interior, and C, coastal, with small letter where restricted, and R, rare. The 10 tree species producing nearly all the commercial timber are indicated by an asterisk (*). Explanation under Statistical Summary, page 6.

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INTRODUCTION

"Guide to Alaska Trees" describes and illustrates the native trees of the 49th State. It supersedes "Pocket Guide to Alaska Trees" (Taylor 1929; Taylor and Little 1950²), which is out-of-print. It is largely condensed and slightly revised from the handbook "Alaska Trees and Shrubs" (Viereck and Little 1972), which contains nearly 100 additional species of native shrubs, or smaller woody plants.

This guide serves for identification of the native trees of Alaska and to compile additional information, including distribution and uses. It is a nontechnical reference for all who are interested in trees, including foresters and land-use planners, residents and tourists, students and teachers, scientists and conservationists. As many northern species are widely distributed, this guide should be useful also in adjacent parts of Canada and eastward.

Identification of the trees of Alaska is not difficult, because relatively few kinds grow in far northern lands toward their limits. Most States contain within their boundaries at least twice as many native tree species as the 32 of Alaska. New residents and visitors will find some familiar trees, as nearly all species grow wild somewhere in the lower 48 States.

²Names and dates in parentheses refer to Selected References, p. 95.

Many publications on the forests and trees of Alaska have been issued by the Forest Service. Alaska was included in "Forest Trees of the Pacific Slope" (Sudworth 1908). "Alaska's Forest Resource" (Hutchinson 1967) is a report of the State's first forest inventory, made as part of the nationwide Forest Survey. "Characteristics of Alaska Woods" (U.S. Forest Products Laboratory 1963) compiled information relating to the characteristics, distribution, and utilization of 11 commercially important species.

Forestry research in Alaska is conducted by the USDA Forest Service under the Pacific Northwest Forest and Range Experiment Station, with headquarters at 809 NE. 6th Avenue., P.O. Box 3141, Portland, Oregon, 97208. Following early studies in the 1920's, a project location established in 1948 has become the Forestry Science Laboratory, P.O. Box 909, Juneau, Alaska 99801. Another project location at the University of Alaska is the Institute of Northern Forestry, Fairbanks, Alaska, 99701.

The request in previous publications for additional data about Alaska trees and shrubs, particularly their ranges, is repeated here. This information can be sent to the Institute of Northern Forestry.

Studies of Alaska Trees

Many botanists and foresters have studied the trees of Alaska. Naturalists with the early exploring expeditions collected botanical specimens, which were named by European specialists. A history of the botanical exploration has been prepared by Hultén (1940a).

Information about the trees of the 49th State has appeared in numerous publications. Selected References (p. 95) lists many, such as floras, monographs, and lists, which have been helpful in the preparation of this guide and which may be consulted for further details. The most comprehensive references for identification of the higher plants of Alaska are the technical floras by Hultén (1941-50, 1960, 1968) and by Anderson (1959).

Foresters have long been active in Alaska. Most of the valuable coastal forest lands were designated as forest reserves between the years 1892 and 1902. These areas became the Tongass and Chugach National Forests in 1907, 2 years after establishment of the Forest Service in the United States Department of Agriculture. The former has been divided into the North Tongass National Forest with headquarters in Juneau and the South Tongass, in Ketchikan. Headquarters of the Chugach is at Anchorage. Under multiple use planning, these publicly owned timberlands are managed for orderly development of the many resources so that the land remains productive.

Plan

This condensed guide follows "Alaska Trees and Shrubs" (Vioreck and Little 1972), which

contains additional information about the preparation of both handbooks. The descriptive text has the usual botanical arrangement by plant families. A brief description is given for each plant family and for each genus with 2 or more species. The species are numbered in one series for ready reference to drawings and maps.

For each species there are included: (1) Common and scientific names, also other names in use; (2) nontechnical description with emphasis on identification, vegetative characters including size and habit, leaves, twigs, buds, bark, wood, and reproductive characters, such as flowers and fruits; (3) notes including abundance, site, vegetation type, and uses, such as wood, food, and wildlife; (4) geographic distribution both within and outside Alaska; (5) distribution map of Alaska; and (6) drawing.

Common and scientific names of trees are those accepted by the Forest Service, U.S. Department of Agriculture (Little 1953). Scientific names of shrubs follow conservative usage. Other widely used names including synonyms have been added.

Descriptions and notes refer to trees and shrubs growing in Alaska. Measurements are in the English system, but equivalents in the metric system have been added in parenthesis. Basic equivalents are: $\frac{1}{8}$ inch (3 millimeters); $\frac{3}{8}$ inch (1 centimeter); 1 inch (2.54 centimeters); 1 foot (0.3048 meter); 3.28 feet (1 meter). A ruler with both inches and centimeters appears on the last page. Trunk diameters of trees are measured at breast height ($4\frac{1}{2}$ ft. or 1.4 m.). Most tree species attain larger heights and diameters southward.

Geographic distribution within Alaska, as known, is stated by place names along the corners and borders of the range. The larger areas under management by the Federal Government in 1974 are listed because of special interest to residents and visitors. Those cited are South Tongass, North Tongass, and Chugach National Forests, under the Forest Service, U.S. Department of Agriculture. Mt. McKinley National Park and Glacier Bay and Katmai National Monuments are under the National Park Service, U.S. Department of the Interior. Kodiak and Aleutian Islands National Wildlife Refuges, Kenai National Moose Range, and Arctic National Wildlife Range are all under the Fish and Wildlife Service, U.S. Department of the Interior. General distribution beyond Alaska has been added. A map of Alaska showing these areas, as well as most place names mentioned, appears on pages 4 and 5. Proposals for additional Federal areas have been submitted to Congress.

Because of space limitations, the species distribution maps are small, thus, distribution is not shown in detail. The range is mapped as continuous to the outer boundaries. Small gaps within, such as high mountains and glacier-covered areas, are not shown. Large tree species maps are being published in "Atlas of United States Trees, Volume 2, Alaska Trees and Common Shrubs" (Viereck and Little 1974).

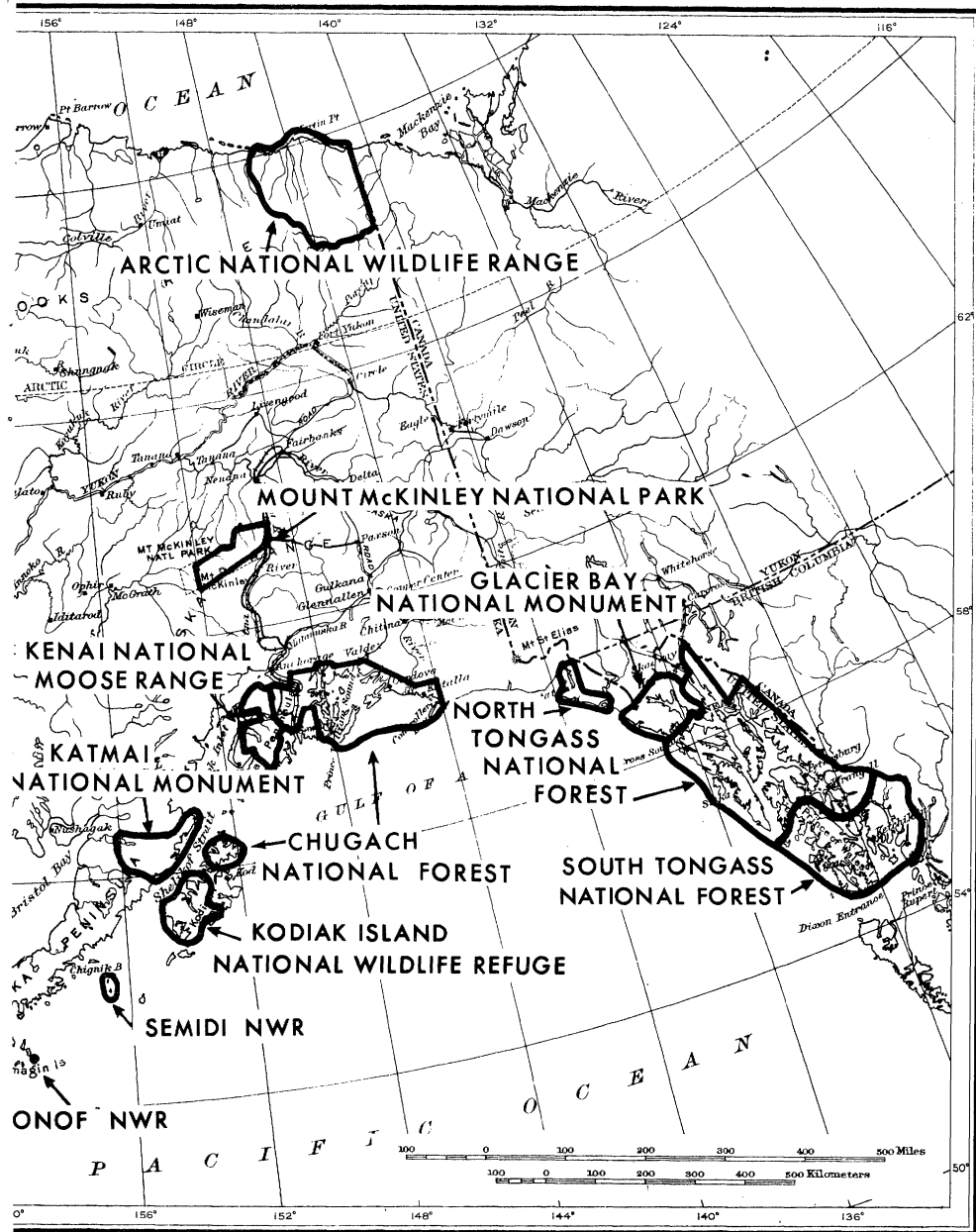
Each species is illustrated by one or more line drawings. Most show a leafy twig (or stem) with both flowers and fruits, some also winter twigs. The scales are indicated, mostly natural size or one-half natural size.

Acknowledgments

Many persons, notably fellow workers in the Forest Service, have helped in the preparation of this guide, "Alaska Trees and Shrubs" (Viereck and Little 1972), and earlier publications. Arland S. Harris, research forester, contributed much information on the trees of southeast Alaska. Joan M. Foote, botanist, aided in collecting and processing specimens and checking many details. Suzanne Foster Manley, former assistant botanist, drafted the species distribution maps in "Alaska Trees and Shrubs," repeated here with slight revision.

The drawings are from "Alaska Trees and Shrubs." Most were from "Pocket Guide to Alaska Trees" (Taylor and Little 1950) and many appeared originally in "Forest Trees of the Pacific Slope" (Sudworth 1908). Nine were made for the 1950 revision by Leta Hughey. That of tamarack was by W. F. Wight (1908). Two drawings of willows (*Salix*), species numbers 16 and 20, were from "The Willows of Alaska" (Coville 1901). The cover drawing is by Barbara H. Honkala, research botanist, who drafted the vegetation map.

George W. Argus, National Museums of Canada, Ottawa, Ontario, assisted in identification of willows (*Salix*). The floras and other publications by Professor Eric Hultén, Naturhistoriska Riksmuseet, Stockholm, Sweden, have been indispensable references. Lloyd A. Spetzman, botanist, Agricultural Research Service, U.S. Department of Agriculture, made many valuable suggestions and prepared a detailed vegetation map of Alaska that has been followed largely in the smaller map published here.



National Forests, Parks, and Wildlife Refuges in Alaska in 1974. Proposals for additional Federal areas have been submitted to Congress.

STATISTICAL SUMMARY

The native trees of Alaska total 32 species, as arranged by plant families in the List of Species under Contents (page iii) and as described and illustrated in this Guide. One introduced species is included as naturalized also.

Six other species of shrubs (5 of willow, *Salix*, and 1 of alder, *Alnus*) rarely reach tree size in Alaska and are described briefly (also illustrated in "Alaska Trees and Shrubs"). Five of these are additions to the State tree list. However, the number of native tree species would be only about 20, if willows and others commonly shrubby were omitted.

Trees are defined as woody plants having one erect perennial stem or trunk at least 3 in. (7.5 cm.) in diameter at breast height (4½ ft., 1.4 m.), a more or less definitely formed crown of foliage, and a height of at least 12 ft. (4 m.) (Little 1953). However, large willows of tree size but with several trunks from the same root and shrubby species rarely attaining these dimensions are accepted here as trees.

The native trees of Alaska belong to 17 genera in 8 plant families. Largest families are the willow family (Salicaceae) with 15 species and the pine family (Pinaceae) with 9. Largest genera are willow (*Salix*), 12 species; alder (*Alnus*), 4; and spruce (*Picea*) and cottonwood-poplar-aspens (*Populus*), 3 each.

In the List of Species, size and general distribution are summarized by letters for reference, as in "Alaska Trees and Shrubs." Trees and shrubs are distinguished as follows: LT, large tree, more than 70 ft. (21 m.) high; MT, medium tree, 30–70 ft. (9–21 m.) high; ST, small tree, 12–30 ft. (4–9 m.) high; LS, large shrub, 6–20 ft. (2–6 m.) high;

MS, medium shrub, 2–6 ft. (0.3–2 m.) high; SS, small or low shrub, 0–2 ft. (0–0.6 m.) high; and PS, prostrate or creeping shrub. General distribution is given as I, interior, and C, coastal, with small letter where restricted.

Only 12 tree species in Alaska are classed as becoming large (LT), that is, more than 70 ft. (21 m.) high. Nine of these are confined to the southeastern and southern coastal forests, where 2 become very large. Sitka spruce (*Picea sitchensis*) reaches a height of 225 ft. (69 m.) and a trunk diameter of 8 ft. (2.4 m.) or more. Western hemlock (*Tsuga heterophylla*) attains 190 ft. (58 m.) in height and 5 ft. (1.5 m.) or more in trunk diameter. A giant black cottonwood (*Populus trichocarpa*) near Haines has a massive trunk 32 ft. 6 in. (9.9 m.) in circumference and a broken top 101 ft. (30.8 m.) tall.

Five other species become medium-sized trees (MT). The remaining 15 illustrated and the 6 shrubby species are small trees (ST). Many are often seen as shrubs, especially in unfavorable sites.

Nearly all the commercial timber of Alaska is produced by 10 tree species, indicated by an asterisk (*) in the List of Species. Six are conifers and 4 are hardwoods. In the coastal spruce-hemlock forests of southeastern Alaska the 5 important conifers are as follows: Sitka spruce (*Picea sitchensis*), western hemlock (*Tsuga heterophylla*), mountain hemlock (*Tsuga mertensiana*), western redcedar (*Thuja plicata*), and Alaska-cedar (*Chamaecyparis nootkatensis*). The lone commercial hardwood in the southeast is black cottonwood (*Populus trichocarpa*). In the interior spruce-hardwood forests,

the commercially important species are white spruce (*Picea glauca*) and 3 hardwoods, balsam poplar (*Populus balsamifera*), quaking aspen (*Populus tremuloides*), and paper birch (*Betula papyrifera*).

The number of tree species native in any area of Alaska is relatively small. Many localities have fewer than 10 tree species, while great expanses of tundra beyond the tree line and above the timberline of mountains have none.

Geographical Distribution

All Alaska tree species range southward across Canada to the contiguous United States, except 4 usually shrubby species of willow (also 2 varieties of paper birch). More than half grow wild somewhere in California.

The tree species of Alaska generally can be separated into two groups according to distribution within the State corresponding to the forest regions, as indicated in the List of Species under Contents (page iii). Twenty are confined to the coastal spruce-hemlock forests (C) of southeast Alaska, several to the southern end. The others are characteristic of the spruce-hardwood forests of the interior (I), but most of these extend at least a short distance southward to the Pacific coast also. These two forest regions are shown on the vegetation map (between p. 47-48) and by maps of the characteristic tree species, white spruce (*Picea glauca*) of the interior (I) and Sitka spruce (*Picea sitchensis*) of the coast of southeast Alaska (C).

The extensive spruce-hardwood forests of interior Alaska are composed of only 3 coniferous tree species, white spruce (*Picea glauca*), black spruce (*P. mariana*), and tamarack (*Larix laricina*), and 3 hardwoods, balsam poplar (*Populus balsamifera*),

quaking aspen (*P. tremuloides*), and paper birch (*Betula papyrifera*), also a few species of willow (*Salix*) and alder (*Alnus*) sometimes reaching tree size.

The 6 tree species of the interior forest just mentioned are trans-continental in range, being widely distributed in the northern coniferous forest ("north woods," boreal forest, or taiga) from Alaska across Canada east to Labrador and Newfoundland and south into the Northeastern States. Bebb willow (*Salix bebbiana*) is a small tree with similar range.

Three tree species have a long north-south distribution. Lodgepole pine (*Pinus contorta*) and black cottonwood (*Populus trichocarpa*) range south in the coastal forests from Alaska to California and beyond in mountains of northern Baja California, more than 30° of latitude. Quaking aspen (*Populus tremuloides*), the tree species with the greatest geographic extent in North America, has a north-south range of about 48° from Alaska and northwestern Canada south to mountains of Mexico.

Local and Rare Species

Several tree species are local or rare in Alaska, where all reach the northern limit of their ranges. However, nearly all have a broad distribution southward to other States and would not be classed as rare and endangered, that is, threatened with extinction.

No tree species is confined to Alaska, or endemic. One tree variety, by some authors accepted as a species, is restricted to Alaska though not rare, Kenai birch (*Betula papyrifera* var. *kenaica*). Yakutat willow (*Salix amplifolia* Cov.), for many years regarded as a local species in the Yakutat Bay region, has been united as a synonym of Hooker

willow (*Salix hookeriana*), of the Pacific coast from British Columbia to California.

Four tree species of southeast Alaska are so rare and local that they would not likely be seen without a special trip to the places cited. One is Hooker willow (*Salix hookeriana*), already mentioned. The others are conifers, Pacific yew (*Taxus brevifolia*), Pacific silver fir (*Abies amabilis*), and subalpine fir (*Abies lasiocarpa*). Being scarce near their northern limits, these species merit protection. All are found within South

Tongass or North Tongass National Forest, where small natural areas could be established for special preservation.

Two tree varieties cross the Rocky Mountains westward into the coastal forests at the head of Lynn Canal near Skagway and Haines: lodgepole pine (*Pinus contora* var. *latifolia*) and western paper birch (*Betula papyrifera* var. *commutata*). The latter enters Alaska also at Hyder near the southern end of the State. Subalpine fir (*Abies lasiocarpa*) appears at both areas also.

VEGETATION OF ALASKA

Alaska is a land of contrasts—contrasts in climate, physical geography, and vegetation. Containing 365.5 million acres (146 million hectares), Alaska has the highest mountain in North America, as well as hundreds of square miles of boggy lowlands. The climate varies from mild and wet to cold and dry. Spanning nearly 1,300 miles (2,100 km.) of latitude and 2,200 miles (3,500 km.) of longitude, Alaska's vegetation varies from the towering fast-growing forests of the southeastern coast, through the low, slow-growing boreal forests of the interior, to the treeless tundra of the north and west.

The summary of the vegetation of Alaska which follows has been condensed from "Alaska Trees and Shrubs" (Viereck and Little 1972). Likewise, the map, vegetation of Alaska, in the center pages (between 47-48, legend on 46) has been adapted from the colored map modified by the senior author for that publication. This reduced and slightly simplified black-and-white map is reproduced also in the Atlas (Viereck and Little 1974). Six main vegetation types are distin-

guished, as numbered below. Treeless bogs and shrub thickets have been combined under other types and are not mapped separately.

Of Alaska's great land surface, approximately 119 million acres (48 million hectares) are forested. Of these, 28 million acres (11.2 million hectares) are classified as "commercial forests." These great timber reserves provide the basis for one of the State's largest industries, and one that will continue to expand in size and importance as the timber demands of the heavily populated areas of the world increase. At present, most of the State's timber production is from the South Tongass, North Tongass, and Chugach National Forests, which contain 92 percent of commercial forests of coastal Alaska. Nearly all of the rest is from other areas within the coastal forests. But as timber demands increase, more and more use will be made of the great timber reserves of the interior or boreal forests.

In addition to the timber values, there are many other important uses of Alaska's forest and tundra areas. Much of Alaska is still wilderness, and the value of

undisturbed wild areas may someday far outweigh the potential value for producing lumber and pulp. An increasing number of people look to Alaska for wilderness that is no longer present in the more developed areas of the world. Thus, it is important that some areas of Alaska forests be retained in their natural state. Tourism in Alaska is an important and growing industry, based primarily on scenic, wilderness, and wildlife values.

The Alaska forests provide many recreational opportunities, including hiking, camping, fishing, and canoeing. In the National Forests are extensive trails and shelter systems that can be used by the hiker, hunter, or canoeist. The National Parks and Monuments provide the visitor with an opportunity to see some of the most spectacular forest and mountain scenery, while the Wildlife Refuges and Ranges, although primarily set aside for the protection and management of wildlife species, also have campgrounds, trails, and other recreational facilities. In the interior boreal forests, the Bureau of Land Management and the State of Alaska have developed campgrounds, canoe trails, and occasional hiking trails through the forested and tundra areas.

Of the forest species, the moose is probably the most abundant and widespread large mammal of the interior forests; occasionally its range extends into the coastal areas. The moose survives the winter primarily by browsing on willows and other shrubs, especially in areas where the shrubs are growing thickly following forest fires, and in willow thickets along the rivers. In coastal areas, the blacktail deer feeds primarily on blueberry and other shrubs during the periods when the snow covers the lower vegetation. In

the summer the deer feeds mainly on the herbaceous plants that grow in the openings in the coastal forests. Even the caribou, often considered a tundra animal, spends the winters in the open forested area adjacent to tree line, especially where lichen growth is abundant.

The forests of Alaska provide more than timber to the people of Alaska and the rest of the United States. They offer wilderness, a place to hike, hunt, fish, and areas to see and photograph wildlife. They are important in protecting our water resource, and they furnish a habitat for a large number of wildlife species.

Coastal Forests

The dense forests of western hemlock and Sitka spruce, a continuation of similar forests along the coast of British Columbia, Washington, and Oregon, extend about 900 miles (1,440 km.) along the Alaska coast from the southeastern tip to Cook Inlet and Kodiak Island. Commercial stands occur from sea level to about 1,500 feet (460 m.) elevation, but scattered trees rise to a timberline at 2,000 to 3,000 feet (460 to 915 m.).

The coastal forests are characterized by steep rough topography. In many areas only a narrow band of trees exists between the ocean and the tundra on snow-clad mountains above. The scenic grandeur of the region is unsurpassed. The narrow waterways with steep forested slopes, the rugged high mountains, and the many glaciers reaching to the coast through forested valleys along with an abundance of streams and lakes offer a wealth of recreation values.

The climate is cool and cloudy in summer, and the winters are mild. Snowfall may be heavy in some forested areas in the north-

ern part, but much of the high precipitation falls as rain. Annual precipitation varies from as much as 222 inches (5,640 mm.) on the outside coast of the southeasternmost islands to 25 inches (630 mm) at Homer on the boundary between coastal and interior forests. The mean annual temperature in the coastal forests ranges from 46° F. (8° C.) at Ketchikan to 37° F. (3° C.) at Cordova. Summer temperatures range in the upper 50's (13–16° C.) and winter temperatures for the coldest month range from the low 20's (–6° C.) to mid 30's (+2° C.).

1. Sitka Spruce-Hemlock Forests

In the southern part the coastal forests are composed primarily of western hemlock and Sitka spruce with a scattering of mountain hemlock, western redcedar, and Alaska-cedar. Red alder is common along streams, beach fringes, and on soils recently disturbed by logging and landslides. Black cottonwood grows on the flood plains of major rivers and recently deglaciated areas on the mainland. Subalpine fir and Pacific silver fir occur occasionally at tree line and near sea level but are not abundant enough to be of commercial value. Blueberries, huckleberry, copperbush, devilsclub, and salal are the most important shrubs. Because of the heavy rainfall and resulting high humidity, mosses grow in great profusion on the ground, on fallen logs, and on the lower branches of trees, as well as in forest openings.

In poorly drained areas at low elevations, open muskegs of low shrubs, sedges, grasses, and mosses are common. These areas are treeless or may have a few scattered shrubby trees of shore pine (lodgepole pine), western hemlock, mountain hemlock, Alaska-cedar, and Sitka spruce.

In the northern and western sections of the coastal forest, the makeup of the tree species changes. Western redcedar is not found north of Frederick Sound, and Alaska-cedar drops out at Prince William Sound. Cottonwood is extensive along some of the glacial outwash rivers and becomes commercially important in the Haines area and on the alluvial terraces to the west. Western hemlock becomes of less importance westward but is found as far as Cook Inlet. Only Sitka spruce remains as the important tree in the coastal forests west of Cook Inlet and the lone conifer on Afognak and Kodiak Islands. Douglas-fir, which is characteristic of the coastal forests of Oregon, Washington, and southern British Columbia, does not reach Alaska.

Interior Forests or Taiga

The white spruce-paper birch forest, extending from the Kenai Peninsula to the south slopes of the Brooks Range and westward nearly to the Bering Sea, is called the boreal forest or taiga—the Russian equivalent. These forests cover about 32 percent of the area or about 106 million acres (42.4 million hectares). However, only about one-fifth or 22.5 million acres (9 million hectares) are classed as commercial forest land.

Characteristic forest stands are found in the Tanana and Yukon Valleys. Here, in contrast to the coast, climatic conditions are extreme. The mean annual temperature is 20 to 30° F. (–7° C. to –1° C.) but winter temperatures below –40° F. (–40° C.) are common and the coldest month averages –10 to –20° F. (–23° to –29° C.). In contrast, summer temperatures may reach into the 90's (above 30° C.), and the warmest month of the year has an average of 60° F. (16° C.). Permanently frozen ground is of scat-

tered occurrence in the southern part of the interior forests and nearly continuous in the northern sections. Although precipitation is light, 6 to 12 inches (150 to 300 mm.) per year, evaporation is low and permafrost forms an impervious layer so that bogs and wet areas are common. Snowfall averages 55 inches (140 cm.) per year at Fairbanks, and snow cover usually persists from mid-October until mid- to late-April. Day length is also extreme in the boreal forest regions with nearly 24 hours of daylight available for plant growth in June, but with only a few hours of sunlight during the winter months. Forest fires have always been an important aspect of the environment of the Alaska interior forests. Even now with modern fire detecting and fighting techniques, more than 4 million acres may burn in a single dry summer.

The vegetation types in interior Alaska form a mosaic of patterns that is related in part to past fire history, to slope and aspect, and to the presence or absence of permafrost. Most forest stands are mixtures of two or more tree species but are usually classified by the dominant species.

2. Closed Spruce-Hardwood Forests

White spruce type.—In general, the best commercial stands of white spruce are found on the warm, dry, south-facing hillsides and adjacent to rivers where drainage is good and permafrost lacking. These stands are rather open under the canopy but may contain shrubs of rose, alder, and willow. The forest floor is usually carpeted with a thick moss mat. On the better sites 100 to 200 year-old spruce with diameters of 10 to 24 inches (25 to 60 cm.) may average 10,000 board feet per acre (58 cubic meters per hectare).

Stands in which commercial white spruce are dominant occupy 12.8 million acres (5.1 million hectares) in interior Alaska.

Quaking aspen type.—Following fire and a willow stage, fast growing aspen stands develop in upland areas on south facing slopes. The aspen mature in 60 to 80 years and are eventually replaced by white spruce, except in excessively dry sites where they may persist. Occasionally aspen stands also follow fire on well drained lowland river terraces and, in these situations, are usually replaced by black spruce in the successional sequence. Stands with aspen dominant occupy about 2.4 million acres (960,000 hectares) in central Alaska.

Paper birch type.—Paper birch is the common invading tree after fire on east- and west-facing slopes and occasionally on north slopes and flat areas. This species occurs either in pure stands or more often mixed with white spruce, aspen, or black spruce. Shrubs may be similar to those under aspen but usually Labrador-tea and mountain-cranberry are more common. Paper birch may be 60–80 feet (18–24 m.) tall and have diameters up to 18 inches (46 cm.), but an average diameter of 8–9 inches (20–22 cm.) is more common in the interior birch stands. Stands dominated by paper birch occupy about 5 million acres (2 million hectares) of interior forests and are especially widespread in Susitna Valley.

The balsam poplar type. Another tree species of importance within the closed spruce-hardwood forest in interior Alaska is balsam poplar, which reaches its greatest size and abundance on the floodplain of the meandering glacial rivers. It invades sandbars and grows rapidly to heights of 80–100 feet (24 to 30 m.) and diameters of 24 inches (60 cm.)

before being replaced by white spruce. Balsam poplar also occurs in small clumps near the altitudinal and latitudinal limit of trees in the Alaska Range and north of the Brooks Range. Commercial stands occupy 2.1 million acres (840,000 hectares), primarily along the Yukon, Tanana, Susitna, and Kuskokwim Rivers. In the Susitna Valley balsam poplar is often replaced in this type by black cottonwood or by hybrids.

3. Open, Low Growing Spruce Forests

On north-facing slopes and poorly drained lowlands, forest succession leads to open black spruce and bogs, usually underlain by permafrost. The black spruce are slow growing and seldom exceed 8 inches (20 cm.) in diameter and are usually much smaller; a tree 2 inches (5 cm.) in diameter is often 100 years in age. The black spruce comes in abundantly after fire because its persistent cones open after a fire and spread abundant seed over the burned areas. A thick moss mat, often of sphagnum mosses, sedges, grasses, and heath or ericaceous shrubs usually make up the subordinate vegetation of the open black spruce stands. Associated with black spruce in the wet bottom lands is the slow-growing tamarack. As with the black spruce, it is of little commercial value, seldom reaching a diameter of more than 6 inches (15 cm.).

Near treeline the open spruce forests consist of both black and white spruce and frequently have an understory of resin birch, alder, and willow.

Treeless Bogs

Coastal areas. — Within the coastal forests in depressions, flat areas, and on some gentle slopes where drainage is poor, treeless areas occur. The vegetation is

variable but most commonly consists of a thick sphagnum moss mat, sedges, rushes, low shrubs, and fruticose lichens. This type is locally called "muskeg." Often a few slow growing, poorly formed, shore pine, western hemlock, or Alaska-cedar are scattered on the drier sites.

Interior areas. — Within the boreal forest are extensive bogs where conditions are too wet for tree growth. North of the Alaska Range in the unglaciated areas, they occur on old river terraces and outwash, in filling ponds and old sloughs and occasionally on gentle north, facing slopes. They are common south of the Alaska Range, on the fine clay soils formed in former glacial lake basins and on morainal soils within the glaciated area. They are also common on the extensive flat areas of the lower Yukon and Kuskokwim Rivers.

The vegetation of these bogs consists of varying amounts of grasses, sedges, and mosses, especially sphagnum. Often the surface has stringlike ridges.

Shrub Thickets

Coastal alder thickets. — Dense thickets of shrubs occur in a number of sites in all the major vegetation zones in Alaska. In coastal Alaska there are extensive alder thickets between the beach and the forest, between the treeline and the alpine tundra meadows, and extending from treeline downward through the forest in avalanche tracks and along streams. The shrub thicket is also common in southeastern Alaska in the many clearcut areas. The alder thicket is almost impenetrable as the boles of the shrubs tend to grow horizontally as well as vertically. To travel through the thicket is even worse; the spiny devilsclub and salmonberry are frequently present. Beneath

the alders there is often a well developed grass and fern layer, as well as a number of herbs and shrubs.

Floodplain thickets.—Another major shrub type, floodplain thickets, is found on the floodplains of the rivers. Although somewhat different in species composition, the type is rather similar from the rivers of the southern coastal areas to the broad braided rivers north of the Brooks Range. This type forms on newly exposed alluvial deposits that are periodically flooded. It develops quickly and may reach heights of 15 to 20 feet (4.5–6 m.) in the south and central Alaska and 5 to 10 feet (1.5–3 m.) along the rivers north of the Brooks Range. The main dominant shrubs of this type are willows and occasionally alders.

Birch-alder-willow thickets.—A third type of shrub thicket occurs near tree line in interior Alaska and beyond tree line in extensive areas of the Alaska and Seward Peninsulas. It consists of resin birch, alder, and several willow species, usually forming thickets 3 to 10 feet (1–3 m.) tall. The thickets may be extremely dense, or they may be open and interspersed with reindeer lichens, low heath type shrubs, or patches of alpine tundra.

Tundra

The low tundra vegetation can be divided into three main types: moist tundra, wet tundra, and alpine tundra. Within each of these major types are mosaics of subtypes related to differences in topography, slope, aspect, and substrate.

4. Moist Tundra

Moist tundra occupies the foothills and lower elevations of the Alaska Range as well as extensive areas on the Seward and Alaska

peninsulas, the Aleutian Islands, and the islands of the Bering Sea. The type varies from almost continuous and uniformly developed cottongrass (*Eriophorum*) tussocks with sparse growth of other sedges and dwarf shrubs to stands where tussocks are scarce or lacking and shrubs are dominant.

5. Wet Tundra

The wet tundra type as shown on the vegetation map includes also the low coastal marshes of southern Alaska. The type is most extensive along the coastal plain north of the Brooks Range, the northern part of the Seward Peninsula, and on the broad Yukon delta. It is usually found in areas with many shallow lakes and little topographic relief. Standing water is almost always present in the summer and in the northern parts permafrost is close to the surface. The vegetation is primarily a sedge and cottongrass mat, usually not in tussocks.

6. Alpine Tundra

In all the mountain ranges of Alaska and on exposed ridges in the arctic and southwestern coastal areas, there is a zone of alpine tundra. Much of this type consists of barren rocks but interspersed between the bare rocks and rubble are low mat plants, both herbaceous and shrubby. Dominant in this type in northern areas and in the Alaska Range are low mats of white mountain-avens which may cover entire ridges and slopes along with many mat forming herbs. In the southeastern coastal mountains and the Aleutians, the most important plants are the low heath shrubs, especially cassiopes and mountain-heaths. On the Aleutian Islands this type consists primarily of crowberry, bog blueberry, mountain-cranberry, alpine-azalea, and several dwarf willows.

KEYS FOR IDENTIFICATION

Most native trees of Alaska can be identified easily by reference to the drawings, descriptions, and maps. If you know a common name, consult the Index of Common and Scientific Names for page numbers, then match your specimen with the drawings and text. The List of Species under Contents may be consulted, if the family is recognized or if the specimen resembles one previously named.

It is desirable to have flowers and fruits or cones, as well as a twig or stem with leaves. However, most trees can be identified from foliage alone.

Many trees are evergreen and can be identified readily at any time of the year. For those plants shedding their leaves, frequently a few old leaves and fruits can be found in winter either still attached or on the ground beneath. In winter, twig and bud characters are useful. Maps may be used to eliminate species not known to grow wild where the specimen was found.

Keys are provided to aid identification, both in summer, when leaves, flowers, and fruits are present, and in winter, when twigs, winter buds, and bark are used. Two here are: Key to Alaska Trees Based Mainly on Leaves and Winter Key to Deciduous Trees of Alaska. Also, each genus with two or more tree species has a key to its Alaska species. For the willows (*Salix*), the largest genus, there are two: Key to Alaska Tree Willows and Vegetative Key to Alaska Tree Willows.

A key is an outline for identifying specimens or plants through the process of elimination. This device is a short cut to save time in reading every description until the one that agrees is found. The

species are divided into two groups according to certain distinguishing characters, and each group is divided successfully into two smaller groups down to a single species at the end. The name of a particular specimen is found through selection, one by one, of the group in which it belongs.

Like an outline, the keys are indented. The two groups forming a pair of contrasting characters are designated by the same letter, single and double, and spaced one directly below the other, usually not together. Step by step, elimination proceeds from left to right by selection of the group to which the specimen belongs until the name is reached. Species numbers are cited beside each name for reference. Then verification is made by comparison with description, illustration, and map. If agreement is lacking or doubtful, the steps followed in the key may be retraced and different steps tried. With incomplete specimens, it may be desirable to check both groups of a pair where the contrasting characters are absent or uncertain.

Emphasis is given to nontechnical and vegetative characters, which are present over longer periods than flowers or fruits, also, to the larger parts. However, a hand lens will be helpful.

The first step is to select the proper key for the specimen. Usually, the keys based mainly on leaves and other vegetative characters are simpler and easier to use than the winter keys. The latter must depend largely upon differences in twigs and buds. Even in winter, enough old leaves, flowers, and fruits may be found for use of the main keys. Of course, keys based largely on leaves can be used throughout the year for the evergreens.

For example, a tree specimen with broad leaves would be identified with the Key to Alaska Trees Based Mainly on Leaves. First, both contrasting parts or groups of the key, beginning with the pair "A" and "AA," should be read. The specimen with broad leaves belongs under "AA," and all the trees under "A," having needlelike or scalelike leaves, are

eliminated. Next, the lines "N" and "NN" are read. If the leaves and twigs are in pairs (opposite), the specimen belongs under "NN." Then, if the leaves have 3 long-pointed lobes, the specimen agrees with "j" instead of "jj" and is a Douglas maple. Confirmation is made by comparison with the description, illustration, and map.

Keys to Alaska Trees Based Mainly on Leaves

- A. Leaves needlelike or scalelike, evergreen (except in tamarack), trees resinous (except in yew); seeds more or less exposed and not enclosed in a fruit—conifers or softwoods (gymnosperms).
- B. Leaves needlelike, flattened, abruptly pointed but not prickly, in 2 rows comblike with leafstalks extending down twig; seeds single in scarlet juicy cuplike disk; rare in extreme southeast Alaska ----- 1. Pacific yew (*Taxus brevifolia*)
- BB. Leaves needlelike or scalelike, not as above; seeds borne on scales of a cone.
- C. Leaves needlelike, more than ¼ in. (6 mm.) long, single, or clustered.
- D. Needles shedding in fall, 12–20 in cluster on short spur twigs (also single on leading twigs) ----- 3. tamarack (*Larix laricina*)
- DD. Needles evergreen, single or 2 (sometimes 3) in a bundle.
- E. Needles 2 (sometimes 3) in a bundle with sheath at base —2. lodgepole pine (*Pinus contorta*)
- F. Cones pointing backward, opening at maturity; generally low spreading tree of muskegs in coastal forests ----- 2a. shore pine (*Pinus contorta* var. *contorta*)
- FF. Cones pointing outward, mostly remaining closed many years; tree often tall and narrow of inner fiord forests at head of Lynn Canal (Skagway to Haines) ----- 2b. lodgepole pine (*Pinus contorta* var. *latifolia*)
- EE. Needles single, without sheath at base.
- G. Older twigs roughened by projections where needles were shed.
- H. Needles sharp-pointed, stiff, without leafstalks—spruce (*Picea*).
- I. Needles 4-angled.
- J. Twigs hairy; needles mostly less than ½ in. (12 mm.) long, resinous; cones egg-shaped or nearly round, mostly less than 1 in. (2.5 cm.) long, curved down on short stalks, remaining on tree ----- 4. black spruce (*Picea mariana*)
- JJ. Twigs hairless; needles more than ½ in. (12 mm.) long, with skunklike odor when

- crushed; cones cylindric, $1\frac{1}{4}$ – $2\frac{1}{2}$ in. (3–6 cm.) long, falling at maturity
- 5. white spruce (*Picea glauca*)
- II. Needles flattened but slightly keeled
- 6. Sitka spruce (*Picea sitchensis*)
- HH. Needles blunt, soft and not stiff, with short leaf-stalks—hemlock (*Tsuga*).
- K. Needles flat, appearing in 2 rows, shiny dark green above, with 2 whitish bands (stomata) on lower surface
- 7. western hemlock (*Tsuga heterophylla*)
- KK. Needles half-round and keeled or angled beneath, crowded on all sides of short side twigs, blue green, with whitish lines (stomata) on both surfaces
- 8. mountain hemlock (*Tsuga mertensiana*)
- GG. Older twigs smooth—fir (*Abies*).
- L. Needles shiny dark green on upper surface and silvery white with many lines (stomata) on lower surface
- 9. Pacific silver fir (*Abies amabilis*)
- LL. Needles dull dark green with whitish lines (stomata) on both surfaces
- 10. subalpine fir (*Abies lasiocarpa*)
- CC. Leaves scalelike, usually less than $\frac{1}{8}$ in. (3 mm.) long, crowded, forming fanlike or flattened sprays.
- M. Leafy twigs flattened; leaves flattened and curved, not spreading
- 11. western redcedar (*Thuja plicata*)
- MM. Leafy twigs 4-angled or slightly flattened; leaves pointed, spreading
- 12. Alaska-cedar (*Chamaecyparis nootkatensis*)
- AA. Leaves broad and flat, shedding in fall (deciduous); trees non-resinous; seeds developed from a flower and enclosed in a fruit—flowering plants (angiosperms).
- N. Leaves and twigs arranged singly (alternate).
- O. Leaves not divided into leaflets (simple).
- P. Leafstalks (petioles) mostly less than $\frac{1}{2}$ in. (12 mm.) long; leaves mostly more than twice as long as broad, with edges finely toothed or without teeth; winter buds covered by a single scale—willow (*Salix*).
- Q. Leaf edges without teeth or only sparsely and indistinctly toothed.
- R. Leaves rounded at base, broadly elliptic, becoming hairless on both sides
- 16. Hooker willow (*Salix hookeriana*)
- RR. Leaves tapering or short-pointed at base, narrower, with hairs on lower surface.
- S. Lower surface of leaves covered by dense hairs, appearing silvery, white, or gray.
- T. Leaves thick, lower surface with dense white woolly hairs
- 17. feltleaf willow (*Salix alaxensis*)
- TT. Leaves thin, lower surface with dense straight hairs, silvery silky hairy
- 20. Sitka willow (*Salix sitchensis*)

- SS. Lower surface of leaves visible through less dense hairs.
- U. Leaves thick, nearly hairless above; hairs on lower surface short and stiff, at least some red, giving reddish hue ----- 19. Scouler willow (*Salix scouleriana*)
- UU. Leaves thin, hairy on both sides; hairs longer, not reddish ----- 18. Bebb willow (*Salix bebbiana*)
- QQ. Leaf edges finely and distinctly toothed from base to apex.
- V. Leaves 1-3 in. (2.5-7.5 cm.) long, mostly short-pointed at both ends ----- 21. littletree willow (*Salix arbusculoides*)
- VV. Leaves 2-5 in. (5-12.5 cm.) long, long-pointed, mostly rounded at base ----- 22. Pacific willow (*Salix lasiandra*)
- PP. Leafstalks (petioles) mostly more than 1/2 in. (12 mm.) long (often shorter in alder); leaves less than twice as long as broad, with edges finely or coarsely toothed; winter buds with 2 or more scales exposed.
- W. Leaf edges finely toothed with curved and rounded teeth —cottonwood, poplar, aspen (*Populus*).
- X. Leaf blades nearly round, less than 2 in. (5 cm.) long; leafstalks flattened ----- 15. quaking aspen (*Populus tremuloides*)
- XX. Leaf blades longer than broad, 2 1/2-5 in. (6-12.5 cm.) long; leafstalks round.
- Y. Seed capsules pointed, hairless, 2-parted; leaves pale green and brownish beneath; tree of interior forests ----- 17. balsam poplar (*Populus balsamifera*)
- YY. Seed capsules rounded, hairy, 3-parted; leaves whitish beneath; tree of coastal forests ----- 14. black cottonwood (*Populus trichocarpa*)
- WW. Leaf edges coarsely toothed with sharp-pointed teeth.
- Z. Leaf edges doubly toothed with teeth of 2 sizes.
- a. Leaf edges not lobed; bark papery and peeling off, white, brown, or pinkish—23. paper birch (*Betula papyrifera*).
- b. Leaves long-pointed, usually wedge-shaped at base; bark usually white in age; interior Alaska ----- 23b. Alaska paper birch (*Betula papyrifera* var. *humilis*)
- bb. Leaves mostly short-pointed.
- c. Leaves thin, mostly rounded at base; bark usually reddish brown; northern part of southeast Alaska ----- 23a. western paper birch (*Betula papyrifera* var. *commutata*)
- cc. Leaves thick, wedge-shaped or rounded at base, with white hairs on toothed edges; bark usually dark brown or gray; southern and southern interior Alaska ----- 23c. Kenai birch (*Betula papyrifera* var. *kenaica*)

- aa. Leaf edges wavy or shallowly lobed; bark usually gray and smooth, not papery nor peeling off—alder (*Alnus*).
- d. Leaves yellow green above, shiny on both sides and especially beneath, sticky when young, edges with relatively long-pointed teeth -----
----- 24. Sitka alder (*Alnus sinuata*)
- dd. Leaves dark green above, dull, not sticky when young, edges with short-pointed teeth.
- e. Leaves thick with edges curled under slightly, with rusty hairs along veins beneath ----
----- 25. red alder (*Alnus rubra*)
- ee. Leaves thin with edges flat, finely hairy or nearly hairless beneath -----
----- 26. thinleaf alder (*Alnus tenuifolia*)
- ZZ. Leaf edges with uniform teeth.
- f. Leaves short-pointed, sometimes 3-lobed -----
---- 27. Oregon crab apple (*Malus diversifolia*)
- ff. Leaves rounded at apex ----- 30. western serviceberry (*Amelanchier alnifolia*)
- OO. Leaves divided into 7–17 leaflets (compound), the leaflets attached along extended leafstalk and shedding with it—mountain-ash (*Sorbus*).
- g. Leaflets mostly 11–15, short-pointed, edges toothed nearly to base.
- h. Leaflets becoming hairless -----
----- 28. Greene Mountain-ash (*Sorbus scopulina*)
- hh. Leaflets white-hairy beneath; naturalized tree -----
- 28.1. European mountain-ash (*Sorbus aucuparia*)
- gg. Leaflets mostly 9 or 11, rounded or short-pointed at apex, edges not toothed in lowest third -----
----- 29. Sitka mountain-ash (*Sorbus sitchensis*)
- NN. Leaves and usually twigs in pairs (opposite).
- i. Leaves with 3 long-pointed lobes, irregularly or doubly toothed -----
----- 31. Douglas maple (*Acer glabrum* var. *douglasii*)
- ii. Leaves divided into 5 or 7 leaflets (compound), finely toothed -----
----- 32. Pacific red elder (*Sambucus callicarpa*)

Winter Key to Deciduous Trees of Alaska

- A. Twigs with many wartlike, blackish spur twigs about $\frac{1}{8}$ in. (3 mm.) long; upright brown cones usually present; trees with pointed crown ----- 3. tamarack (*Larix laricina*)
- AA. Twigs without spur twigs or with longer spurs; trees with spreading, usually rounded crown.
- B. Winter buds, leaf-scars, and twigs arranged singly (alternate).
- C. Winter buds covered by a single scale ----- willow (*Salix*; the species not readily distinguished in winter)
- CC. Winter buds with 2 or more scales exposed.
- D. Winter buds usually resinous or sticky, shiny, brown, long-pointed; lowest bud-scale centered over leaf-scar—cottonwood, poplar, aspen (*Populus*).
- E. Winter buds $\frac{1}{4}$ in. (6 mm.) or less in length, slightly or not resinous -----
----- 15. quaking aspen (*Populus tremuloides*)

- EE. Winter buds $\frac{3}{8}$ –1 in. (10–25 mm.) long, very resinous.
- F. Tree of interior forests -----
 ----- 13. balsam poplar (*Populus balsamifera*)
- FF. Tree of coastal forests -----
 -- 14. black cottonwood (*Populus trichocarpa*)
- DD. Winter buds not resinous or sticky (slightly so in Sitka alder); lowest bud-scale at side of bud.
- G. Winter buds mostly stalked (slightly in No. 52), with the 3 exposed scales meeting at edges (overlapping in No. 52); old, hard, blackish cones or conelike fruits usually present—alder (*Alnus*).
- H. Cones with long stalks more than $\frac{1}{2}$ in. (12 mm.) long, mostly longer than cones -----
 ----- 24. Sitka alder (*Alnus sinuata*)
- HH. Cones with short stalks less than $\frac{1}{2}$ in. (12 mm.) long.
- I. Cones $\frac{1}{2}$ –1 in. (12–25 mm.) long -----
 ----- 25. red alder (*Alnus rubra*)
- II. Cones less than $\frac{1}{2}$ in. (12 mm.) long -----
 ----- 26. thinleaf alder (*Alnus tenuifolia*)
- GG. Winter buds not stalked, composed of overlapping scales; fruits not conelike.
- J. Winter buds $\frac{1}{4}$ in. (6 mm.) or less in length; bud-scales with few or no hairs.
- K. Twigs with many small whitish dots (lenticels and resin); bark papery, peeling off -----
 ----- 23. paper birch (*Betula papyrifera*)
- KK. Twigs with few inconspicuous dots (lenticels); bark not papery.
- L. Winter buds blunt-pointed, dark brown; twigs coarse, gray or brown, often with dense gray hairs near tip, with short side twigs or spurs -----
 ----- 27. Oregon crab apple (*Malus diversifolia*)
- LL. Winter buds sharp-pointed, purple; twigs slender, reddish purple, shiny, hairless, without short side twigs or spurs ----- 30. western serviceberry (*Amelanchier alnifolia*)
- JJ. Winter buds large, usually more than $\frac{3}{8}$ in. (10 mm.) long; inner exposed bud-scales densely hairy—mountain ash (*Sorbus*).
- M. Winter buds with whitish hairs.
- N. Winter buds reddish brown, inner scales with whitish hairs at tip -----
 ----- 28. Greene mountain-ash (*Sorbus scopulina*)
- NN. Winter buds densely covered with whitish hairs; naturalized tree ----- 28.1. European mountain-ash (*Sorbus aucuparia*)
- MM. Winter buds with rusty brown hairs -----
 -- 29. Sitka mountain-ash (*Sorbus sitchensis*)
- BB. Winter buds, leaf-scars, and usually twigs in pairs (opposite).
- O. Twigs slender, reddish, with small dark red buds -----
 ----- 31. Douglas maple (*Acer glabrum* var. *douglasii*)
- OO. Twigs stout, gray, with large gray buds -----
 ----- 32. Pacific red elder (*Sambucus callicarpa*)

GUIDE TO ALASKA TREES

YEW FAMILY

(Taxaceae)

The seed plants with seeds partly exposed (gymnosperms), not enclosed in fruits, are represented in Alaska by 3 families of conifers or softwoods, the yew family (Taxaceae), the pine family (Pinaceae), and the cypress family (Cupressaceae). The Alaska examples are evergreen (with 1 exception) trees and shrubs with narrow or small leaves resembling needles or scales. Pacific yew (*Taxus brevifolia* Nutt.), the Alaska member of the yew family, is distinguished by the brown seeds borne singly in a scarlet, juicy, cuplike or berrylike disk, by the flat, pointed, nonresinous needles in 2 rows, and by the twisted leafstalks extending down the twig.

1. PACIFIC YEW

(*Taxus brevifolia* Nutt.)

Other name: western yew.

Small tree or large shrub of extreme south end of southeast Alaska, to 20-40 ft. (6-12 m.) tall, with straight conical trunk 2-6 in. (5-15 cm.) or rarely 18 in. (45 cm.) in diameter at breast height, with open crown or horizontal or drooping branches. Leaves (needles) in 2 rows, $\frac{1}{4}$ - $\frac{3}{4}$ in. (12-20 mm.) long, flat, slightly curved, stiff or soft, abruptly pointed but not prickly, shiny yellow green above, pale green beneath, not resinous. Petioles yellow, extending down the slender twigs, twisting to produce an even, comblike arrangement of needles. Bark purplish brown, thin, scaly, ridged, and fluted. Wood bright red with thin light yellow sapwood, fine-textured, heavy, hard, elastic.

Pollen and seeds on different trees (dioecious). Seeds single, $\frac{3}{8}$ in. (1 cm.) long, brown, exposed at apex but partly surrounded by a thick scarlet, juicy, cuplike disk or "berry."

Southward, the strong, durable wood is used for poles, bows, canoe paddles, and cabinet work. However, in Alaska the trees are too scarce to be commercially important. The plants could serve as ornamentals.

The seeds are poisonous when eaten, causing vomiting, diarrhea, and inflammation of urinary ducts and the uterus. Also, yew foliage is poisonous when browsed by livestock. However, the juicy scarlet "berries" around the seeds are not toxic.

Pacific yew is rare and local in the extreme south end of southeast Alaska, near sea level on poor sites and in canyons. It is scattered in understory of the coast forest of western redcedar, western and mountain hemlocks, and Sitka spruce. The irregular distribution may be related to dispersal of the seeds by birds. Growth is slow. Another species of yew has been introduced in southeast Alaska as an ornamental shrub and hedge plant.

Pacific yew has been found in Alaska only on a few islands near Ketchikan. These include Annette, Dog, Cat, Mary, Bold, and Gravina Islands. Also southern end of Prince of Wales Island north to Kasaan Island in Kasaan Bay. Probably rare in nearby areas. South Tongass National Forest. Pacific coast region from Alaska and British Columbia south through western Washington to central California and in mountains to Idaho and northwestern Montana.

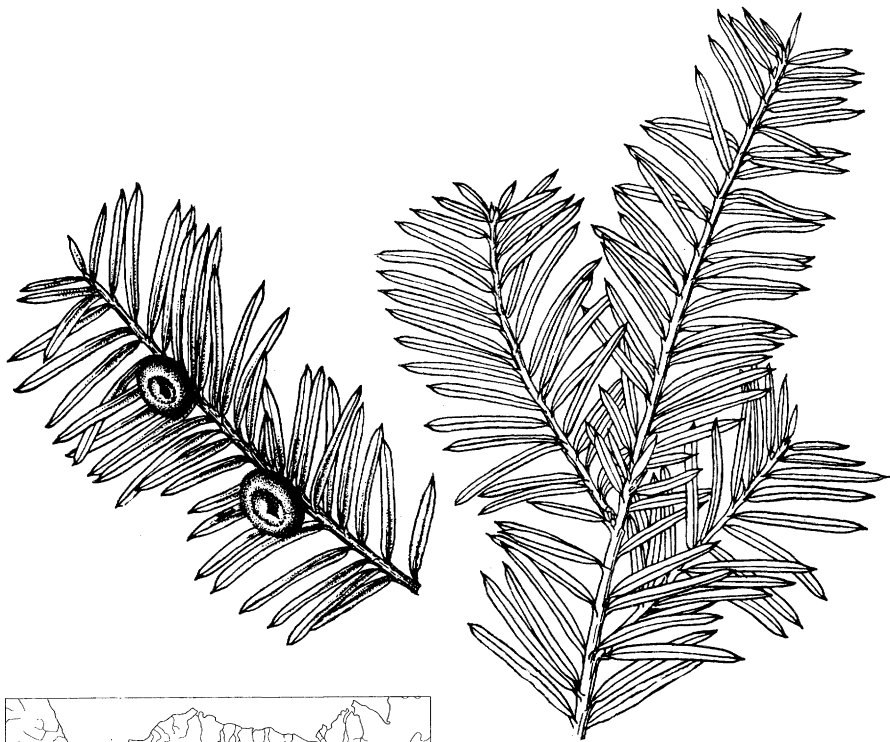
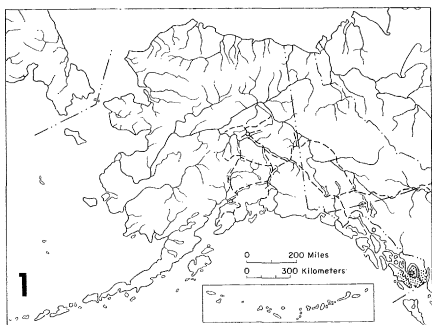


Figure 1.—Pacific yew (*Taxus brevifolia*), natural size.



PINE FAMILY
(*Pinaceae*)

Conifers, or softwoods, are economically the most important group of trees in Alaska. Many have tall straight trunks and narrow crowns, except where dwarfed near the limits of tree growth. However, the 2 native species of juniper are low shrubs. These narrowleaf evergreens make up nearly all the trees of the coastal forests of southeast Alaska and most of the timber of the interior

forests. They furnish nearly all the State's lumber, pulpwood, building logs, and other wood products.

These cone-bearing trees are resinous softwoods with needle-like or scalelike evergreen leaves with seeds exposed in cones, usually hard and woody. Pollen is borne in small male cones usually on the same plant, and true flowers and fruits are lacking. Alaska's conifers are classified in 3 plant families, yew family (*Taxaceae*), pine family (*Pinaceae*) with needlelike leaves, and scalelike leaves. Members of the yew family have seeds borne singly in a scarlet juicy cuplike disk, rather than in a cone, and may not be true conifers.

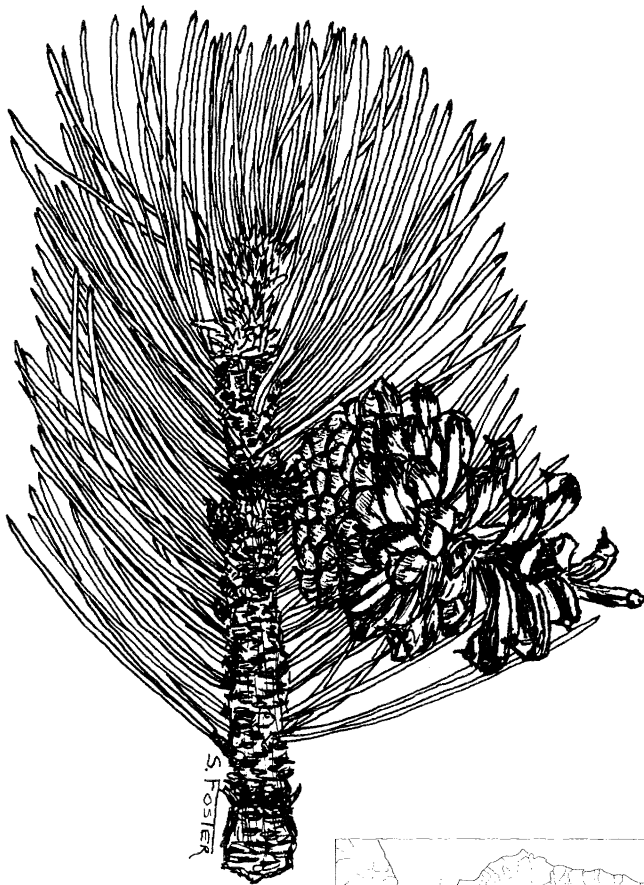
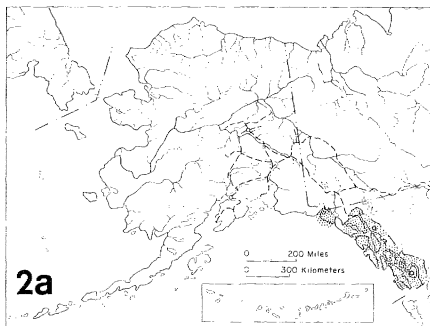


Figure 2a.—Shore pine (*Pinus contorta* var. *contorta*), natural size.

The pine family (Pinaceae) is well represented in Alaska by 5 genera and 9 species of trees with narrow, mostly long needles. The cones have many cone-scales, each bearing 2 long-winged seeds at its base. Characters of the 5 genera and names of their Alaska species are summarized here for ready identification.

Larch (*Larix*), the only Alaska conifer shedding its leaves in fall and leafless in winter. One species, tamarack (*L. laricina* (Du Roi) K. Koch), with slender flexible needles borne 12–20 in a cluster on short stout spur twigs (or single on leading twigs).



Pine (*Pinus*), 1 species, lodgepole pine (*P. contorta* Dougl.), with 2 varieties. Needles 2 in a bundle or cluster with sheath at base, relatively long and stiff. Cones one-sided, with many prickly cone scales.

Spruce (*Picea*), 3 species, black, white, and Sitka spruce. Needles sharp-pointed and stiff, either 4-angled or flattened and slightly keeled, extending out on

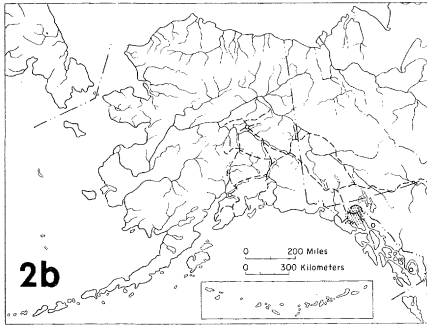


Figure 2b.—Lodgepole pine (*Pinus contorta* var. *latifolia*), natural size.

all sides of twig. There is no leaf-stalk, but each leaf is attached on a small stalklike or peglike projection of the twig. Older twigs without needles are rough because of these projections. Cut branches of spruce and hemlock shed their needles promptly upon drying. The cones hang down. (In the preparation of botanical specimens, immersion of freshly cut twigs in boiling water for a few minutes before pressing reduces shedding of needles.)

Hemlock (*Tsuga*), 2 species, western and mountain hemlock. Needles short, blunt, soft and not stiff, flat or slightly keeled, with short leafstalks, spreading in 2

rows or curved upward. As in spruce, the older twigs are slightly rough from the peglike projections. The cones hang down.

Fir (*Abies*), 2 species, Pacific silver fir and subalpine fir. Needles flat and without leaf-stalks, often spreading in 2 rows or curving upward. Older twigs smooth with round leaf-scars. Cones upright in highest branches of the narrow pointed crowns. As the cone-scales fall from the axis at maturity, old cones are not found on or under the trees.

2. LODGEPOLE PINE

(*Pinus contorta* Dougl.)

Other names: scrub pine, tamarack pine.

The general description and range of this species are followed

by similar notes for the 2 varieties in Alaska. Small to large evergreen, resinous tree of southeast Alaska, 20-75 ft. (6-23 m.) tall and 8-32 in. (20-81 cm.) in trunk diameter, with crown rounded spreading or narrow pointed. Leaves (needles) 2 in a bundle with sheath at base, 1-2¼ in. (2.5-6 cm.) long, relatively long and stiff, often twisted, yellow green to dark green with whitish lines (stomata). Twigs stout, orange when young, becoming gray brown and rough. Winter buds short-pointed, of many narrow red brown scales. Bark gray to dark brown, scaly, thin or becoming thick. Wood resinous or pitchy, coarse-textured, straight-grained (scrubby trees with spiral grain), moderately lightweight, moderately soft. Heartwood light yellow to yellow brown, sapwood narrow and whitish.

Cones 1 to few, almost stalkless, egg-shaped, one-sided, 1¼-2 in. (3-5 cm.) long, light yellow brown, with many prickly cone scales, maturing in 2 years, persistent, opening or remaining

closed many years. Seeds brown, about 5/8 in. (15 mm.) long, including the long broad wing.

Alaska's only native species of pine is not important for lumber because of its mostly small size and limited occurrence. The wood is used for poles and fuel. The sweet orange-flavored sap served the Indians as a delicacy, fresh or dried. In the vicinity of Fairbanks, the inland variety has been introduced as a fast growing hardy shade tree.

Wood of lodgepole pine of the Rocky Mountain region is suitable for pulping for papers and fiberboard. Other uses are lumber, railroad ties, mine timbers, and poles, posts, and fuelwood. The lumber is mostly for rough construction, occasionally for boxes, siding, finish, and flooring.

This species including 3 geographic varieties has a broad range from southeast Alaska, central Yukon, and southwestern Mackenzie, south in mountains and along coast to Colorado, Utah, and California; also local in northern Baja California.

Key to the 2 Alaska Varieties

Cones pointing backward, opening at maturity; generally low spreading tree of muskegs in coastal forests -----

----- 2a. shore pine (*Pinus contorta* var. *contorta*)

Cones pointing outward, mostly remaining closed many years: tree often tall and narrow of inner fiord forests at head of Lynn Canal Skagway to Haines) -----

----- 2b. lodgepole pine (*Pinus contorta* var. *latifolia*)

2a. SHORE PINE

(*Pinus contorta* Dougl. var. *contorta*)

Other names: lodgepole pine, scrub pine, tamarack pine.

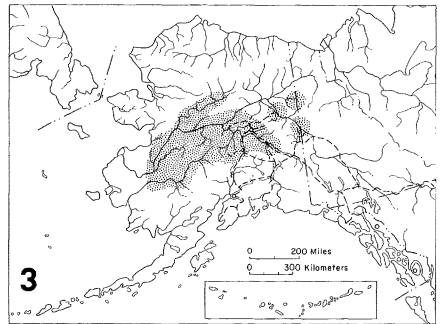
Shore pine, the common pine through southeast Alaska, is often a low spreading or scrubby tree

20-40 ft. (6-12 m.) high and 8-12 in. (20-30 cm.) in trunk diameter. However, it sometimes becomes 75 ft. (23 m.) tall and 18-32 in. (45-81 cm.) in diameter. Cones pointing backward on twig, opening at maturity in October-November but remaining attached.



Figure 3.—Tamarack (*Larix laricina*), natural size. Winter twigs at bottom.

The dwarf coastal form is common in open muskegs of peat moss and on benches near lakes. Intolerant of shade, it grows in open stands as a scrub pine, straight when young but gnarled in age, with large branches extending almost to the ground. On the poorest sites, it is often like a prostrate shrub. It is best developed and largest in the better-drained borders between muskeg and hemlock or hemlock-redcedar stands. Occasionally the trees are pioneers of rapid growth after infrequent fires or logging or on outwash sand and gravel.



This coastal variety ranges throughout southeast Alaska north to the head of Lynn Canal at Haines and to Glacier Bay and Dixon Harbor. The northwestern grove is an area of several square miles on rolling muskegs about 15 miles (24 km.) east of Yakutat,

where the trees of poor form reach 40 ft. (12 m.) in height and 1 ft. (30 cm.) in trunk diameter. South Tongass and North Tongass National Forests, Glacier Bay National Monument. Pacific coast from British Columbia to northwestern California.

2b. LODGEPOLE PINE

(*Pinus contorta* var. *latifolia*
Engelm.)

Other names: Rocky Mountain lodgepole pine, *Pinus contorta* ssp. *latifolia* (Engelm.) Critchfield.

The Rocky Mountain or inland variety of lodgepole pine reaches the State only in the vicinity of Skagway and Haines. This mostly tall form with narrow crown becomes 50–75 ft. (15–23 m.) high and 8–12 in. (20–30 cm.) in trunk diameter here and somewhat larger southward. Cones hard, heavy, pointing outward, mostly remaining closed many years, opening after a forest fire to release seeds. However, in Alaska some cones open at maturity.

The Rocky Mountain variety of lodgepole pine can be added to the list of Alaska trees, though not mentioned in botanical references. This inland variety differs from shore pine in being generally a taller tree with narrow crown and thinner scaly bark, in having slightly longer needles, and in the slightly larger, heavier, closed cones which point outward on the twig rather than backward.

This variety of lodgepole pine crosses the Coast Range from Canada into Alaska only in the vicinity of Skagway and Haines and Chilkat River at the head of Lynn Canal near the northernmost end of southeast Alaska. It forms stands in the mixed forest with Sitka spruce, western paper

birch, and subalpine fir (also from the Rocky Mountains) and in the inner fiords down to sea level. North Tongass National Forest. Also northward in Yukon Territory along Yukon River and tributaries near Dawson to within 50 miles (80 km.) of the Alaska border. East to southwestern Mackenzie and south through western Alberta and British Columbia and in Rocky Mountains to Colorado and Utah.

3. TAMARACK

(*Larix laricina* (Du Roi)
K. Koch)

Other names: Alaska larch, eastern larch, hackmatack; *Larix alaskensis* W. F. Wight, *L. laricina* var. *alaskensis* (W. F. Wight) Raup.

Small to medium-sized deciduous tree 30–60 ft. (9–18 m.) high, with straight tapering trunk 4–10 in. (10–25 cm.) in diameter, occasionally to 75 ft. (24 m.) tall and 13 in. (33 cm.) in diameter, horizontal branches extending nearly to ground, and thin pointed crown of blue green foliage. Leaves (needles) shedding in fall (deciduous), in crowded clusters of 12–20 on short stout spur twigs or branches or single on leading twigs, $\frac{3}{8}$ –1 in. (1–2.5 cm.), very narrow, slender and flexible, 3-angled, blue green, turning yellow before falling in early autumn. Twigs long, stout, dull tan, hairless, with many short stout spur twigs to $\frac{1}{4}$ in. (6 mm.) long, bearing crowded raised leafscars, becoming blackish and rough. Winter buds small, round, about $\frac{1}{16}$ in. (2 mm.) long, covered by many short-pointed overlapping scales. Bark dark gray, smoothish, thin, becoming scaly and exposing brown beneath. Wood light brown, hard, heavy, elastic.

Cones curved upright on short stalks along horizontal twigs, rounded, $\frac{3}{8}$ - $\frac{5}{8}$ in. (1-1.5 cm.) long, dark brown, composed of about 20 rounded, finely toothed cone-scales, opening in early autumn and remaining attached in winter. **Seeds** light brown, $\frac{1}{2}$ in. (12 mm.) long, including long broad wing.

Tamarack is the only Alaska conifer shedding its leaves in winter. It is scattered in muskegs and various moist soils of the interior in open stands with paper birch, black spruce, alders, and willows. Occasionally it forms dense stands on flood plains with black spruce and white spruce. Where it does occur naturally on upland well drained sites, its growth rate may be equal to that of white spruce; one stand in the Tanana Valley has produced trees 13 in. (33 cm.) in diameter in 100 years.

The durable, strong wood is used to some extent for poles, railroad ties, and fenceposts.

Interior Alaska tamarack is restricted to drainages between Brooks Range on the north and Alaska Range on the south. Locally abundant along Tanana River but scattered along Yukon and Kuskokwim Rivers and up Koyukuk River to Allakaket but not north to the limit of trees. West to Unalakleet River, which

drains into Norton Sound, and to Napaimiut on the lower Kuskokwim River. Mt. McKinley National Park. There are broad gaps separating the Alaska trees from the main range from Yukon Territory eastward, except for 2 records from near the Alaska-Yukon Border. From Alaska, Yukon Territory, and District of Mackenzie east across Canada along northern limit of trees to Hudson Bay, Labrador, and Newfoundland, south in Northeastern United States to New Jersey, Illinois, and Minnesota (local in Maryland and West Virginia), and northwest to northeastern British Columbia.

The Alaska trees were named as a separate species, afterwards reduced to a variety and to synonymy. The slight differences in cone-scales and their bracts seem insufficient for retention of a separate name.

SPRUCE (*Picea*)

Spruce trees have short leaves (needles) spreading on all sides of twig, mostly 4-sided or slightly flattened, sharp-pointed and stiff, shedding promptly on drying. Twigs become rough from peg-like bases of leaves. The cones hang down.

Key to the 3 Alaska Species

Leaves (needles) 4-angled, with whitish lines (stomata) on all sides.

Twigs hairy; needles mostly less than $\frac{1}{2}$ in. (12 mm.) long, resinous; cones egg-shaped or nearly round, mostly less than 1 in. (2.5 cm.) long, curved down on short stalks, remaining on tree

----- 4. black spruce (*Picea mariana*)

Twigs hairless; needles more than $\frac{1}{2}$ in. (12 mm.) long, with skunk-like odor when crushed; cones cylindric, $1\frac{1}{4}$ - $2\frac{1}{2}$ in (3-6 cm.) long, falling at maturity

----- 5. white spruce (*Picea glauca*)

Leaves (needles) flattened but slightly keeled, with 2 whitish bands (stomata) on lower surface; twigs hairless; cones cylindric, $2-3\frac{1}{2}$ in. (5-9 cm.) long, falling at maturity

----- 6. Sitka spruce (*Picea sitchensis*)

4. BLACK SPRUCE

(*Picea mariana* (Mill.)
B.S.P.)

Other names: bog spruce, swamp spruce.

Evergreen resinous tree of interior forests, usually small and 15-30 ft. (4.5-9 m.) high, and 3-6 in. (7.5-15 cm.) in trunk diameter, with narrow pointed crown. Often a shrub 10 ft. (3 m.) or less in height. Sometimes a medium-sized tree to 50-60 ft. (15-18 m.) tall and 9 in. (23 cm.) in trunk diameter, the maximum height measured 72 ft. (22 m.). The branches are short, sparse, and often slightly drooping at ends. **Leaves** (needles) short-stalked, spreading on all sides of twig, $\frac{1}{4}$ - $\frac{5}{8}$ in. (6-15 mm.) long, 4-angled, pointed, stiff, ashy blue green, with whitish lines (stomata) on all sides. **Twigs** slender, hairy, covered with very short reddish hairs, becoming brown and rough from peglike bases of leaves. **Bark** thin, composed of gray or blackish scales, brown beneath, the cut surface of inner bark yellowish. **Wood** yellowish white, light-weight, soft, fine-textured, with growth rings very narrow to almost microscopic.

Cones curved downward on short stalks, small and short, egg-shaped or nearly round, $\frac{5}{8}$ -1 $\frac{1}{4}$ in. (1.5-3 cm.) long, dull gray or blackish, remaining on tree several years and often conspicuously clustered in tree tops; cone-scales rigid and brittle, rounded, and slightly toothed. **Seeds** brown, about $\frac{1}{2}$ in. (12 mm.) long including large wing.

Black spruce is characteristic of cold wet flats, muskegs, north-facing slopes, silty valley terraces, and lake margins in the spruce-birch interior forests up to an altitude of 2,000 ft. (610 m.), locally to 2,700 ft. (823 m.). Extending to tree line on gentle damp slopes,

such as northern side of Alaska Range. Dense pure stands are frequently on wet area burns. Clusters of black spruce are common, because the lower branches take root to form a ring of small trees around the central parent tree.

Besides its usually different habitat and smaller size with more compact branching, black spruce is distinguished from white spruce by the shorter and blunter needles, hairy twigs, and smaller cones with brittle, slightly toothed cone-scales curved down on short stalks and remaining attached several years. The twigs of black spruce are reported to be tougher and gummier also. These 2 species of the interior forests can be distinguished also in the seedling stage by the finely toothed leaf margins in white spruce and absence of teeth in black spruce. Logs and tree trunks can be identified by inner bark color, yellowish in black spruce and whitish in white spruce. Annual growth rings of black spruce wood are narrower also.

The wood is of slight importance for lumber because of the small size of the trees. Occasionally the logs are cut along with white spruce for cabins. The trees are important as fuel, especially in stands killed by fire, remaining standing and well preserved for several decades. Southward black spruce is a popular Christmas tree.

Interior Alaska north to southern slopes of Brooks Range but at lower elevations and not as far north as white spruce. West to upper Kobuk River and to Elim at base of Seward Peninsula; reported only to Kaltag on Yukon River and the Stoney River on Kuskokwim River. Southwest at base of Alaska Peninsula to Bristol Bay at Naknek. South of Alaska Range in Susitna Valley,



Figure 4.—Black spruce (*Picea mariana*), natural size.

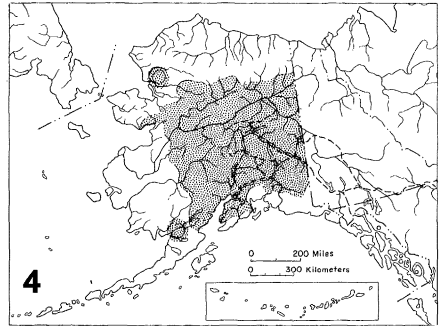
Cook Inlet and Kenai Peninsula south to Homer, and Copper River basin south to Tonsina. Not in southeast Alaska. Chugach National Park, Kenai National Moose Range. East across Canada near northern limit of trees to Hudson Bay, Labrador, and Newfoundland, south to New Jersey, Minnesota, Manitoba, and British Columbia.

5. WHITE SPRUCE

(*Picea glauca* (Moench)
Voss)

Other names: western white spruce, Canadian spruce, Alberta spruce, *Picea glauca* var. *albertiana* (S. Brown) Sarg.; Porsild spruce, *P. glauca* var. *porsildii* Raup.

White spruce, the most important tree of the spruce-birch interior forest, is a medium-sized to large tree 40–70 ft. (12–21 m.) high and 6–18 in. (15–46 cm.) in trunk diameter. On the best sites it reaches 80–115 ft. (24–35 m.) and 30 in. (76 cm.), but at timberline it becomes a prostrate shrub with a broad base below the snow-cover line. Crown pointed and usually very narrow and spire-like, sometimes broad and conical,



composed of slightly drooping branches with upturned ends and many small drooping side twigs. **Leaves** (needles) short-stalked, spreading on all sides of twig but massing on top near ends, $\frac{1}{2}$ – $\frac{3}{4}$ in. (12–20 mm.) long, 4-angled, sharp-pointed, stiff, blue green, with whitish lines on all sides; leaves and twigs with skunklike odor when crushed. **Twigs** slender, hairless, orange brown, becoming rough from peglike bases of leaves. **Bark** thin, gray, smoothish or in scaly plates, the cut surface of inner bark whitish. **Wood** almost white, the sapwood not easily distinguished, moderately lightweight, moderately soft, of fine and moderately uneven texture, with growth rings easily seen in cross-sections.

Cones nearly stalkless, hanging down, cylindric, $1\frac{1}{4}$ – $2\frac{1}{2}$ in. (3–6 cm.) long, shiny light brown,

falling at maturity; cone-scales thin and flexible, margins nearly straight and without teeth. Seeds brown, about $\frac{3}{8}$ in. (10 mm.) long, including large wing.

White spruce is the commonest tree of interior Alaska, occurring from near sea level to tree line at about 1,000–3,500 ft. (305–1,607 m.). The tree line is lowest in the north and west and on north-facing slopes and highest in the southeast interior and on south-facing slopes. This species is found in mostly open forests, usually with paper birch or in pure stands. In a few places, such as the Chugach National Forest, it extends to tidewater. Although not exacting as to site, this species grows best on well drained soils on south-facing gentle slopes and sandy soils along the edges of lakes and rivers. It forms the tallest forests along the large rivers, where running water thaws the soil. It is seldom found where permafrost is close to the surface. White spruce often replaces balsam poplar along the river floodplains and also invades the open forests of birch and aspen that follow fire. The trees have average growth rate, attaining an age of 100–200 years at maturity.

Alaska trees commonly have very narrow crowns and short broad cones and have been referred to a western variety (western white spruce, var. *albertiana* (S. Brown) Sarg.). In contrast the trees of the typical variety, for example, in the Lakes States and Northeast, have broader conical crowns. Another western variation scattered in Alaska has smooth bark with resin blisters (as in fir) and relatively broad crown (Porsild spruce, var. *porsildii* Raup).

On Kenai Peninsula, where this species meets Sitka spruce, hybrids or intermediate trees occur,

as noted under that species. Natural hybrids between white spruce and black spruce apparently are very rare in interior Alaska. One intermediate tree identified as a hybrid was discovered among trees of these two species on the north edge of Tanana Valley about 250 miles (400 km.) east-southeast of Fairbanks, at about 1,800 feet (550 m.) elevation.

White spruce is used extensively in interior Alaska for cabin logs, peeled and in natural form, sawed flat on 3 sides, or milled on lathes into uniformly round logs having diameters of 6, 8, or 10 inches (15, 20, or 25 cm.). Large numbers of pilings and rough timbers from interior Alaska have been transported to the North Slope for construction of oil drilling platforms. Timbers for bridges and corduroy roads are other uses. A small quantity is cut for fuel also. This species supplies much of the lumber sawed in interior Alaska, also dimension material for buildings in light and medium construction. Early uses included flumes, sluice boxes, and boats.

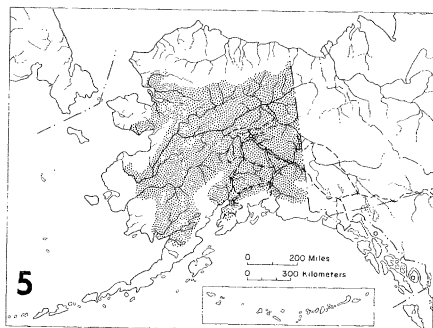
In Canada, white spruce is the most important commercial tree species and the foremost pulpwood. Uses include scaffolding planks, paddles and oars, sounding boards in musical instruments, shop fittings, agricultural implements, kitchen cabinets, boxes, cooperage, shelving, veneer, and plywood. The seasoned wood is almost tasteless and odorless and well suited for food containers.

The range of white spruce through interior Alaska corresponds to that mapped for the spruce-birch interior forests, north and west to the limit of tree growth but not in the southeast. In the northeast to Firth River and its tributary Joe Creek on the Arctic slope and north to south



Figure 5.—White spruce (*Picea glauca*), natural size.

slopes of Brooks Range and north-west to Noatak River near Chukchi Sea. West to upper Fish River on Seward Peninsula, Unalakleet, Mountain Village on Yukon River, Holitna River on Kuskokwim River, and reaching Bristol Bay coast at Dillingham on Nushagak Bay. Also south of Alaska Range from Susitna Valley to Cook Inlet and northern Kenai Peninsula and east to Copper River Basin. Chugach National Forest, Mt. McKinley National Park, Katmai National Monument, Kenai National Moose Range, Arctic National Wildlife Range. East across Canada near northern limit of trees to Hudson Bay, Labrador, and Newfoundland, south to New York, Minnesota, Montana, and British Columbia, also local in Black Hills.



6. SITKA SPRUCE (*Picea sitchensis* (Bong.) Carr.)

Other names: tideland spruce, yellow spruce, western spruce, silver spruce, coast spruce.

Sitka spruce is the largest and one of the most valuable trees in Alaska, also the State tree. Large to very large evergreen tree to 160 ft. (49 m.) in height and 3–5 ft. (0.9–1.5 m.) in trunk diameter, infrequently to 200–225 ft. (61–69 m.) and 7–8 ft. (2.1–2.4 m.) or

more. From the much enlarged or buttressed base, the tall straight evenly tapering trunk rises to an open pointed broad conical crown with horizontal branches. Leaves (needles) standing out on all sides of twig, flattened and slightly keeled, $\frac{5}{8}$ –1 in. (15–25 mm.) long, sharp-pointed, dark green, the upper surface slightly keeled or angled and with 2 whitish bands (stomata), lower surface rounded or slightly keeled and sometimes with few whitish lines. Twigs stout, stiff, hairless, light brown to dark brown, becoming rough from peglike bases of leaves. Bark gray and smoothish on small trunks, thin, becoming dark purplish brown with scaly plates, the inner bark whitish with brown dots. Wood moderately lightweight, moderately soft, of fine and moderately even texture, and usually very straight grained. Sapwood nearly white and heartwood light reddish brown.

Cones short-stalked, hanging down, cylindric, 2–3½ in. (5–9 cm.) long, light orange brown, falling at maturity; cone-scales long, stiff, thin, rounded and irregularly toothed. **Seeds** brown, about ½ in. (12 mm.) long, including large wing.

Sitka spruce forms more than 20 percent of the hemlock-spruce coastal forests of Alaska and also occurs in pure stands. It grows more rapidly and to larger size than western hemlock and is more light-requiring. The largest old growth trees in southeast Alaska have trunk diameters exceeding 8 ft. (2.4 m.) and ages of 500–750 years or more. Many years ago there was reported a giant 14½ ft. (4.4 m.) in trunk diameter measured 6 ft. (1.8 m.) above the ground, but further information including the locality is lacking. (The national champion Sitka spruce, at Forks, Wash., is somewhat larger, approximately 17.9

ft. (5.4 m.) in trunk diameter and 248 ft. (75.6 m.) in height.) Westward on the Chugach National Forest, the trees are smaller, averaging 80 ft. (24 m.) in height, 1½ ft. (45 cm.) in diameter, and about 200 years in age. At Afognak and Kodiak Islands there are pure stands of Sitka spruce, the only conifer. On Kodiak Island near the southwestern limit, this tree is reported to be migrating westward during the past few centuries.

This species extends from sea level to the timberline up to about 3,000 ft. (914 m.) in the coastal mountains but grows mainly at altitudes below 1,500 ft. (457 m.). However, dwarf plants have been seen as high as 3,500–3,900 ft. (1067–1189 m.) on unglaciated rocky outcrops (nunataks) projecting above the Juneau Ice Field.

In bare or open areas, such as at Glacier Bay, the bushy trees often propagate by layering. The lowest branches touch the ground, become partly covered up, develop roots, and then turn upward to form separate trees. Sprouts from stumps have been observed also.

Small groves of Sitka spruce trees were planted as early as 1805 by Russians at Unalaska, near the eastern end of the treeless Aleutian Islands and far outside the tree limits. These trees are still growing and have produced cones. Younger trees are absent, perhaps because of grazing. Several plantings have been made also on other Aleutians. Both the common and scientific names honor Sitka Island, now Baranof Island, where the southeast Alaska town of Sitka is located.

Sitka spruce produces high-grade wood pulp, the best on the Pacific coast. The wood with that of western hemlock is extensively used in manufacture of newsprint. This species is also the prin-

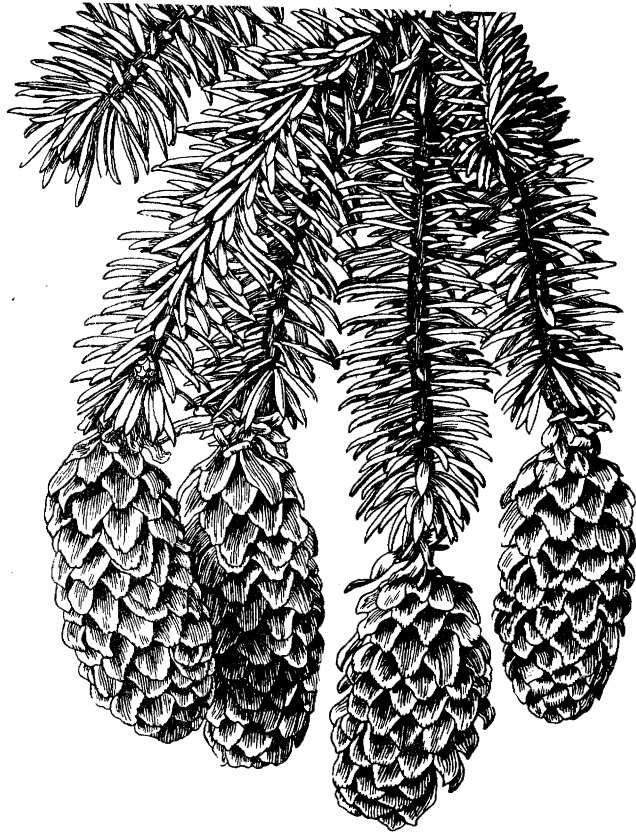
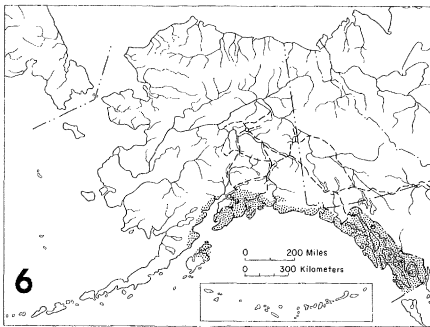


Figure 6.—Sitka spruce (*Picea sitchensis*), three-fourths natural size.



principal saw-timber tree of southeast Alaska and is made into all the usual forms of lumber. The high-grade lumber from the large clear trunks has many uses. It is the most important wood for airplane and glider construction, and in World War II was utilized especially in British mosquito bombers. Other important uses are oars, ladders and scaffolding, and

boats, particularly racing sculls. Resonant qualities, large size, and uniformity make the wood valuable for piano sounding boards. Much low-grade lumber is made into packing boxes for the Alaska salmon industry. Other uses are general construction, food containers, shelving, and kitchen furnishings. Alaska has about two-fifths of the total supply of this species and seven-eighths of the United States supply.

The range of Sitka spruce is the same as the hemlock-spruce coastal forests of southeast and southern Alaska. Throughout southeast Alaska north to head of Lynn Canal at Skagway, Glacier Bay, and Yakutat Bay. West

along coast of southern Alaska to Prince William Sound, Kenai Peninsula, and west side of Cook Inlet. Along southern coast of Alaska Peninsula southwest to its westernmost limit at Cape Kubukli near southern boundary of Katmai National Monument. Also Afognak Island and eastern half of Kodiak Island, where it is the only conifer. South Tongass, North Tongass, and Chugach National Forests, Glacier Bay National Monument, Kenai National Moose Range, Kodiak Island National Wildlife Refuge. From Kodiak Island and southern Alaska southeast along Pacific coast to northwestern California.

On Kenai Peninsula there are natural hybrids between white spruce and Sitka spruce (*Picea glauca* × *sitchensis*; Lutz spruce, *Picea* × *lutzii* Little). The hybrid is a tree 55–70 ft. (17–21 m.) high and 1–1½ ft. (30–45 cm.) in trunk diameter. Hybrid trees are recognized by their leaves and cones intermediate between those of the parent species. The leaves

are slightly 4-angled, less so than in white spruce and are near Sitka spruce in the whitish upper surfaces. The cones are intermediate in size or small as in white spruce.

Cone-scales are short as in white spruce but like Sitka spruce in being thin, light brown, and irregularly toothed. These hybrids are found on Kenai Peninsula where the ranges of the two species meet and overlap slightly and may be sought elsewhere along the border between the coastal and interior forest types.

HEMLOCK (*Tsuga*)

Hemlock trees have very slender leading twigs or leaders which are curved down or nodding. The leaves are short needles, flat or half-round, blunt, soft, and not stiff, with short leaf-stalks, shedding promptly on drying. Twigs are very slender, becoming roughened by peglike bases after leaves fall. The cones are stalkless and usually hang down.

Key to the 2 Alaska Species

- Leaves (needles) flat, appearing in 2 rows, shiny dark green above, with 2 whitish bands (stomata) on lower surface; 5/8–1 in. (1.5–2.5 cm.) long 7. western hemlock (*Tsuga heterophylla*)
- Leaves (needles) half-round and keeled or angled beneath, crowded on all sides of short side twigs, blue green, with whitish lines (stomata) on both surfaces; cones cylindrical, 1–2½ in. (2.5–6 cm.) long 8. mountain hemlock (*Tsuga mertensiana*)

7. WESTERN HEMLOCK

(*Tsuga heterophylla* (Raf.) Sarg.)

Other names: west coast hemlock (lumber), Pacific hemlock; formerly *Tsuga mertensiana* auth.

Large evergreen tree becoming 100–150 ft. (30–46 m.) tall and 2–4 ft. (0.6–1.2 m.) in trunk diameter, with long slender trunk often becoming fluted when large,

and short narrow crown of horizontal or slightly drooping branches, the very slender leading twig curved down or nodding. The largest trees are as much as 190 ft. (58 m.) in height and 5 ft. (1.5 m.) or more in diameter. Leaves (needles) short-stalked, spreading in 2 rows, 1/4–7/8 in. (6–22 mm.) long, flat, rounded at tip, flexible, shiny dark green above, and with 2 whitish bands (stomata) on lower surface. Twigs

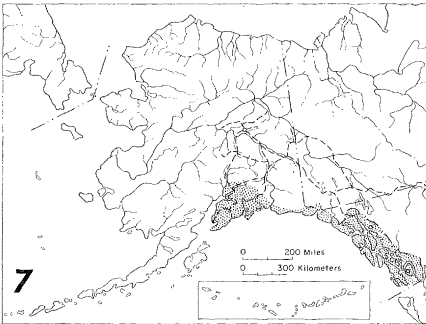


Figure 7.—Western hemlock (*Tsuga heterophylla*), natural size.

slender, dark reddish brown, finely hairy, roughened by peglike bases after leaves fall. **Bark** reddish brown to gray brown, becoming thick and furrowed into scaly plates; a pocketknife will disclose the red inner bark not found in spruce. **Wood** moderately lightweight, moderately hard, of moderately fine and even textured, non-resinous. Heartwood pale reddish brown, sapwood similar or whitish.

Cones stalkless and hanging down at end of twig, small, elliptic, $\frac{5}{8}$ –1 in. (1.5–2.5 cm.) long, brown, with many thin papery scales. **Seeds** about $\frac{1}{2}$ in. (12

mm.) long including large wing.

Western hemlock is the most abundant and one of the most important tree species in southeast Alaska and forms more than 70 percent of the dense hemlock-spruce coastal forests. This species attains its largest size on moist flats and lower slopes, but with abundant moisture, both atmospheric and soil, it grows well on shallow soils. It is very tolerant of shade.

This species is one of the best pulpwoods for paper and paperboard and products such as rayon. Other important uses are lumber for general construction, railway ties, mine timbers, and marine piling. The wood is suited also for interior finish, boxes and crates, kitchen cabinets, flooring and ceiling, gutter stock, and veneer for plywood. The outer bark contains a high percentage of tannin and is

a potential source of this product. Alaska Indians made coarse bread from the inner bark of this tree and shore pine. Western hemlock is the State tree of Washington.

Western hemlock has the distribution of the hemlock-spruce coastal forests of southeast and southern Alaska but does not go as far west as Sitka spruce, not reaching Afognak and Kodiak Islands or the west side of Cook Inlet. It extends throughout southeast Alaska north to head of Lynn Canal at Skagway, Glacier Bay, and Yakutat Bay, west to Prince William Sound and east side of Cook Inlet to Portlock at southwest end of Kenai Peninsula and northwest to hills around Anchorage. South Tongass, North Tongass, and Chugach National Forests, Glacier Bay National Monument, and Kenai National Moose Range. Southeast along Pacific coast to northwestern California and east in mountains to southeastern British Columbia, northwestern Montana, and northern Idaho.

8. MOUNTAIN HEMLOCK

(*Tsuga mertensiana* (Bong.) Carr.)

Other names: alpine hemlock, black hemlock.

Small to large evergreen tree becoming 50–100 ft. (15–30 m.) high and 10–30 in. (25–76 cm.) in trunk diameter, maximum about 125 ft. (38 m.) and 40 in. (1 m.), with marked taper when open grown, narrow crown of horizontal or drooping branches, and very slender leading twig curved down or nodding; a shrub near timber line. **Leaves** (needles) mostly crowded on all sides of short side twigs and curved upward, short-stalked, $\frac{1}{4}$ –1 in. (6–25 mm.) long, flattened above and rounded, keeled, or angled beneath (half-round in section),

stout and blunt, blue green and with whitish lines (stomata) on both surfaces. **Twigs** mostly short, slender, light reddish brown, finely hairy, roughened by peglike bases after leaves fall. **Bark** gray to dark brown, thick, and deeply furrowed into scaly plates. **Wood** moderately heavy, moderately hard, and moderately fine and even textured. Heartwood pale reddish brown, sapwood thin and similar or whitish.

Cones stalkless and usually hanging down, cylindric, 1–2½ in. (2.5–6 cm.) long and $\frac{3}{4}$ in. (2 cm.) wide, purplish but turning brown, with many thin papery scales. **Seeds** light brown, about $\frac{1}{2}$ in. (12 mm.) long including large wing.

Mountain hemlock extends from sea level to an altitude of 3,000–3,500 ft. (914–1067 m.), growing in an altitude higher than other trees. On upland sites, it is well formed and resembles western hemlock. Toward the timberline, it replaces the latter and becomes a prostrate shrub. It grows with shore pine in muskegs of deep peat as well as on subalpine slopes on the ocean side of the Coast Range in southeast Alaska. In the Prince William Sound and Cook Inlet regions, mountain hemlock is found on better drained slopes and near tidewater, reaching its maximum height.

The wood is marketed with western hemlock, being similar but somewhat more dense, and has the same uses. Nearly pure stands of mountain hemlock on Prince of Wales Island have been logged for pulp. The wood has been used for railroad ties. However, in the higher altitudes where commonly found, mountain hemlock is largely inaccessible and unimportant commercially.

Southeast and southern Alaska. Through southeast Alaska north to head of Lynn Canal at Skagway, Glacier Bay, and Yakutat

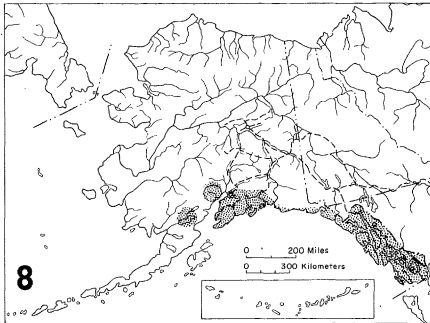
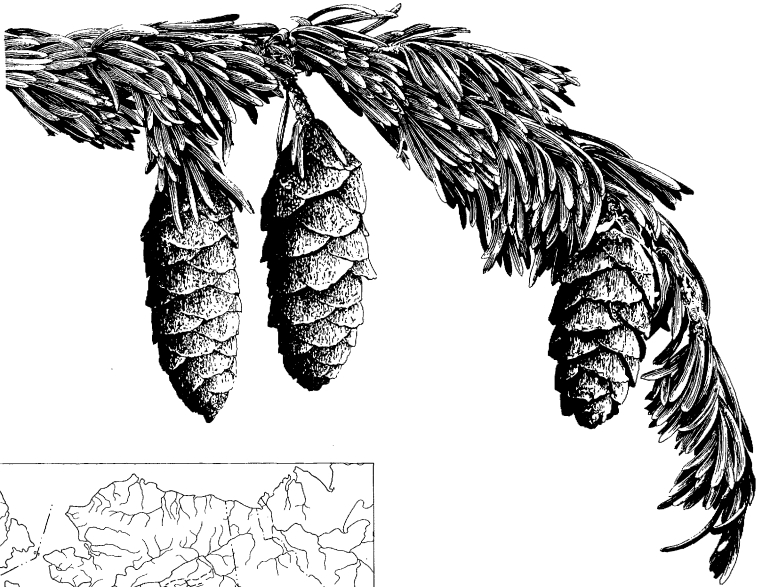


Figure 8.—Mountain hemlock (*Tsuga mertensiana*), natural size.

Bay, west to Prince William Sound, Kenai Peninsula, and east side of Cook Inlet. Also local at Lake Iliamna on Alaska Peninsula. South Tongass, North Tongass, and Chugach National Forests, Glacier Bay National Monument, Kenai National Moose Range. Southeast along Pacific Coast of British Columbia and in mountains to western Montana and central California.

This species honors the German naturalist Karl Heinrich Mertens (1796–1830), who discovered it near Sitka, Alaska, in 1827.

Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco; *Ps. taxifolia* (Poir.) Britton) though not native is sometimes planted in southeast Alaska as an ornamental and in forestry tests. Growth is rapid. The flat leaves (needles) $\frac{5}{8}$ – $1\frac{1}{4}$ in. (1.5–3 cm.) long resemble those of fir but are nar-

rowed into stalks at base and have an elliptic leaf-scar. Winter buds are distinctive, pointed, red brown, and not resinous. The elliptic, light brown cones 2– $3\frac{1}{2}$ in. (5–9 cm.) hang down and have thin rounded cone-scales and prominent 3-toothed bracts. Douglas-fir, one of the world's most valuable timber trees, is widespread in the Pacific coast and Rocky Mountain regions north in British Columbia nearly to Alaska. On the coast it extends almost to the north end of Vancouver Island and slightly inland north to Gardner Canal. In the interior it ranges north to Fort McLeod and Tacla Lake at latitude 55° , north of the southern tip of Alaska.

FIR (*Abies*)

Fir trees have narrow pointed crowns with mostly horizontal branches. The leaves are flat needles without leafstalks, those

on lower branches often spreading in 2 rows along the twig, others mostly curving upward. Older twigs are smooth with round leaf-scars. Cones are upright and stalkless in the highest branches. At maturity the cone-scales and seeds are shed, but the narrow up-

right axis persists on the twig. No old cones remain on the trees or on the ground.

Two species of fir are present in southeastern Alaska, both rare and local. They are not likely to be seen without a special trip to one of the places mentioned.

Key to the 2 Alaska Species

Leaves (needles) shiny dark green on upper surface and silvery white with many lines (stomata) on lower surface -----

9. Pacific silver fir (*Abies amabilis*)

Leaves (needles) dull dark green with whitish lines (stomata) on both surface -----

10. subalpine fir (*Abies lasiocarpa*)

9. PACIFIC SILVER FIR

(*Abies amabilis* (Dougl.)
Forbes)

Other names: silver fir, white fir (lumber).

Medium-sized resinous and aromatic tree rare and local in extreme southeast Alaska, becoming 80 ft. (24 m.) tall and 24 in. (60 cm.) in trunk diameter, maximum 149 ft. (45 m.) tall and 49 in. (1.24 m.) in diameter. **Leaves** (needles) crowded and spreading, stalkless, $\frac{3}{4}$ - $1\frac{1}{4}$ in. (2-3 cm.) long, flat, deeply grooved and shiny dark green above, beneath silvery white with whitish lines (stomata), those on lower branches notched or rounded at tips and spreading in 2 rows, those toward top of tree shorter and sharp-pointed, twisted in brushlike mass on upper side of twig. **Twigs** slender, finely hairy. **Bark** smooth, gray, splotched with white. **Wood** with whitish sapwood and pale brown heartwood, fine-textured, lightweight, soft.

Cones in highest branches, upright, 4-5 in. (10-12.5 cm.) long, 2-2 $\frac{1}{2}$ in. (5-6 cm.) in diameter purplish, finely hairy or nearly hairless; many fan-shaped rounded overlapping scales, falling from

axis in autumn. **Seeds** light brown, about 1 in. (2.5 cm.) long, including broad wing.

The trees are logged with other conifers. Fir logs are sawed into lumber with Sitka spruce, if large and clear, or chipped with hemlock and used for pulp. Southward, where more abundant, the wood is used for interior finish.

Pacific silver fir is rare and local in extreme southeast Alaska. It has been recorded from well-drained lower slopes of canyons, benches, and flats from sea level to 1,000 ft. (305 m.) altitude in the coastal forest of Sitka spruce and eastern hemlock, being very shade tolerant. Large trees were found on forest survey plots east of Ketchikan in mountains near Marten Arm of Boca de Quadra, Smeaton Bay of Behm Canal, and near Thorne Arm. Also at Very Inlet. Northeast of Ketchikan, trees have been observed in Carol Inlet and George Inlet. However, earlier reports from Kosciusko Island and near northern end of Prince of Wales Island remain unverified. South Tongass National Forest. South through Pacific coast region of British Columbia and in mountains to Oregon and northwestern California.

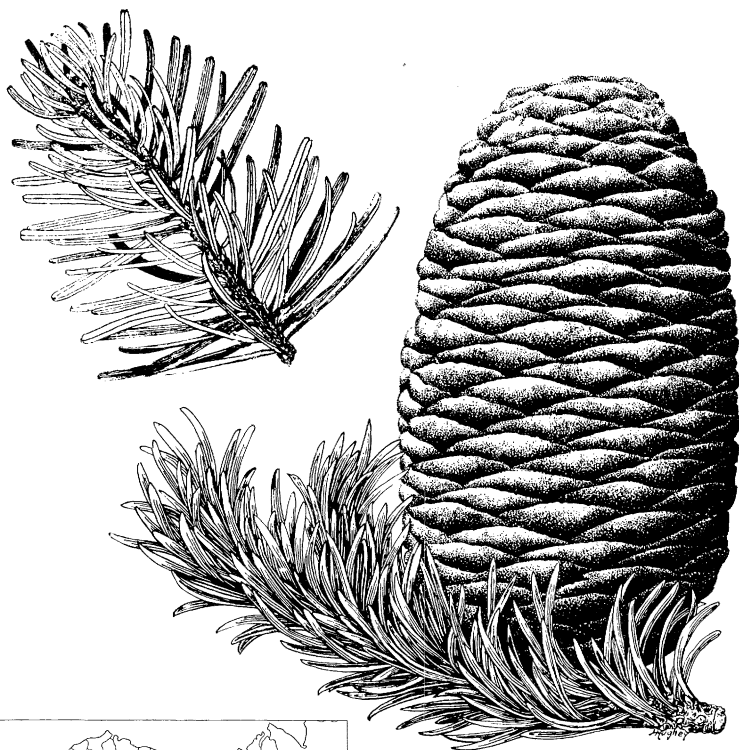
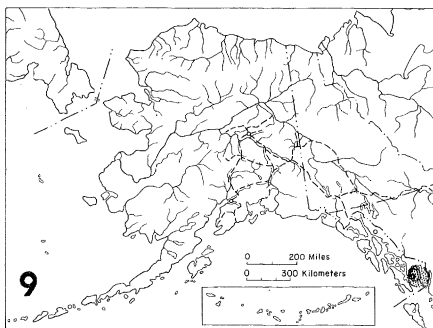


Figure 9.—Pacific silver fir (*Abies amabilis*), natural size.



10. SUBALPINE FIR

(*Abies lasiocarpa* (Hook.)
(Nutt.)

Other names: alpine fir, white fir (lumber).

Small to medium-sized ever-green tree, rare and local in south-east Alaska, commonly 20–60 ft. (6–18 m.) high and 4–12 in. (10–30 cm.) in trunk diameter, with long, narrow, sharp-pointed, or spirelike crown and branches extending nearly to base, resinous

and aromatic. However, larger trees to 95 ft. (29 m.) tall and 27 in. (69 cm.) in diameter have been observed. **Leaves** (needles) crowded and spreading, stalkless, $\frac{3}{4}$ – $1\frac{1}{2}$ in. (2–4 cm.) long, flat, dark blue green and with whitish lines (stomata) on both sides, grooved above, those on lower branches rounded on occasionally notched at tip and in 2 rows, those near top of tree shorter, pointed, stiff, and twisted upward and curved on upper side of twig. **Twigs** gray, rusty hairy. **Bark** ash gray, smooth, thin. **Wood** pale brown, fine-textured, lightweight, soft, usually knotty because of the many persistent branches.

Cones in highest branches, upright, cylindric, $2\frac{1}{2}$ –4 in. (6–10 cm.) long and $1\frac{1}{4}$ – $1\frac{1}{2}$ in. (3–4

cm.) in diameter, dark purple, finely hairy; many fan-shaped, rounded, overlapping scales, falling from axis in autumn. Seeds light brown, $\frac{5}{8}$ in. (1.5 cm.) long, including broad wing.

Subalpine fir is of rare, local occurrence in mountains of southeast Alaska. This inland tree grows in cool, moist subalpine slopes near timberline, becoming shrubby or prostrate, and is found on the valley floors as well. It appears to be very shade tolerant.

Near the southernmost tip of Alaska, subalpine fir is known from several localities. At Hyder it is in Salmon River valley near sea level and at higher altitudes near the timberline at 2,500 ft. (762 m.) and on the Texas Creek road. It grows in the forest of Sitka spruce and hemlock. Also at 3,000 ft. (914 m.) altitude on Harris Ridge near Hollis and Virginia Mountain near Calder on Prince of Wales Island, associated with mountain hemlock and Sitka spruce.

At the northern end of southeast Alaska, subalpine fir from the interior of British Columbia crosses over the divide of the Coast Range. In Taku River valley northeast of Juneau, this species extends from the Canadian border down to sea level on outwash of Norris Glacier. It is common, scattered with Sitka spruce, hemlock, and black cottonwood. Near Skagway at head of Lynn Canal, subalpine fir descends from timberline at 3,000 ft. (914 m.) to sea level.

Northeastward in Yukon Territory, this species occurs within 125 miles (200 km.) of the Alaska border along Stewart River, a tributary of Yukon River. South Tongass and North Tongass National Forests. Southeast Alaska, central Yukon Territory, and southwestern District of Mackenzie, south through British

Columbia and southwestern Alberta and in mountains to New Mexico, Arizona, and Oregon.

Subalpine fir has been reported from 3 localities in south central Alaska: Copper River Basin, Mentasta Pass on Glenn Highway, and mountains northeast of Anchorage. Specimens are needed before those unverified range extensions should be accepted.

CYPRESS FAMILY

(*Cupressaceae*)

The cypress family (*Cupressaceae*) has 2 genera and species of trees in Alaska, also a third genus with 2 species of low shrubs, junipers. This family formerly included in the pine family is characterized by small scalelike leaves paired or in 3's. The cones are small with few cone-scales bearing mostly few seeds with short side wings. However, junipers have berrylike cones and wingless seeds.

Characteristics of the 3 genera and names of their Alaska species are summarized here for ready identification.

Western redcedar (*Thuja plicata* Donn), the only Alaska species of thuja. Leaves scalelike, flattened and curved, on flattened twigs in fanlike sprays. Small cones clustered near ends of twigs and becoming turned up.

Alaska-cedar (*Chamaecyparis nootkatensis* (D. Don) Spach), the only species of white-cedar. Leaves scalelike, pointed and spreading. Leafy twigs 4-angled or slightly flattened. Cones small, hard, nearly round.

Juniper (*Juniperus*), 2 species, common juniper (*J. communis* L.) and creeping juniper (*J. horizontalis* Moench). Dwarf shrubs with scalelike or awl-shaped leaves, small round berrylike cones, and few wingless seeds.

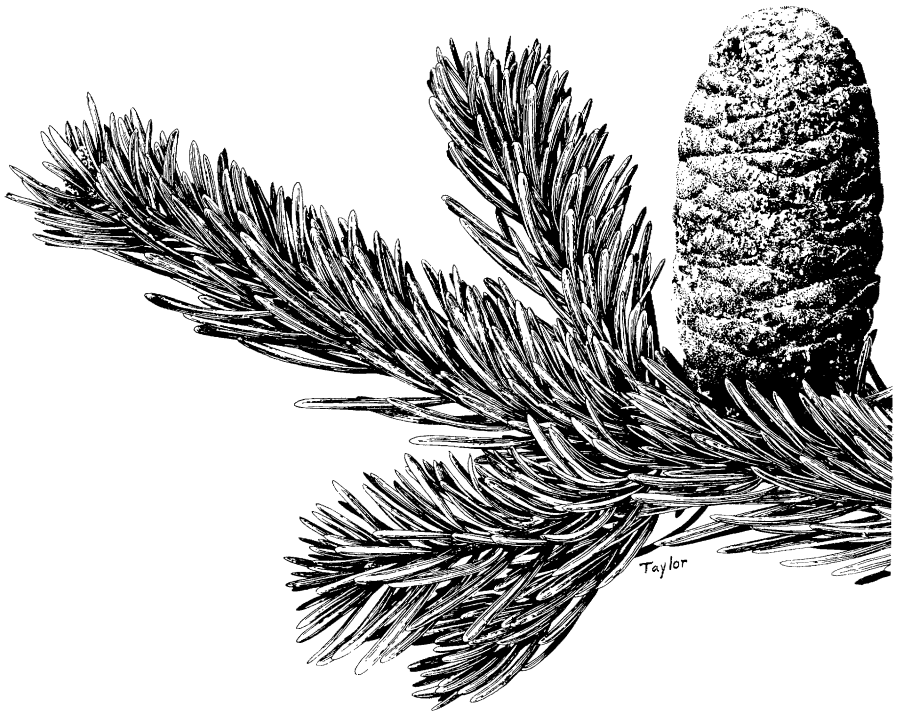
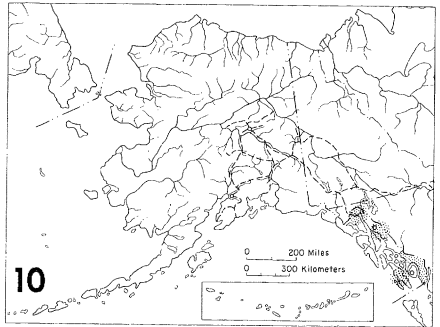


Figure 10.—Subalpine fir (*Abies lasiocarpa*), natural size.

11. WESTERN REDCEDAR (*Thuja plicata* Donn)

Other names: giant arborvitae, canoe cedar, shinglewood, Pacific redcedar, arborvitae.

Large evergreen tree 70–100 ft. (21–30 m.) tall, sometimes 130 ft. (40 m.), with tapering trunk 2–4 ft. (0.6–1.2 m.) in diameter, sometimes to 6 ft. (1.8 m.), swollen or buttressed base, pointed conical crown, and horizontal branches curving upward at tips. Leaves scalelike, flattened, $\frac{1}{16}$ – $\frac{1}{8}$ in. (1.5–3 mm.) long, on leader twigs to $\frac{1}{4}$ in. (6 mm.) long and pointed, shiny yellow green above and dull green below. Leafy twigs flattened, in fanlike sprays, slightly drooping, older twigs gray and smooth. Bark gray or brown, thin, fibrous and stringy or shreddy, becoming thick and furrowed into

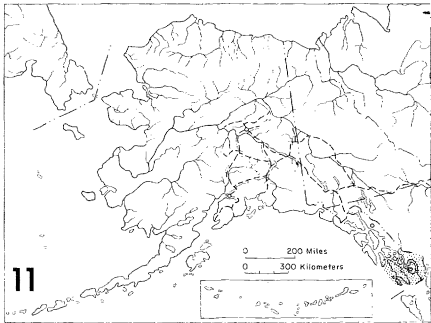


long ridges. Wood with the distinctive odor of cedars, fine-textured, straight-grained, lightweight, moderately soft, and brittle. Heartwood reddish brown, the narrow sapwood white.

Cones clustered near ends of twigs and becoming turned up on short stalks, elliptic, $\frac{1}{2}$ in. (12 mm.) long, light brown, composed of several paired elliptic leathery cone-scales. Seeds 3 or fewer under a cone-scale, $\frac{3}{16}$ in. (5 mm.) long, light brown, with 2 narrow wings.



Figure 11.—Western redcedar (*Thuja plicata*), natural size.



Western redcedar is native in the southern half of southeast Alaska from sea level to 3,000 ft. (915 m.) altitude on the west slopes of the Coast Range, attaining its largest size below 500 ft. (150 m.). Although sometimes in pure stands, it is also dominant in the redcedar-hemlock forest and scattered in the hemlock-spruce forest. It is of moderately slow growth and long-lived.

Western redcedar is well suited for boat and canoe construction. It is the most widely used wood for shingles. Other uses of this very durable lightweight wood are utility poles, fenceposts, light construction, pulp, clothes closets and chests, conduits, piling, and fish-trap floats. The Indians employed the wood for totem poles, dugout canoes, and houses and made mats, baskets, and ropes from the stringy bark. This is an important timber tree of the coast region of British Columbia. Western redcedar is exported to Japan in log form, though some is used locally.

Southern half of southeast Alaska north to Wrangell and vicinity of Petersburg on southern parts of Mitkof, Kupreanof, and

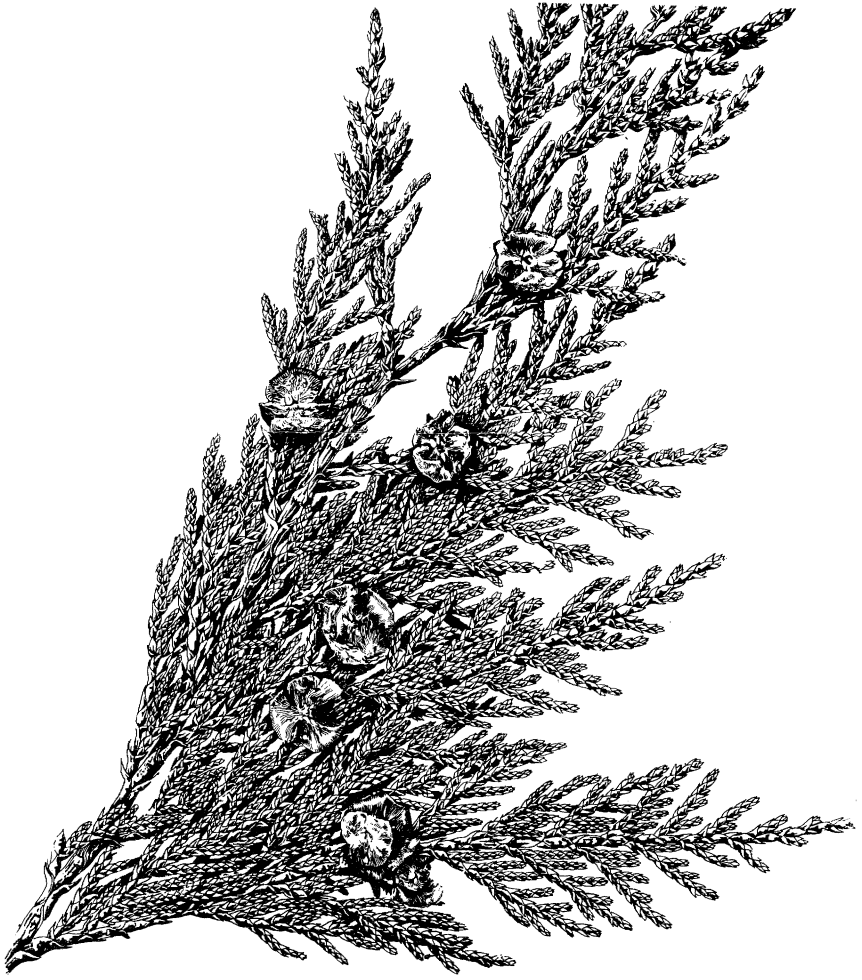
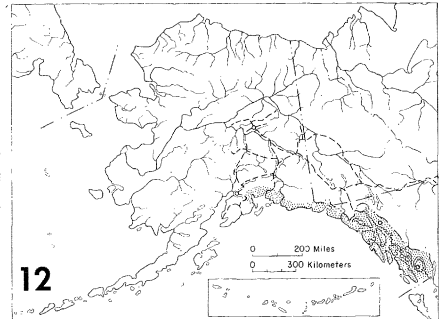


Figure 12.—Alaska-cedar (*Chamaecyparis nootkatensis*), natural size.

· Kuiu Islands. On Kupreanof Island north to Duncan Canal (collected on Woewodski Island) but not found at Portage Bay on north end where formerly reported. South Tongass National Forest and south end of North Tongass National Forest. Pacific coast region of southeast Alaska south to northwestern California, also east in Rocky Mountains to western Montana and southeastern British Columbia.



12. ALASKA-CEDAR

(*Chamaecyparis nootkatensis*
(D. Don) Spach)

Other names: Alaska yellow-cedar, Nootka false-cypress, yellow-cedar, Alaska cypress, Sitka cypress, yellow cypress.

Medium sized evergreen tree 40–80 ft. (12–24 m.) high and 1–2 ft. (30–60 cm.) in trunk diameter, sometimes a large tree to 100 ft. (30 m.) tall and 4 ft. (1.2 m.) in diameter, with narrow crown of slightly drooping branches. **Leaves** scalelike, $\frac{1}{16}$ – $\frac{1}{8}$ in. (1.5–3 mm.) long, pointed and spreading, yellow green, with slightly spreading, pointed tips; leaves on leader twigs to $\frac{1}{4}$ in. (6 mm.) long and sharp-pointed. Leafy twigs 4-angled or slightly flattened, in flat, spreading sprays on slightly drooping branches, becoming reddish brown. **Bark** shreddy, with long narrow shreds and fissures, ash gray or purplish brown. **Wood** with distinctive odor, fine-textured, relatively straight-grained, moderately heavy, moderately hard. Heartwood bright yellow with narrow band of lighter sapwood.

Cones scattered, short-stalked, nearly round, less than $\frac{1}{2}$ in. (12 mm.) in diameter, hard, ashy gray, often covered with whitish bloom, of 4 or 6 paired rounded hard cone-scales each with a central pointed projection, maturing in 2 years. **Seeds** 2–4 under a cone-scale, $\frac{3}{16}$ in. (4 mm.) long, brown, with 2 broad wings.

Alaska-cedar extends along the coast of southeast Alaska from sea level to timberline but is best developed at 500–1,200 ft. (150–365 m.) altitude. It is scattered with western redcedar, in pure stands, in forests of Sitka spruce and western hemlock, and, on higher slopes or muskegs, with mountain hemlock. The trees are slow-growing, those 15–20 in.

(38–51 cm.) in trunk diameter being 200–300 years old.

The very durable aromatic wood is easily worked and takes a beautiful finish. It is valuable for window frames and exterior doors, boat construction, and similar purposes. It is used also for utility poles, piles, interior finish, furniture, cabinet work, patterns, and novelties. Indians of southeast Alaska made their canoe paddles from this wood. Much Alaska-cedar is exported to Japan in log form, though some is used locally.

Through southeast Alaska north to Lynn Canal and Yakutat and west in southern Alaska to Glacier Island and Wells Bay in Prince William Sound. South Tongass, North Tongass, and Chugach National Forests. Pacific coast region from southern Alaska southeast through British Columbia and in mountains to Oregon and north-western California.

WILLOW FAMILY

(Salicaceae)

The willow family (Salicaceae) contains the cottonwoods, poplars, and aspens (all in the genus *Populus* with 3 tree species in Alaska), and the willows (*Salix*), a large genus of 33 or more native species ranging in size from creeping or dwarf shrubs to large shrubs and small trees (12 species). Distinguishing characters are as follows: (1) leaves borne singly (alternate), with margins evenly toothed or without teeth (entire) but not lobed; (2) flower clusters (catkins) composed of an axis bearing many small flowers each above a scale, in early spring before or with the leaves; (3) flowers without sepals or petals, of 2 kinds on different plants, male flowers with pollen and on other plants the female flowers with seeds; and (4) the tiny seeds with long white cottony hairs, borne in

small seed capsules mostly 2-parted.

Cottonwoods, poplars, and aspens usually have broad leaves with petiole nearly as long as blade, stout twigs, and large winter buds with several scales exposed, resinous (except in aspen), an end (terminal) bud present. Willows usually have narrow leaves with very short petioles, slender or wiry twigs, and small winter buds covered by a single scale, without an end bud. Catkins in the genus of cottonwoods hang down, while those of willows are upright or slightly spreading. Flowers of cotton-

woods have deeply lobed scales soon shedding, a broad or cup-shaped disk, and 10 to many stamens. Willow flowers have scales without or with teeth, persistent or late shedding, disk reduced usually to 1 small gland, and 2-8 stamens.

COTTONWOOD, POPLAR, ASPEN (*Populus*)

This genus has no single English common name. The 3 Alaska species of the cottonwood genus, all common trees, are balsam poplar, black cottonwood, and quaking aspen.

Key to the 3 Alaska Species

Leaf blades longer than broad, 2½-5 in. (6-12.5 cm.) long; leafstalks round.

Seed capsules pointed, hairless, 2-parted; leaves pale green and brownish beneath; tree of interior forests -----

13. balsam poplar (*Populus balsamifera*)

Seed capsules rounded, hairy, 3 parted; leaves whitish beneath; tree of coastal forests -----

14. black cottonwood (*Populus trichocarpa*)

Leaf blades nearly round, less than 2 in. (5 cm.) long; leafstalks flattened ----- 15. quaking aspen (*Populus tremuloides*)

13. BALSAM POPLAR (*Populus balsamifera* L.)

Other names: tacamahac, tacamahac poplar, cottonwood; *Populus tacamahaca* Mill.

Medium-sized deciduous tree usually 30-50 ft. (9-15 m.) high, with straight trunk 4-12 in. (10-30 cm.) in diameter and long thin open crown, sometimes a large tree 80-100 ft. (24-30 m.) tall and 2 ft. (60 cm.) in trunk diameter. Leaves with slender petioles 1-2 in. (2.5-5 cm.) long, round, finely hairy. Leaf blades ovate or broadly lance-shaped, 2½-4½ in. (6-11 cm.) long, 1½-3 in. (4-7.5 cm.) wide, mostly long-pointed at apex and rounded at base, with many small rounded teeth, hairless or nearly so, shiny dark green above, pale green and rusty brown beneath. Twigs red brown and

hairy when young, with orange dots (lenticels), becoming gray, with raised leaf scars showing 3 dots. Winter buds large, to 1 in. (2.5 cm.) long, long-pointed, sticky or resinous, covered with shiny brown scales, with pungent balsam odor which permeates the air in spring. Bark light gray to gray, smooth, becoming rough, thick, and deeply furrowed. Wood with thick whitish sapwood and light brown heartwood, fine-textured, lightweight, soft.

Flower clusters (catkins) 2-3½ in. (5-9 cm.) long, narrow, drooping, with many small flowers about ⅛ in. (3 mm.) long, each with disk and above a light brown hairy lobed scale, male and female on different trees (dioecious). Male flowers with 20-30 reddish purple stamens; female flowers with conic slightly 2-lobed hair-

less ovary and 2 broad wavy stigmas. **Seed capsules** in catkins to 6 in. (15 cm.) long, short-stalked, egg-shaped, $\frac{1}{4}$ - $\frac{5}{16}$ in. (6-8 mm.) long, long-pointed, light brown, hairless but warty, 2-parted, with many tiny cottony seeds. Flowering in May-June before the leaves, fruit maturing in June.

Balsam poplar, sometimes erroneously called balm-of-Gilead, is a rapidly growing tree. It is common in river valleys including sandy bottoms and gravelly flood plains, terraces, and coarse alluvial fans throughout the interior except near the coasts. In forests, especially in openings and clearings, it is associated with white spruce, birch, and aspen. It is often common with willows and alders in flood plain thickets and along river banks.

In the mountains balsam poplar extends to somewhat higher altitudes than white spruce, to 3,500 ft. (1067 m.) altitude or more on north and west slopes of the Alaska Range. Also, it projects farther north to the Arctic slope in a few places. At Firth River near the northeast corner of Alaska and north of the treeline, balsam poplar, white spruce, and feltleaf willow are the only trees.

The wood is used chiefly for boxes, crates, and pulpwood southward. A small amount is sawed for use in the Anchorage area and efforts are being made to broaden the market.

Interior Alaska, north and west to limits of trees, south to Kodiak Island and northern end of southeast Alaska. On south slopes of Brooks Range in drainages of Porcupine, Koyukuk, Kobuk, and Noatak Rivers; north of Brooks Range in small isolated stands along many of the rivers draining into Arctic Ocean but best developed and most extensive along Canning River. West to Igloo near western tip of Seward Peninsula; southward, at Unalakleet, and reaching coast of Bristol Bay near Dillingham; on Alaska Peninsula as far west as Chignik, and on Kodiak Island. South of Alaska Range in Cook Inlet and Copper River drainages and in extreme northern part of southeastern Alaska near Haines and Skagway and Taku Inlet near Juneau. North Tongass and Chugach National Forests, Mt. McKinley National Park, Katmai National Monument, Kenai National Moose Range, Kodiak National Wildlife Refuge, Arctic Range Wildlife.

VEGETATION OF ALASKA (CENTER MAP BETWEEN PAGES 47-48)

COASTAL FORESTS

1. Sitka spruce-hemlock forests. Tall, dense coastal forests of Sitka spruce, western hemlock, locally with other conifers, and black cottonwood, often interspersed with open treeless bogs.

INTERIOR FORESTS or TAIGA

2. Closed spruce-hardwood forests. Tall to moderately tall closed forests of white and black spruce, paper birch, aspen, and balsam poplar; on moderate to well drained sites.

3. Open, low growing spruce forests and treeless bogs. Primarily of black spruce but often interspersed with white spruce, paper birch, tamarack, and willows, locally interspersed with treeless bogs; on poorly drained sites usually underlain by permafrost.

TUNDRA or TREELESS

4. Moist tundra. Tundra meadows dominated by sedges, especially in tussocks. Also extensive areas of willow and alder thickets on streams and protected slopes.

5. Wet tundra. Wet coastal tundra and marsh, predominantly sedges and grasses. Also extensive shrub thickets along streams.

6. Alpine tundra, ice and snow. Predominantly barren, alpine tundra dominated by white mountain-avens, low heath shrubs, prostrate willows, and dwarf herbs. Also extensive shrub thickets of resin birch, alder, and willows at lower elevations.

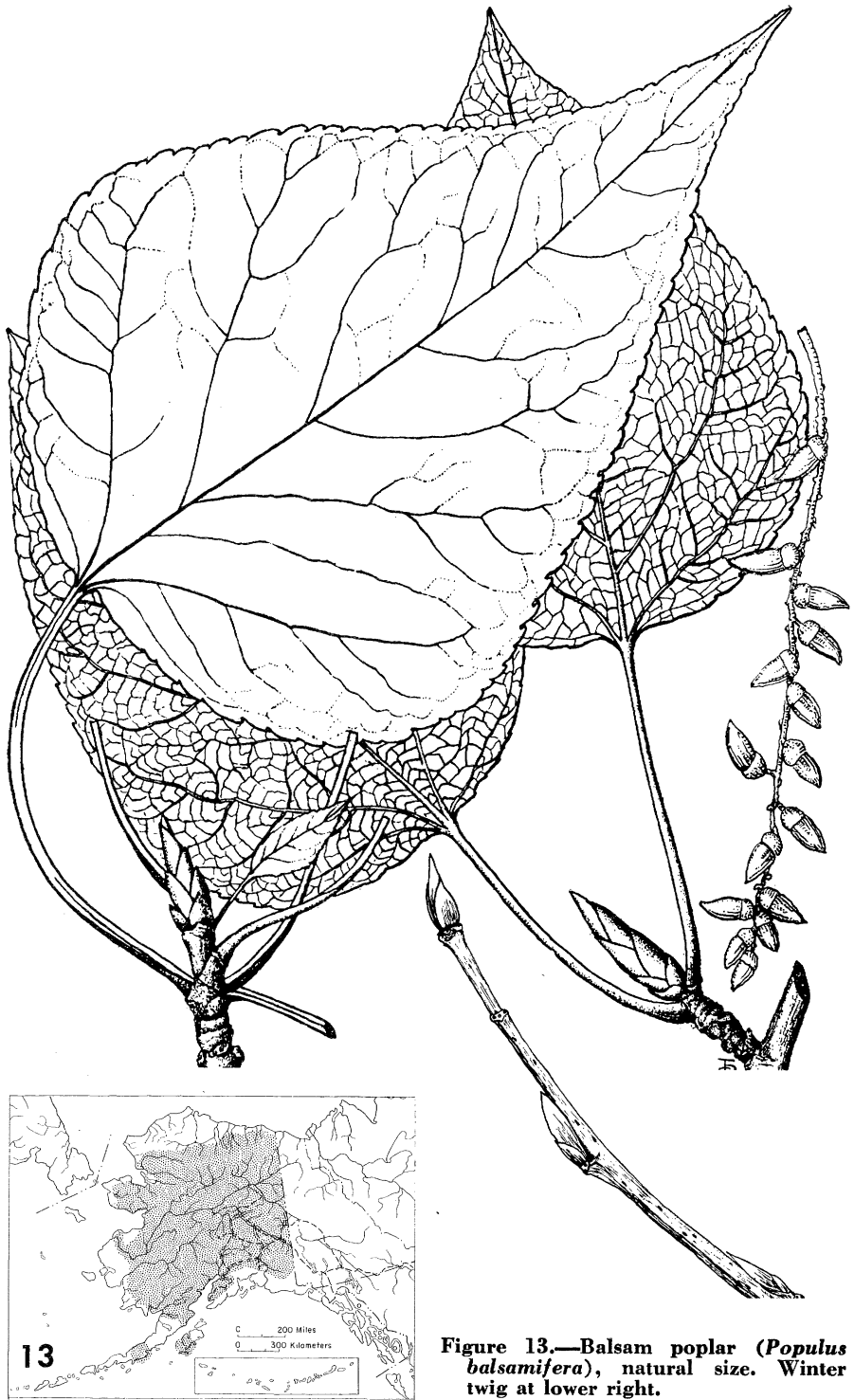
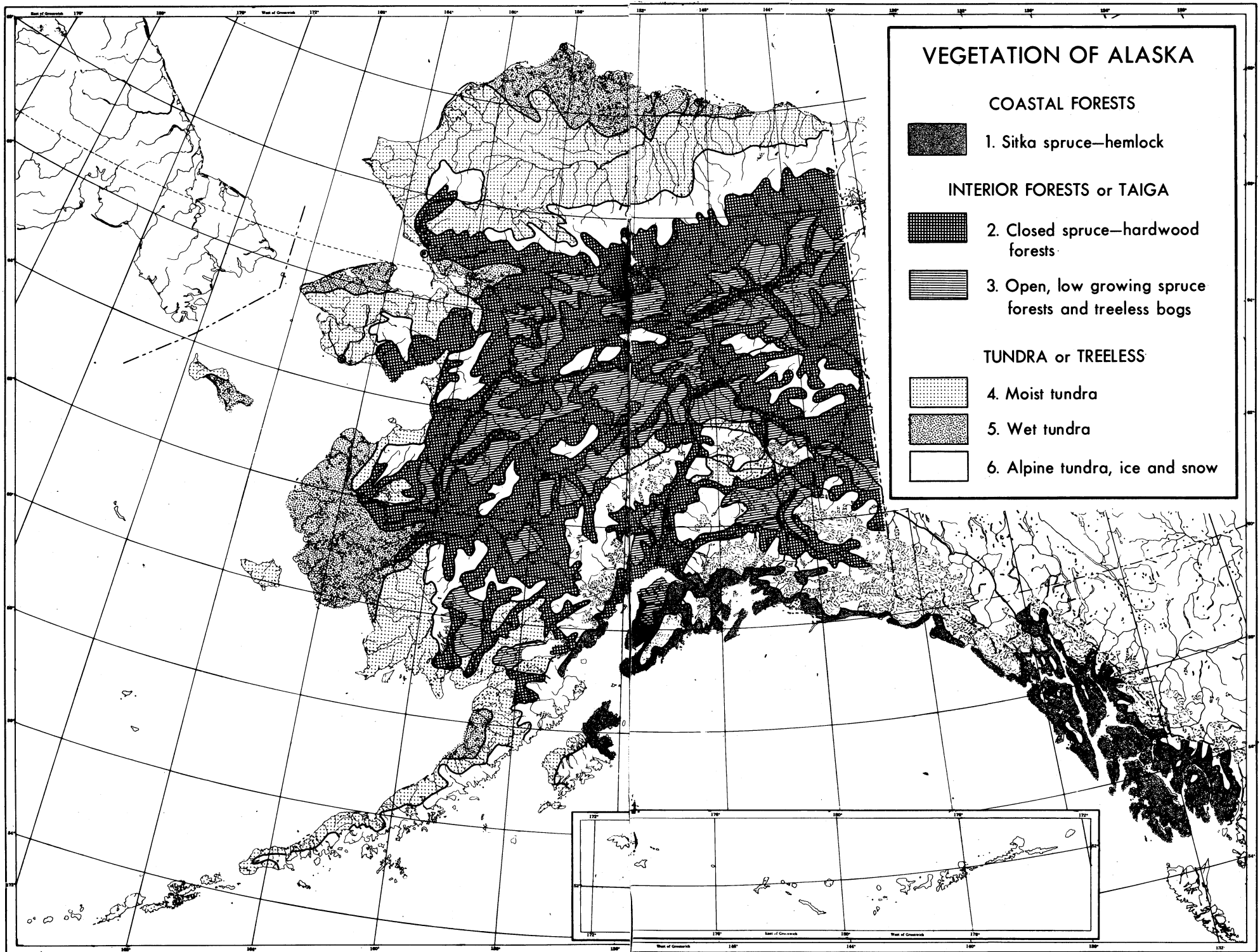


Figure 13.—Balsam poplar (*Populus balsamifera*), natural size. Winter twig at lower right.



VEGETATION OF ALASKA.

Legend on page 46.

East across Canada to Labrador and Newfoundland, south in eastern United States to West Virginia, Indiana, and Iowa and in western mountains locally as far south as Colorado.

Balsam poplar intergrades or hybridizes with black poplar in southern Alaska where ranges of the two overlap, as mentioned under the latter. Rare hybrids with quaking aspen, which has smaller, rounded leaves and flattened petioles, have been recorded also.

14. BLACK COTTONWOOD (*Populus trichocarpa* Torr. & Gray)

Other names: cottonwood, balsam cottonwood, northern black cottonwood, Pacific poplar; *Populus trichocarpa* var. *hastata* (Dode) Henry; *P. balsamifera* L. ssp. *trichocarpa* (Torr. & Gray) Brayshaw, var. *californica* S. Wats.

Large deciduous tree to 80–100 ft. (24–30 m.) tall; with straight trunk 3 ft. (1 m.) in diameter, with narrow pointed crown; in age larger and developing a tall massive trunk and small flat-topped crown. Leaves with slender petioles 1½–2 in. (4–5 cm.) long, round, finely hairy. Leaf blades broadly ovate, 2½–5 in. (6–12.5 cm.) long, 1½–3 in. (4–7.5 cm.) wide, mostly long-pointed at apex, rounded or slightly notched at base, with many small rounded teeth, hairless or nearly so, shiny dark green above, beneath whitish and often with rusty specks. Twigs red brown and hairy when young, with orange dots (lenticels), becoming dark gray, sometimes angled, with raised leaf scars showing 3 dots. Winter buds large, to ¾ in. (2 cm.) long, long-pointed, sticky or resinous, covered with shiny brown scales. Bark gray to dark gray, smooth, becoming rough, thick, deeply fur-

rowed with flat ridges. Wood with thin whitish sapwood and light brown heartwood, fine-textured, lightweight, soft.

Flower clusters (catkins) 1½–3 in. (4–7.5 cm.) long, narrow, drooping, with many small flowers about ⅛ in. (3 mm.) long, each with disk and above a light brown hairy lobed scale, male and female on different trees (dioecious). Male flowers with 40–60 reddish purple stamens; female flowers with rounded densely hairy ovary and 3 broad lobed stigmas. **Seed capsules** in catkins to 6 in. (15 cm.) long, short-stalked, rounded, ⅜ in. (5 mm.) in diameter, white hairy, 3-parted, with many tiny cottony seeds. Flowering in May before the leaves, fruit maturing in June–July.

Black cottonwood is the largest broadleaf tree in Alaska, growing rapidly to a height of 80–100 ft. (24–30 m.) at maturity. It is also the hardwood or broadleaf tree of greatest size in northwestern North America, reaching a height of 125 ft. (38 m.) on the best sites at age 35 years.

A champion of this species, the largest then known, was discovered in Alaska in 1965 by foresters on the State timber inventory project. Measurements of this giant are as follows: circumference of trunk at breast height, 32 ft. 6 in. (9.9 m.), total height, 101 ft. (30.8 m.), and estimated spread of crown, 60 ft. (18.3 m.). It is located on State land about 25 miles (40 km.) northwest of Haines on a gravel flat 300 ft. (91 m.) from Klehini River about 5 miles (8 km.) west of the village of Klukwan. This ancient tree had its main stem broken off many years ago but has several large branches forming the top. The trunk is deeply grooved and hollow. In 1969 a larger black cottonwood was found near Salem, Oreg., thus replacing the northern

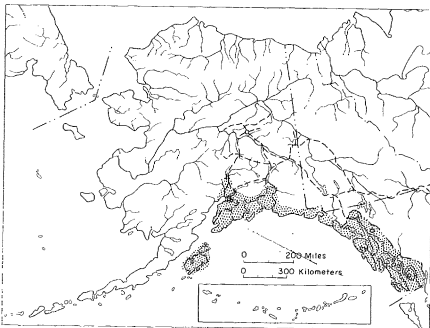
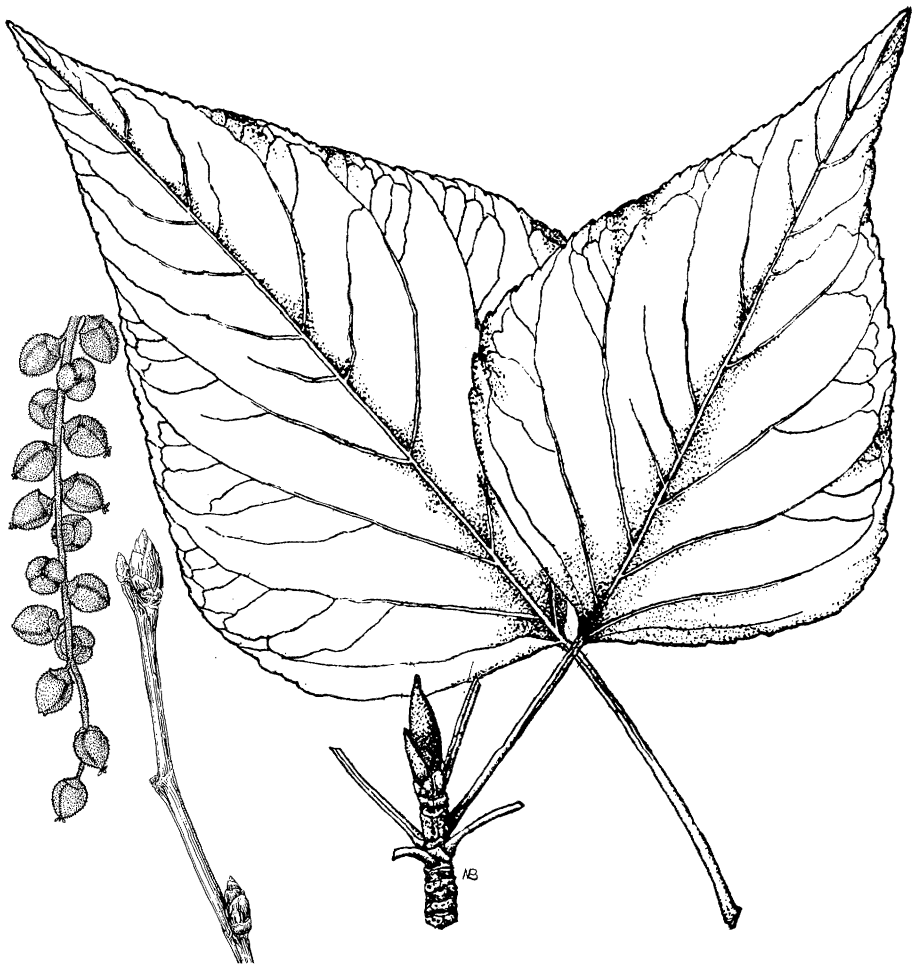


Figure 14.—Black cottonwood (*Populus trichocarpa*), natural size. Winter twig at left.

rival as the national champion. Though with a broken top and not as tall, the Klukwan giant has a slightly broader trunk than the Oregon winner, which measures 30 ft. 2 in. (9.2 m.) in circumference.

This species is found in lowlands of the coastal forests of southeast and southern Alaska. It is best developed at lower levels on river bottoms and sandbars, forming pure stands with undergrowth of willows and alders. It is common on the valley floors of a few large streams, such as Stikine and Taku Rivers. Very rare on islands.

Trees are planted for shade in

towns of southeast Alaska. Southward, the wood is used for boxes and crates, pulpwood, and excelsior. The small supply in Alaska is a possible source of paper pulp, veneer, and lumber. Square cut logs have been used for cabins.

Black cottonwood is not easily distinguished from its close relative, balsam poplar. Both have much the same general appearance and similar habitats. The chief differences are in the seed capsules, which in black cottonwood are nearly round, densely hairy, and split into 3 parts and which in balsam poplar are longer than broad and long-pointed, hairless but warty, and split into 2 parts. Also, there are minor differences in flowers. The pistil of black cottonwood has 3 carpels and 3 stigmas, while that of balsam poplar has 2 carpels and 2 stigmas. The number of stamens is reported to be greater in black cottonwood. Leaves of black cottonwood generally are broader in proportion to length and seem to be whiter beneath. As the ranges of the two species are separate except at their narrow borders, most trees or specimens without seed capsules can be named by locality.

Black cottonwood hybridizes extensively with balsam poplar where the ranges meet and overlap slightly, for example, in the Cook Inlet and Lynn Canal areas. Hybrids or intermediate trees are recognized by the seed capsules, which may be 3-parted and hairless or 2-parted and hairy.

Pacific coast of southeastern Alaska, rare toward southern end and reported from only a few islands; commoner from Stikine River north to head of Lynn Canal along the Dyea, Chilkat, and Klehini Rivers, Glacier Bay, and Yakutat Bay; west to Prince William Sound, Cook Inlet, Susitna Valley, and Kodiak Island.

South Tongass, North Tongass, and Chugach National Forests, Glacier Bay National Monument, Kenai National Moose Range, Kodiak National Wildlife Refuge. Southern Alaska and southern Yukon Territory south through British Columbia to Montana, Idaho, and California and in mountains to Utah and Baja California.

Black cottonwood and balsam poplar have long been regarded as separate species. The two have geographic ranges mostly far apart and grow under somewhat different climates with different associated tree species. Recently black poplar has been united by a few botanists as a subspecies of balsam poplar, because of the slight differences and the intermediate trees where the ranges meet. However, foresters treat the two as separate species in forest management.

15. QUAKING ASPEN (*Populus tremuloides* Michx.)

Other names: American aspen, trembling aspen, popple, squawstongue; *Populus tremuloides* var. *aurea* (Tidestr.) Daniels.

Small to medium-sized deciduous tree commonly 20–40 ft. (6–12 m.) tall, maximum 80 ft. (24 m.), with straight trunk 3–12 in. (7.5–30 cm.) in diameter, maximum 18 in. (46 cm.), and short, irregularly bent limbs making a narrow domelike crown. Leaves with slender flattened petioles 1–2.5 in. (2.5–6 cm.) long. Leaf blades nearly round, 1–2 in. (2.5–5 cm.) long and broad, short-pointed at apex, rounded at base, with many small rounded teeth, hairless, shiny green above, pale beneath, which tremble in the slightest breeze, turning bright yellow (sometimes reddish) in autumn. Twigs slender, reddish and slightly hairy when young, becoming

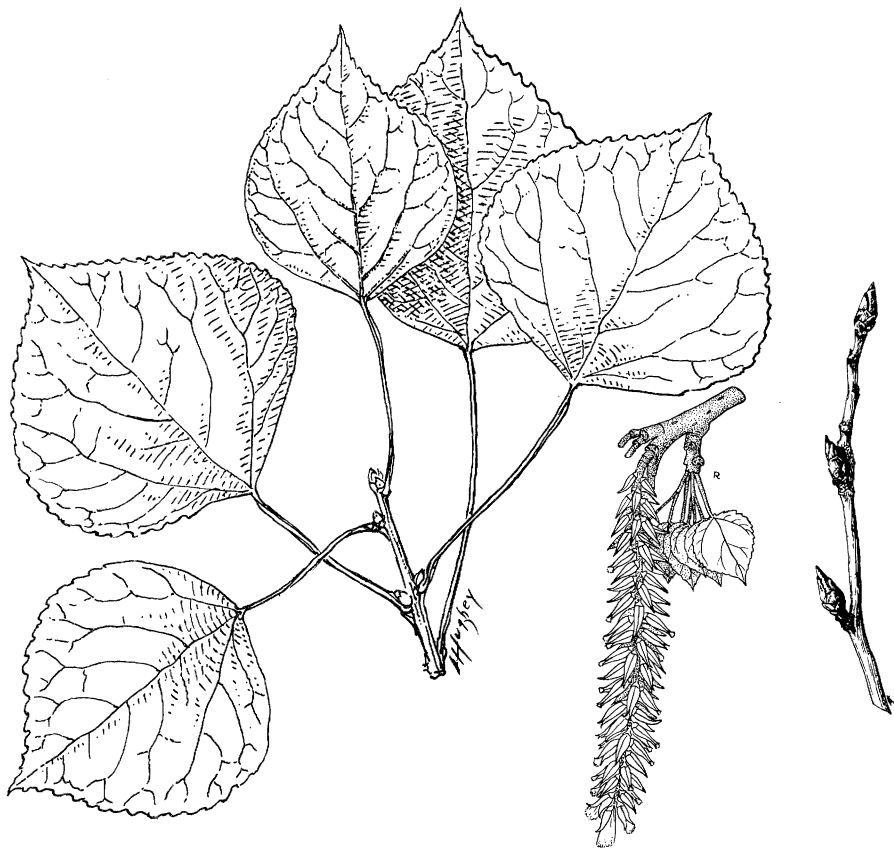
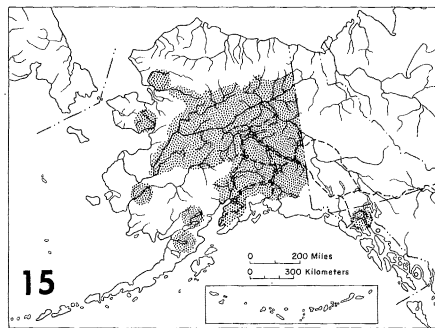


Figure 15.—Quaking aspen (*Populus tremuloides*), natural size. Winter twig at right.

gray, with raised leaf scars showing 3 dots. **Winter buds** conic, $\frac{1}{4}$ in. (6 mm.) long, long-pointed, of shiny red brown hairless scales, not resinous or flower buds slightly so. **Bark** whitish or greenish gray, smooth, thin, with characteristic curved scars and black knots. **Wood** of broad whitish sapwood and light brown heartwood, finetextured, lightweight, soft, and brittle.

Flower clusters (catkins) $1-2\frac{1}{2}$ in. (2.5–6 cm.) long, narrow, drooping, with many small flowers $\frac{1}{8}$ in. (3 mm.) long, each with saucer-shaped disk and above a brown hairy lobed scale, male and female on different trees (dioecious). **Male flowers** with 6–12



stamens; female flowers with conic ovary, short style, and 2 stigmas each 2-lobed. **Seed capsules** in catkins $3-4\frac{1}{2}$ in. (7.5–11 cm.) long, nearly stalkless, less than $\frac{1}{4}$ in. (6 mm.) long, conic, hairless, 2-parted, with many tiny cottony seeds. Flowering in May before the leaves, fruit maturing in May–June.

Quaking aspen is a fast-growing tree common on south slopes, well-drained benches, and creek bottoms throughout the interior of Alaska to about 3,000 ft. (914 m.) altitude. It often occurs in dense pure stands, especially following forest fires. Aspen frequently propagates by suckers from roots. Growth will continue for 80–100 years before the stands begin to deteriorate. Also in forests with white spruce and birch. Rare hybrids with balsam poplar have been noted.

The wood has not yet been utilized commercially in quantity in Alaska. Elsewhere it is used for pulpwood, boxes and crates, and excelsior.

Interior Alaska as far north as the south slopes of Brooks Range but not as far north or as high in mountains as white spruce; westward to Koyukuk and Kobuk Rivers; south on Yukon River to Holy Cross and on Kuskokwim to Bethel and to base of Alaska Peninsula at Lake Iliamna; south of Alaska Range in Susitna Valley, Cook Inlet, Kenai Peninsula, and Copper River areas. Southeast Alaska only in extreme northern part near Haines and Skagway at head of Lynn Canal. Chugach National Forest, Mt. McKinley National Park, Kenai National Moose Range.

The most widely distributed tree species in North America, ranging from Alaska east across Canada to Labrador and Newfoundland, south in the Northeastern United States to New Jersey, Virginia, and Missouri, and south in western mountains to Trans-Pecos Texas, California, and Mexico.

WILLOW (*Salix*)

Willows are well represented in Alaska, as in other far northern lands. In habit they vary from prostrate or creeping dwarf

shrubs to erect bushes 2–6 ft. (0.6–2 m.) tall and large shrubs or small trees, usually with many stems. As 12 of the 33 Alaska species are known to attain the size and habit of small trees, willows (*Salix*) are the largest genus of trees here. Numerous variations occur, and some species seem to intergrade or hybridize, often making identification difficult. Some botanists distinguish by name many additional varieties or subspecies of Alaska willows.

Although field identification is difficult, especially in winter, the willows as a group can be distinguished by the usually slender or wiry twigs, the winter buds covered by a single bud-scale, and by the bitter quinelike taste of the bark. The short-stalked leaves generally are long and narrow, with smooth or finely toothed edges. The yellowish or greenish male and female flowers are borne in hairy, narrow catkins 1–3 in. (2.5–7.5 cm.) long, on separate trees or shrubs in early spring before or with the leaves.

The fruits in tassellike catkins are pointed, thin-walled seed capsules about $\frac{1}{4}$ in. (6 mm.) long, which split open in spring and summer to release the numerous tiny seeds with tufts of cottony hairs.

Shrubby willows are widely distributed almost throughout Alaska, extending beyond the limits of trees to the Arctic coast, Bering Sea, and Aleutian Islands. They are the undergrowth of the open spruce-birch forest of interior Alaska and form thickets on sandbars and other porous soils along streams. Although not suitable for lumber because of their small size, shrubby willows provide important summer and winter food for many game animals, especially moose and ptarmigan.

The great variation in willows and their tendency to hybridize

make it difficult to construct a completely workable key. Two keys are provided. For using the first key to Alaska tree willows, it is best to have material grown under normal conditions (not sprouts from stumps of fast-growing roadside shoots) and to have both mature catkins and leaves. Because the catkins often develop before the leaves, it may be desirable to tag the shrub and return to it at different times during the growing season. In addition, unusual growth forms resulting from differences in site cannot always be included in the key. The second key, for specimens without catkins, is a vegetative key based on leaves, twigs, and

growth form.

With considerable field experience, one can learn to distinguish many willows. It is best to start with the more common and distinctive willows, such as Sitka willow and Scouler willow in southeastern Alaska, and feltleaf willow and Bebb willow in central Alaska. Once the characteristics of these become familiar, it is easier to recognize the less common and less easily identified willows.

Five shrubby species rarely reaching tree size are described briefly at the end of the genus as Nos. 22.1–22.5. Drawings and maps are in "Alaska Trees and Shrubs" (Viereck and Little 1972).

Key to Alaska Tree Willows

(and shrubs that rarely reach tree size)

- A. Pedicels, ovaries, and seed capsules hairless (young ovaries in some species with few hairs, especially near tip).
- B. Catkins stalkless, young twigs densely hairy; stipules glandular margined, persisting on twig several years -----
 22.4. Richardson willow (*Salix lanata* ssp. *richardsonii*)
- BB. Catkins on leafy twigs, stipules not persisting on twigs.
- C. Leaf margins distinctly toothed.
- D. Leaves lance-shaped, 4–5 times as long as broad, with long narrow tip, shiny above; scales of catkin yellow, soon shedding ----- 22. Pacific willow (*Salix lasiandra*)
- DD. Leaves rounded or blunt at tip, not lance-shaped; scales of catkin not yellow or deciduous.
- E. Leaves whitish (glaucous) beneath, ovate to obovate, toothed or entire on margins, hairless or with few hairs on veins of upper surface (or both surfaces with long silky hairs when young); pedicels short, about 1/32 in. (1 mm.) -----
 22.3. Barclay willow (*Salix barclayi*)
- EE. Leaves light green beneath, dark green above, regularly toothed, hairless; pedicels 1/16–1/8 in. (1.5–3 mm.) long -----
 22.2. tall blueberry willow (*Salix novae-angliae*)
- CC. Leaf margins entire or with few small teeth near base.
- F. Twigs with dense long hairs when young; catkins large and thick, to 3/4 in. (2 cm.) in diameter; styles 1/8 in. (3 mm.) long -- 16. Hooker willow (*Salix hookeriana*)
- FF. Twigs hairless or with scattered hairs, never densely hairy; catkins usually less than 5/8 in. (15 mm.) in diameter; styles less than 1/16 in. (1.5 mm.) long -----
 22.3. Barclay willow (*Salix barclayi*)

- AA. Ovaries hairy (mature seed capsules sometimes with only few hairs near tip).
- G. Pedicels of flower and seed capsule $\frac{1}{8}$ – $\frac{3}{16}$ in. (3–5 mm.) long, conspicuous, exceeding scales ----- 18. Bebb willow (*Salix bebbiana*)
- GG. Pedicels shorter, less than $\frac{1}{8}$ in. (3 mm.) long, not exceeding scales.
- H. Leaves distinctly glandular toothed around margin ----- 21. littletree willow (*Salix arbusculoides*)
- HH. Leaves irregularly or indistinctly toothed or entire.
- I. Leaves without hairs on lower surface, except occasionally on midvein, upper surface shiny green; stipules long and narrow, glandular margined, persistent several years ----- 22.5. diamondleaf willow (*Salix planifolia* ssp. *pulchra*)
- II. Leaves distinctly hairy on lower surface, upper surface not shiny green; stipules shedding.
- J. Leaves hairless above, lower surface with dense woolly hairs ----- 17. feltleaf willow (*Salix alaxensis*)
- JJ. Leaves hairy on both surfaces, sometimes with scattered hairs.
- K. Lower surface of leaves shiny, silky from straight appressed silvery hairs ----- 20. Sitka willow (*Salix sitchensis*)
- KK. Lower surface of leaves without silky sheen.
- L. Lower surface of leaves with scattered, short, stiff hairs at least partly red, giving a reddish hue; catkins without leafy stalks developing before leaves; pedicels $\frac{1}{8}$ in. (3 mm.) long ----- 19. Scouler willow (*Salix scouleriana*)
- LL. Lower surface of leaves densely hairy with woolly hairs, never red; catkins on leafy twigs or developing with or after the leaves; pedicels short or lacking ----- 22.1. grayleaf willow (*Salix glauca*)

Vegetative Key to Alaska Tree Willows

(and shrubs that rarely reach tree size)

Because leaf, twig, and growth form characteristics of some willows are extremely variable, a vegetative key cannot account for all the variability. The key must deal primarily with the typical specimen in a typical location. Perhaps the following key will serve for three-fourths of the Alaska tree willow specimens. However, many will not key out or will key to a wrong species. Usually, it should be possible to narrow the choice to 2 or 3. The descriptions, drawings, and maps will then be of aid in further determination.

- A. Adult leaves with hairs on lower surface.
- B. Lower surface of leaves with dense hairs, appearing silvery, white, or gray.
- C. Lower surface of leaves with dense white *woolly* hairs ----- 17. feltleaf willow (*Salix alaxensis*)
- CC. Lower surface of leaves with dense *straight* hairs.
- D. Lower surface silky hairy, upper surface green, with scattered hairs; tall shrub or tree to 20 ft. (6 m.) high ----- 20. Sitka willow (*Salix sitchensis*)

- DD. Lower surface dull gray hairy, upper surface greenish gray, without hairs; shrub usually less than 10 ft. (3 m.) high ----- 22.1. grayleaf willow (*Salix glauca*)
- BB. Lower surface of leaves visible through less dense hairs.
- E. Margins of leaves distinctly toothed; leaves dark green and shiny above, whitish (glaucous) beneath, with long, stiff, straight hairs oriented toward tip of leaf, 3-4 times as long as broad; shrub 10-15 ft. (3-4.5 m.) tall, with slender branches -----
----- 21. littletree willow (*Salix arbusculoides*)
- EE. Margins of leaves not toothed or with a few teeth on basal half.
- F. Hairs on lower surface short and stiff, at least partly red, giving a reddish hue -----
----- 19. Scouler willow (*Salix scouleriana*)
- FF. Hairs denser, longer, not reddish.
- G. Tall shrubs or trees 10-25 ft. (3-7.5 m.) tall; twigs diverging at nearly right angles from the main stem -----
----- 18. Bebb willow (*Salix bebbiana*)
- GG. Medium shrubs, usually under 10 ft. (3 m.) high; twigs usually branching at 45° angle or less -----
----- 22.1. grayleaf willow (*Salix glauca*)
- AA. Adult leaves without hairs on lower surface.
- H. Stipules persistent on the twigs for several years.
- I. Stipules broad at the base and glandular toothed along margins; twigs coarse, brown to black, densely hairy, even after several years -----
----- 22.4. Richardson willow (*Salix lanata* ssp. *richardsonii*)
- II. Stipules linear, narrow at base, without glandular teeth; twigs fine, usually reddish brown, shiny, without dense hairs at 1 year -----
----- 22.5. diamondleaf willow (*Salix planifolia* ssp. *pulchra*)
- HH. Stipules persisting less than 1 year.
- J. Leaves with teeth around margin.
- K. Leaves 3-4 times as long as broad; tall shrubs or trees.
- L. Leaves large, 3-4 in. (7.5-10 cm.) long, lance-shaped, with long tapering tip; young twigs woolly -----
----- 22. Pacific willow (*Salix lasiandra*)
- LL. Leaves smaller, 2-3 in. (5-7.5 cm.) long, not lance-shaped, short-pointed; young twigs not woolly -----
----- 21. littletree willow (*Salix arbusculoides*)
- KK. Leaves less than 3 times as long as broad.
- M. Leaves whitish (glaucous) beneath -----
----- 22.3. Barclay willow (*Salix barclayi*)
- MM. Leaves light green, not whitish (glaucous) beneath -----
----- 22.2. tall blueberry willow (*Salix novae-angliae*)
- JJ. Leaves entire or with teeth only on lower part.
- N. Stems coarse, densely hairy, leaves large at maturity, to 3 in. (7.5 cm.) long, obovate; Yakutat Bay area -----
----- 16. Hooker willow (*Salix hookeriana*)
- NN. Stems fine, thinly hairy, leaves smaller, 1½-2½ in. (4-6 cm.) long, dull grayish green above, elliptic to ovate; widely distributed in most of Alaska except southeast -----
----- 18. Bebb willow (*Salix bebbiana*)

16. HOOKER WILLOW

(*Salix hookeriana* Barratt)

Other names: bigleaf willow, Yakutat willow, *Salix amplifolia* Cov.

A shrub or small tree, usually about 10–16 ft. (3–5 m.) tall but occasionally attaining a height of 25 ft. (7.5 m.) and a trunk diameter of 8–15 in. (20–38 cm.). Leaves oval to broadly obovate or rarely the uppermost ovate, 1½–3 in. (4–7.5 cm.) long and ¾–2 in. (2–5 cm.) wide, broadly pointed to rounded at apex, mostly rounded at base, edges without teeth or sparsely wavy-toothed, pale green above, whitish beneath, more or less hairy on both sides while unfolding but becoming hairless. Twigs stoutish, dark brown, densely white- or gray-woolly for 2 or 3 years. Buds dark reddish brown, hairy. Bark gray, smooth.

Catkins on leafy stalks, appearing before or with the leaves, 3–4 in. (7.5–10 cm.) long and ½–⅓ in. (12–15 mm.) wide at maturity; scales brownish to blackish, covered with long whitish hairs. Seed capsules long, hairless. Flowering in mid-May to early June, seeds ripening mid-June to July.

In Alaska, Hooker willow grows in a variety of sites including beach ridges, stabilized sand dunes, and coastal meadows. Rare in Alaska, except in the Yakutat Bay region where it has been known for many years as a local species, Yakutat willow (*Salix amplifolia* Cov.). Collected recently from a few other coastal areas including Middleton Island. At Yakutat the plants are browsed by moose.

Coastal Alaska in the vicinity of Prince Williams Sound and Yakutat Bay. North Tongass National Forest. Also coastal dunes, Pacific Coast from Queen Charlotte Islands (Moresby Island)

and extreme southwestern British Columbia, Vancouver Island, and Puget Sound region of western Washington south to northwestern California. Reported also from eastern Siberia.

This species honors William Jackson Hooker (1785–1865), English botanist, in whose work the description was published.

17. FELTLEAF WILLOW

(*Salix alaxensis* (Anderss.) Cov.)

Other names: *Salix longistylis* Rydb., *S. alaxensis* var. *longistylis* (Rydb.) Schneid., ssp. *longistylis* (Rydb.) Hult.

A shrub or small tree to 20–30 ft. (6–9 m.) high with a trunk 4–7 in. (10–18 cm.) in diameter, occasionally dwarfed and nearly prostrate in exposed places. Leaves elliptic or oblanceolate (reverse lance-shaped), 2–4 in. (5–10 cm.) long and ½–1½ in. (1.2–4 cm.) wide, short-pointed, usually tapering to base, edges without teeth or nearly so, above dull green and hairless or sometimes somewhat short-hairy, beneath covered with a dense white or creamy-white felt; midrib yellowish. One-year and 2-year twigs stoutish, usually white-woolly. In (Rydb.) Schneid. or ssp. *longistylis* (Rydb.) (Hult.) the young twigs and buds without hairs and often with a bluish white bloom. Bark gray, smooth, becoming rough and furrowed into scaly plates.

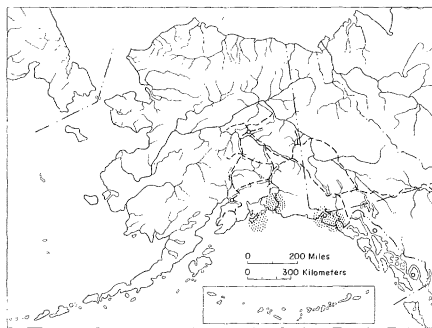
Catkins stoutish, not stalked, appearing before the leaves, 2–4 in. (5–10 cm.) long at maturity; scales blackish. Seed capsules long, pointed, white-woolly. Flowering May and June, seeds ripening in June and July.

Feltleaf willow is widely distributed in valleys almost throughout Alaska. Extending beyond the



Figure 16.—Hooker willow (*Salix hookeriana*), natural size. Female catkin at left; seed capsules in center; male catkin at right.

limits of the spruce-birch interior forest, it is the only tree willow in many areas, such as north and west of Kodiak Island and at Firth River on the northeast Arctic slope. In many places in northern Alaska, this willow is important as the only wood available for fuel. Though not the common "diamond willow" from which ornamental canes are made, the trunks sometimes have this pattern of diamond-shaped scars where the lower twigs have died. Feltleaf willow is a preferred



browse species of moose which pull down and break branches and trunks up to 1½ in. (4 cm.) in diameter. Eventually the shrub grows above the reach of the moose and becomes too thick for the moose to break. It is reported that the inner bark has served as food for humans.

Widely distributed and common almost throughout Alaska from northern part of southeast Alaska to Arctic Ocean. Southeast Alaska from Wrangell to head of Lynn Canal at Skagway, Glacier Bay, and Yakutat Bay; north through the interior to the Arctic coast and northwest to Cape Lisburne; west to Bering Sea; southwest on Alaska Peninsula and Aleutian Islands to Unalaska Island; and south to Kodiak Island, Cook Inlet, and Prince William Sound. North Tongass, South Tongass, and Chugach National Forests, Glacier Bay and Katmai National Monuments, Mt. McKinley National Park, Kenai National Moose Range, Kodiak National Wildlife Refuge, Arctic National Wildlife Range. East to northwest shore of Hudson Bay and south to central British Columbia, but not reaching contiguous United States. Also in eastern Asia.

This willow was first collected at Kotzebue Sound beyond Bering Strait. The specific name *alaxensis* means Alaskan but is from an old spelling.

18. BEBB WILLOW

(*Salix bebbiana* Sarg.)

Other names: diamond willow, beak willow, *S. rostrata* Richards., *S. depressa* L. ssp. *rostrata* (Anderss.) Hiitonen.

A large shrub 10 ft. (3 m.) tall or a small, bushy tree 15–25 ft. (4.5–7.5 m.), rarely 35 ft. (10.5 m.) with trunk diameter of 6–9 in. (15–23 cm.). Leaves elliptic and pointed at both ends to broadly oblanceolate or obovate-oval and very short-pointed at apex and broad at base, 1–3½ in. (2.5–9 cm.) long and ¾–1 in. (10–25 mm.) wide, edges without teeth or somewhat wavy, dull green above, gray or whitish and roughly net-veined beneath, more or less hairy

on both sides but becoming less hairy with age. In an uncommon variety, the smaller leaves are hairless or nearly so beneath and often less rough. Twigs slender, branching at wide angles, yellowish to brown, gray hairy when young but afterward becoming hairless. Bark gray to dark gray, smooth, becoming rough and furrowed. Wood lightweight, brittle.

Catkins on short leafy stalks, before or with the leaves, at maturity 1–3 in. (2.5–7.5 cm.) long and loose, scales narrow, yellowish with reddish tips, hairy. Seed capsules long, very slender, with short hairs ⅛–⅜ in. (3–5 mm.) long, on slender, sparsely hairy stalks. Flowering mid-May through mid-June, seeds ripening by mid- to late June, catkins shed by mid-July.

Bebb willow is the most common upland willow in interior Alaska, occurring as scattered individuals in most forest types. It is also the most common species in the willow stands that follow forest fires on upland sites and in thickets adjacent to streams, swamps, and lakes. In open meadows it forms large spreading shrubs. It is an important browse species for moose throughout interior Alaska. In winter heavy snows tend to bend the branches down so that they are in reach of both moose and snowshoe hares.

Bebb willow is the most important producer of “diamond willow.” This term applies to several species with diamond-shaped patterns on their trunks. When the stems are carved they result in a striking pattern of diamond-shaped cavities with a sharp contrast between the white or cream sapwood and the reddish brown heartwood. Diamond willow is carved into canes, lamp posts, furniture and candle holders. In the old roadhouse at Copper Center, the newel posts and balusters

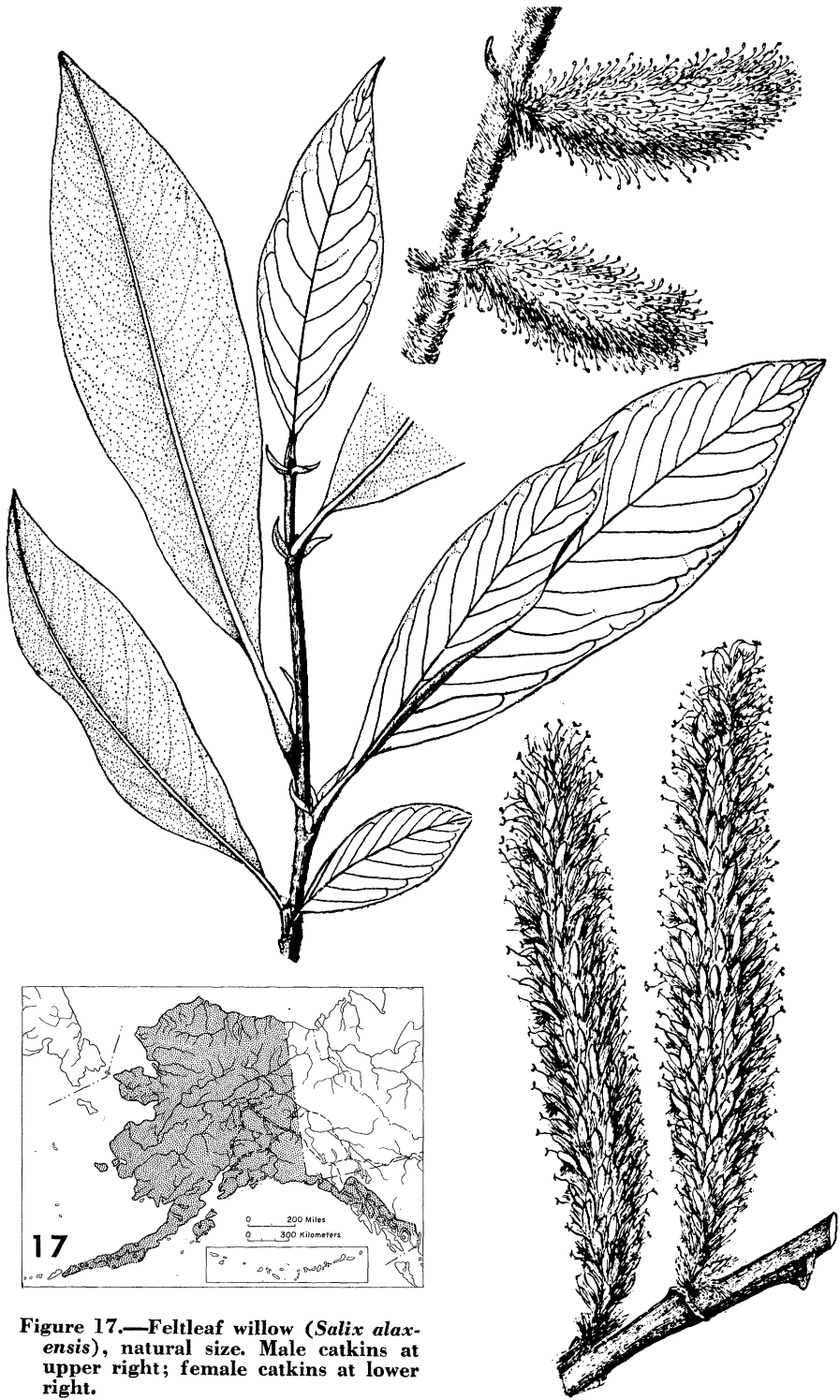


Figure 17.—Feltleaf willow (*Salix alaxensis*), natural size. Male catkins at upper right; female catkins at lower right.

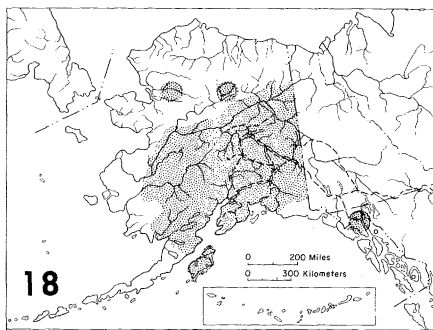


Figure 18.—Bebb willow (*Salix bebbiana*), natural size. Seed capsules at left; male catkin at upper right.

of the whole staircase have been carved from diamond willow.

The depressions or “diamonds” are caused by one or more fungi which attack the willow at the junction of a branch with the main trunk. The “diamond willows” occur most commonly under shade of trees or where the site is poor. They are most abundant in the Copper River Basin area but occur in Alaska throughout the boreal forest from the Kenai Peninsula northward. In addition to the Bebb, the following also form “diamonds” although usually to a lesser degree: Park willow, feltleaf willow, littletree willow, and Scouler willow.

In other areas of the United States, Bebb willow formerly was used for baseball bats, charcoal, gunpowder, and withes for furniture and baskets.



Widely distributed in interior Alaska, south to the Pacific Coast. In the northern part of southeastern Alaska at Glacier Bay and the head of Lynn Canal. In central Alaska from Prince William Sound north to the south slopes of the Brooks Range, west on the Yukon River to Holy Cross, and south to Katmai, Kodiak Island, and the Kenai Peninsula. North Tongass and Chugach National Forests, Mt. McKinley National Park, Katmai National Monument, Kenai National Moose



Figure 19.—Scouler willow (*Salix scouleriana*), natural size. Seed capsules at upper left; female catkin at upper right; male catkin at lower right.

19. SCOULER WILLOW

(*Salix scouleriana* Barratt)

Other names: mountain willow, black willow, fire willow.

A shrub or tree with compact rounded crown usually 15 ft. (4.5 m.) tall and 4 in. (10 cm.) in trunk diameter but in some localities in Alaska becoming a tree 50-60 ft. (15-18 m.) tall and 16-20 in. (40.5-51 cm.) in trunk diameter.

Range, Kodiak National Wildlife Refuge. East across Canada to Hudson Bay, Labrador, and Newfoundland, and south to New Jersey, Nebraska, New Mexico, and central California. Also in eastern Asia.

This species commemorates Michael Schuck Bebb (1833-95), American specialist on willows.

Leaves variable, mostly oblanceolate to narrowly obovate or sometimes oblong or elliptic, 2–5 in. (5–12.5 cm.) long and $\frac{1}{2}$ – $1\frac{1}{2}$ in. wide (12–40 mm.), mostly very short-pointed at apex and tapering to base, edges without teeth to sparsely wavy-toothed, dark green and nearly hairless above, beneath whitish to white and more or less gray hairy or becoming rusty hairy when older. Twigs stoutish, yellowish or greenish brown and densely hairy when young, reddish to dark brown and nearly hairless when older; buds red. Bark gray smooth, thin, becoming dark brown, divided into broad flat ridges. Wood light brown tinged with red and with thick whitish sapwood, fine-textured, lightweight, soft.

Catkins stout, stalkless or on short leafless stalks, appearing in great abundance before the leaves, at maturity 1–2 in. (2.5–5 cm.) long and nearly $\frac{1}{2}$ in. (12 mm.) thick; scales obovate, black, long hairy. Seed capsules long, slender, gray-woolly. One of the earliest flowering of the willows, its catkins developing as pussy willows even before the snow has melted; flowering in May, seeds dispersing in June, catkins shedding by July.

Scouler willow is the most common willow of southeastern and south central Alaska where it occurs over a wide range of habitats and vegetation types. It is especially abundant in the vicinity of Anchorage and Kenai Peninsula where it has become extensive in the uplands following past widespread fires. It is often called "fire willow" because of its rapid occupation of burned areas, forming blue-green thickets. In southeastern Alaska it comes in abundantly after logging and also occurs along streams and roadsides and occasionally in the more open spruce and hemlock stands. Over all of southeastern and south cen-

tral Alaska, it commonly reaches tree size. In south central Alaska where it is an important moose browse species, most trees have been barked by moose. In the interior of Alaska, Scouler willow occurs in spruce, birch, and aspen stands, and occasionally in bogs, but is most common in areas that have been burned. It is one of several used for "diamond willow" carvings.

Southern end of southeastern Alaska north and west along the coast to Kodiak and Katmai, north to the Tanana River. Also in the upper and central Yukon River district around Dawson. South Tongass, North Tongass, and Chugach National Forests, Mt. McKinley National Park, Glacier Bay and Katmai National Monuments, Kenai National Moose Range, Kodiak National Wildlife Refuge. Eastward to Saskatchewan and south to New Mexico and California.

This species honors its discoverer, John Scouler (1804–71), Scotch naturalist who made plant collections on the northwest coast of North America in 1825–27.

20. SITKA WILLOW

(*Salix sitchensis* Sanson)

Other names: silky willow, *Salix coulteri* Anderss.

A large shrub or small tree 10–20 ft. (3–6 m.) high with trunk 4–6 in. (10–15 cm.) in diameter or rarely 30 ft. (9 m.) tall and 12 in. (30 cm.) in diameter. In exposed places, becoming a low, nearly prostrate shrub. Leaves oblanceolate or narrowly obovate or sometimes elliptic, 2–4 in. (5–10 cm.) long, usually short-pointed at apex, mostly tapering to a narrow base, edges without teeth or sparsely and inconspicuously

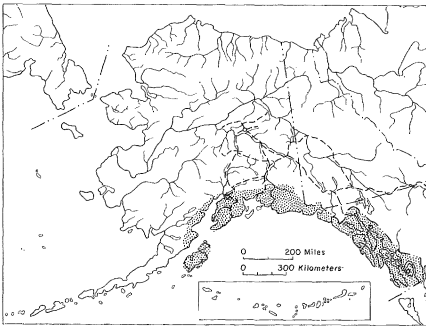


Figure 20.—Sitka willow (*Salix sitchensis*), natural size. Seed capsules at left; female catkin at right; male catkins at lower right.

wavy-toothed, above dark green and with sparse short hairs when young, beneath paler and with short silvery, silky hairs. Twigs

slender, sometimes thinly hairy when young but when older hairless and dark reddish brown. Bark gray, smooth, becoming slightly furrowed and scaly. Wood pale red, fine-textured, lightweight, soft.

Catkins slender, tightly flowered on short leafy stalks, appearing with the leaves, 2–4 in. (5–10 cm.) long at maturity; scales small, brown, densely hairy. Seed capsules short, silvery hairy.

Flowering in May, seeds ripening in early to mid-June, catkins shedding by July or early August.

Sitka willow is common in the coastal forest region of southeast Alaska, growing in sunny locations along streams and beaches or in the upland where the forest is open or absent. The satiny sheen on the lower surface of the leaves serves to distinguish it from other willows. The wood is not used commercially though the Indians burn it in drying fish, as the smoke has no bad odor. The supple twigs have been used by the Indians in basketmaking and for stretching skins, and the pounded bark has also been applied to heal wounds.

Pacific coast region of southeast and southern Alaska. Throughout southeast Alaska from Ketchikan northwest to head of Lynn Canal at Skagway, Glacier Bay, and Yakutat Bay, and west to Prince William Sound, Cook Inlet, and Kodiak Island, north as far as Anchorage and the Chitina River. South Tongass and North Tongass National Forests, Glacier Bay National Monument, Kenai National Moose Range, Kodiak National Wildlife Refuge. Alaska and British Columbia south along the coast to southern California and east to New Mexico and Black Hills. Also in eastern Asia.

Sitka willow was named for Sitka, Alaska, near which it was discovered by Karl Heinrich Mertens in 1827.

21. LITTLETREE WILLOW

(*Salix arbusculoides*
Anderss.)

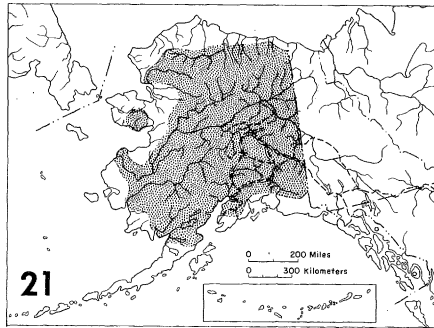
An erect shrub 10–15 ft. (3–4.5 m.) tall or commonly a small tree 25–30 feet (7.5–9 m.) tall and 5–6 in. (12–15 cm.) in trunk diameter.

Leaves narrowly elliptic-lanceolate, often oblanceolate while unfolding, 1–3 in. (2.5–7.5 cm.) long, $\frac{3}{8}$ – $\frac{3}{4}$ in. (10–20 mm.) wide, usually short-pointed at both ends, with edges finely but shallowly toothed, green and hairless above, beneath whitish to white and finely silvery-hairy or in an uncommon variety hairless; veins closely parallel. Twigs slender, much branched, the younger yellowish brown and sometimes thinly short-hairy, the older reddish brown, hairless, and shiny. Bark gray to reddish brown, smooth.

Catkins small and slender on very short stalks, appearing slightly before or with the leaves, 1–2 in. (2.5–5 cm.) long at maturity; scales blackish. Seed capsules small, thinly silvery-hairy. Flowering mid-May to early June, seeds ripening mid- to late June.

Littletree willow is one of the most common willows, forming dense thickets along streams and rivers in interior Alaska. It also grows in the upland along streams and is a common successional species following the burning of open stands of black spruce in wet sites. It is less commonly found as a shrub in stands of white spruce and birch. On the north slope of the Brooks Range, it grows on streambanks and gravel bars in association with several other willow species. It is one of several species that form "diamond willow" patterns.

Widely distributed in interior Alaska from the Copper River Basin northward to the northern foothills of the Brooks Range, westward to the Kobuk River and Yukon Delta. Mt. McKinley National Park, Kenai National Moose Range, Arctic National Wildlife Range. East to Hudson Bay and south to British Columbia and central Quebec.



22. PACIFIC WILLOW (*Salix lasiandra* Benth.)

Other names: western black willow, yellow willow.

A tall shrub or small tree to 20 ft. (6 m.) high. Farther south in contiguous United States, it is a small tree 20–30 ft. (6–9 m.) tall but occasionally a larger tree 50–60 ft. (15–18 m.) tall with a trunk 2–3 ft. (60–90 cm.) in diameter. Leaves lance-shaped, 2–5 in. (5–12.5 cm.) long and ½–1 in. (12–25 mm.) wide, long pointed, mostly rounded at the base, with edges finely toothed, shiny green above, glaucous and more or less hairy beneath. Twigs hairy when young, stoutish, chestnut to reddish, shiny, hairless with age. Bark gray, smooth, becoming rough and deeply furrowed. Wood pale brown, brittle.

Figure 21.—Littletree willow (*Salix arbusculoides*), natural size.

Catkins on leafy stalks, appearing with the leaves, 2–4 in. long (5–10 cm.) at maturity; scales yellowish, hairy toward the base. Seed capsules without hairs

Pacific willow is an occasional pioneer species on the sand and silt bars of the rivers of interior Alaska, usually with other willows but occasionally forming pure stands. It is occasional to rare in the uplands in willow thickets along streams and roadsides.

Interior and southeast Alaska. In southeast Alaska only in the vicinity of Yakutat, Haines, and Skagway and in British Columbia adjacent to the boundary along the Stikine and Chilkat Rivers. In interior Alaska from Palmer north to the central Yukon River district and Wiseman and west to

Holy Cross on the lower Yukon River. North Tongass National Forest. East to Saskatchewan and south to southern California and New Mexico.

22.1. Grayleaf willow (*Salix glauca* L.) An erect to spreading shrub with dull gray appearance, commonly 3–4 ft. (1–1.2 m.) tall; in exposed sites may be depressed and in favorable sites rarely becomes a small tree to 20 ft. (6 m.) high and 5 in. (12.5 cm.) in trunk diameter. **Leaves** oval to lanceolate, $1\frac{1}{2}$ – $3\frac{1}{2}$ in. (4–9 cm.) long, entire or with small glandular teeth on the lower part. Upper surface green, lower surface whitish (glaucous), both surfaces densely hairy to nearly hairless. **Twigs** reddish brown to grayish, hairy or hairless. **Catkins** $\frac{3}{4}$ –2 in. (2–5 cm.) long, on leafy shoots, developing with or after the leaves and often persisting into the fall. **Seed capsules** hairy, gray when young and turning light brown with age. Throughout Alaska except Aleutian Islands and southeast coast. East across North America to Labrador and Newfoundland, south to southern British Columbia, and in the Rocky Mountains to northern New Mexico, Northern Europe and Asia.

22.2. Tall blueberry willow (*Salix novae-angliae* Anderss.). An erect shrub usually 6–8 ft. (2–2.5 m.) tall, rarely to 20 ft. (6 m.) and treelike. **Leaves** elliptic to obovate, 1–3 in. (2.5–7.5 cm.) long and about $\frac{1}{3}$ as wide, margins with teeth often glandular tipped, upper surface dark green, lower surface lighter but not whitish (glaucous), prominently net-veined. **Twigs** brown, usually straight, coarse, with dense white silky hairs when young. **Catkins** $\frac{3}{4}$ – $2\frac{1}{2}$ in. (2–6 cm.) long on leafy stalks, appearing after the leaves have started

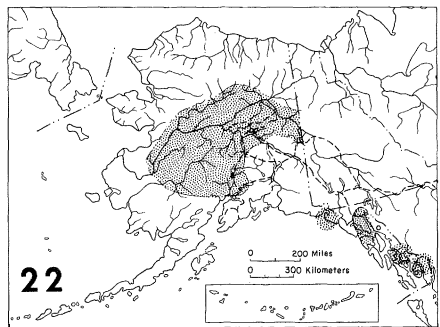
to develop. **Seed capsules** green to brown, hairless, $\frac{1}{4}$ – $\frac{5}{16}$ in. (6–8 mm.) long. Common along rivers in central Alaska. East to British Columbia and southward in mountains to northern California and southern Utah.

22.3. Barclay willow (*Salix barclayi* Anderss.). Spreading, much branched shrub tending to form dense thickets 3–6 ft. (1–2 m.) high, rarely to 10–20 ft. (3–6 m.) and treelike, variable in growth form, leaf structure, color, and habitat. **Leaves** broadly elliptic to obovate, $\frac{3}{4}$ –3 in. (2–7.5 cm.) long, margins toothed, serrate to entire; upper surface shiny yellow green, thinly hairy when young but becoming hairless, sometimes with short reddish hairs along midrib; lower surface whitish (glaucous), thinly hairy but soon becoming hairless; usually turning black in drying. **Twigs** blackish and densely hairy when young, becoming reddish brown and hairless with blackish buds. **Catkins** 2–3 in. (5–7.5 cm.) long, on stalks with 2–3 leaves, appearing with the leaves. **Seed capsules** short and stout, hairy when young but soon becoming hairless, green to reddish. Along coast to Alaska from southeastern tip to Aleutian Islands. Occasional to rare in Alaska Range and in the interior lowlands. South along the coast to Washington and eastward to Alberta and Montana.

22.4. Richardson willow (*Salix lanata* L. ssp. *richardsonii* (Hook.) A. Skwartz). Erect, much-branched shrubs usually forming dense clumps 3–6 ft. (1–2 m.) tall, rarely to 20 ft. (6 m.). **Leaves** elliptic to obovate, $\frac{3}{4}$ – $2\frac{1}{2}$ in. (2–6 cm.) long, about $\frac{1}{2}$ to $\frac{3}{4}$ as wide, entire or toothed on margins, both surfaces with long thin hairs when young but becoming hairless with age, dark green above, whitish (glaucous) beneath. Stipules conspicuous, broad,



Figure 22.—Pacific willow (*Salix lasiandra*), natural size.



with glandular teeth on the edges, persistent on the twig for several years. Young twigs stout and densely hairy, dark brown to black; older twigs hairless, orange-red to red-brown and characterized by persistent stipules. **Catkins** 1½–2½ in. (4–6 cm.) long on leafless peduncles, developing early in spring before the leaves; scales dark brown to black with dense silky hairs. **Seed capsules** stout, green to light brown, hairless, on short stalks. From the Arctic coast southward through most of central and south central Alaska but not reaching to western Alaska Peninsula or Kenai Peninsula. In southeastern Alaska only in mountains in area from Juneau to Haines. This subspecies occurs across northern Canada to Baffin and Southampton Islands, south to Northwestern Hudson Bay and British Columbia; north-eastern Asia. The species occurs across northern North America, Europe, and Asia and south in mountains of Asia.

22.5. Diamondleaf willow (*Salix planifolia* Pursh ssp. *pulchra* (Cham.) Argus). An upright much-branched shrub 3–6 ft. (1–2 m.) tall, rarely to 15 ft. (4.5 m.), often forming loose thickets in wet habitats but becoming a prostrate creeping shrub in exposed sites in arctic and alpine tundra. **Leaves** elliptic to oblanceolate, pointed at both ends and often diamond-shaped, 1–2½ in. (2.5–6 cm.) long and about ⅓–½ as wide, hairless and shiny green above and pale to whitish (glaucous) beneath, entire on edges or with a few small teeth near base. Stipules linear, glandular-toothed, persisting on twigs 2–3 years. A few brown leaves usually remain on the twigs through the following winter and into the next summer. **Twigs** shiny dark brown, reddish or purple, hairy when young but becoming hairless in

age. **Catkins** ¾–1½ in. (2–4 cm.) long, stalkless on the branches, developing in early spring before the leaves; scales blackish in upper part and hairy. **Seed capsules** ⅝ in. (8 mm.) long, stout, hairy, greenish gray when young but becoming brown with age. Almost all of Alaska except the western Aleutians and the coastal forests of southeastern Alaska. Along the south coast from Unalaska Island to Prince William Sound. In southeastern Alaska only in the extreme northern part of mountains above Haines and Skagway. In Asia from Novaya Zemlya to Chukchi Peninsula.

BIRCH FAMILY

(Betulaceae)

The birch family (Betulaceae) is represented in Alaska by 2 genera, birch (*Betula*) and alder (*Alnus*), and 7 species, also intergrading varieties and hybrids. Distinguishing characters are as follows: (1) Leaves borne singly (alternate), broad, margins sharply and usually double-toothed with teeth of 2 sizes, and in alders often slightly wavy lobed; (2) flower clusters (catkins) composed of an axis bearing many minute greenish flowers 2–3 above a scale, in early spring before the leaves, from buds partly formed the preceding summer; (3) flowers with minute calyx, of 2 kinds on the same plant (monoecious); (4) male flowers with pollen in long, narrow catkins at end of twig and female flowers in short catkins on sides of twig; and (5) fruits conelike, ½–2 in. (1.2–5 cm.) long, of many nutlets ("seeds") and scales.

The tree birches of Alaska are easily recognized by their smooth, thin, white, pinkish, coppery brown, or purplish brown bark, which peels off in papery strips; the soft cone-like fruits shed,

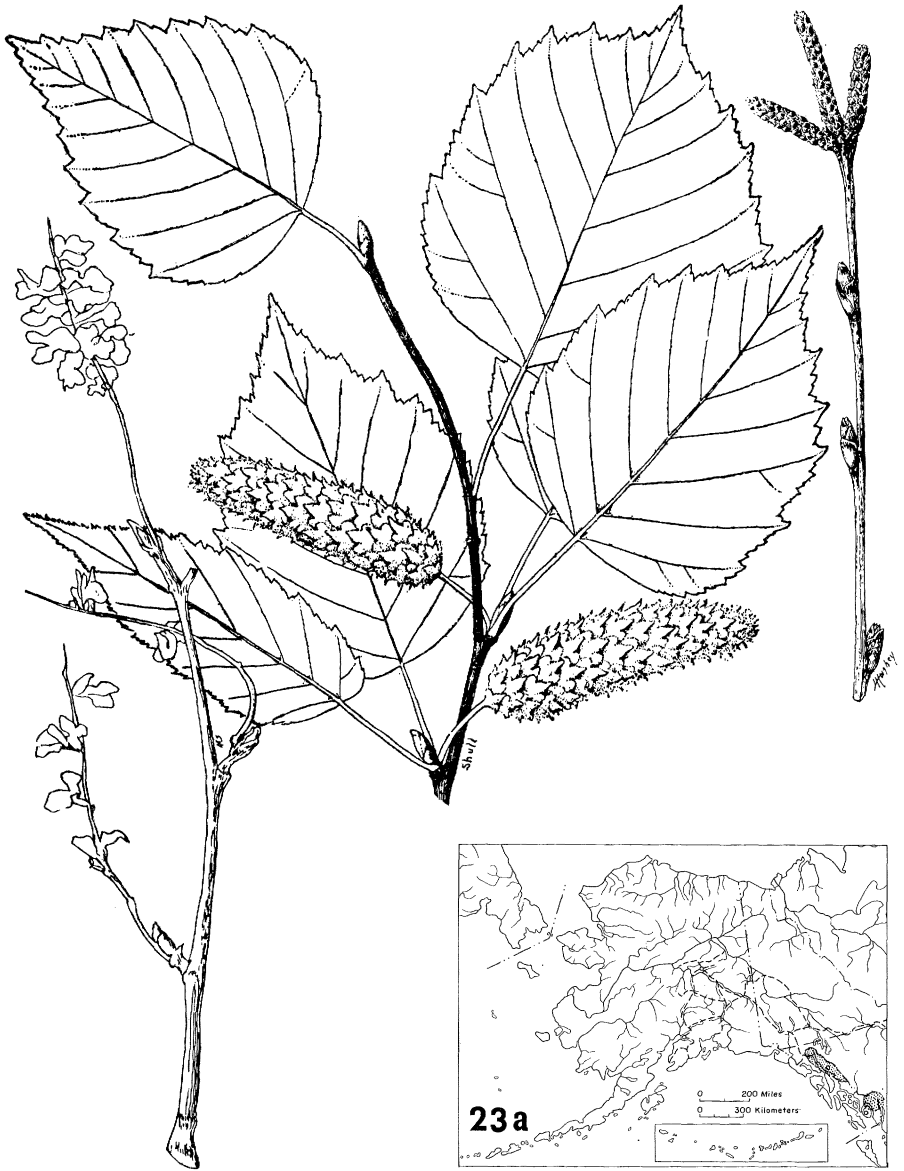


Figure 23a.—Western paper birch (*Betula papyrifera* var. *commutata*), natural size. Winter twig with old fruits at left; leafy twig with fruits in center; winter twig with buds of male catkins at right.

leaving slender axis. Alders generally have smooth gray bark, which is not papery, and usually have at all seasons some old dead, hard, blackish or dark brown conelike fruits remaining on the twigs. Birch twigs commonly have

raised gland dots and have winter buds not stalked, composed of overlapping scales. Alder twigs lack glands and have usually stalked winter buds with 3 exposed scales usually meeting at their edges or overlapping.

BIRCH (*Betula*)

Alaska has 2 species of dwarf, shrubby birches both widely distributed, and 3 kinds of tree birches. These are variable and intergrade and hybridize wherever their ranges meet. The dwarf birches have round, rounded-toothed leaves less than $\frac{3}{4}$ in. (2 cm.) long. Dwarf arctic birch (*Betula nana* L.) has leaf blades often broader than long, straight or notched at base. Resin birch (*B. glandulosa* Michx.) has leaf blades longer than broad, wedge-shaped at base.

The tree birches of Alaska have larger, ovate leaves $1\frac{1}{2}$ – $3\frac{1}{2}$ in. (4–9 cm.) long and are treated as 3 geographical varieties of a single transcontinental species, pa-

per birch (*Betula papyrifera* Marsh.). Western paper birch (var. *commutata* (Reg.) Fern.), of the northern part of southeast Alaska, has leaves mostly rounded at base and usually reddish brown bark. Alaska paper birch (var. *humilis* (Reg.) Fern. & Raup), common through the interior forests, has rather long-pointed leaves usually wedge-shaped at base and usually white bark in age (or reddish brown when young or in dense stands). Kenai birch (var. *kenaica* (W. H. Evans) Henry), of southern and southern interior Alaska and treated by some authors as a distinct species, has relatively thick, usually short-pointed leaves and usually dark brown or gray bark.

Key to Alaska Tree Birches

- A. Leaf blades ovate, $1\frac{1}{2}$ – $3\frac{1}{2}$ in. (4–9 cm.) long, mostly thin, with pointed teeth on edges; trees with thin papery bark, peeling off—23. paper birch (*Betula papyrifera*), 3 varieties in Alaska.
 - B. Leaves long-pointed, usually wedge-shaped at base; bark usually white in age (or reddish brown when young or in dense stands); interior Alaska—23b. Alaska paper birch (*Betula papyrifera* var. *humilis*).
 - BB. Leaves mostly short-pointed; bark brown or pinkish; southern and southeast Alaska.
 - C. Leaves thin, mostly rounded at base; bark usually reddish brown; northern part of southeast Alaska—23a. western paper birch (*Betula papyrifera* var. *commutata*)
 - CC. Leaves thick, wedge-shaped or rounded at base, with white hairs on toothed edges; bark usually dark brown or gray southern and southern interior Alaska—23c. Kenai birch (*Betula papyrifera* var. *kenaica*).
- AA. Leaf blades elliptic, thick, mostly less than $1\frac{1}{2}$ in. (4 cm.) long, with rounded teeth on edges; large shrubs or small trees with smooth bark not peeling—23.1. hybrid birches (*Betula hybrids*).

23. PAPER BIRCH

(*Betula papyrifera* Marsh.)

Other names: white birch, canoe birch.

The general description and range of this species are summarized here, followed by similar notes for the three varieties in Alaska. Small to medium-sized deciduous tree usually 20–60 ft.

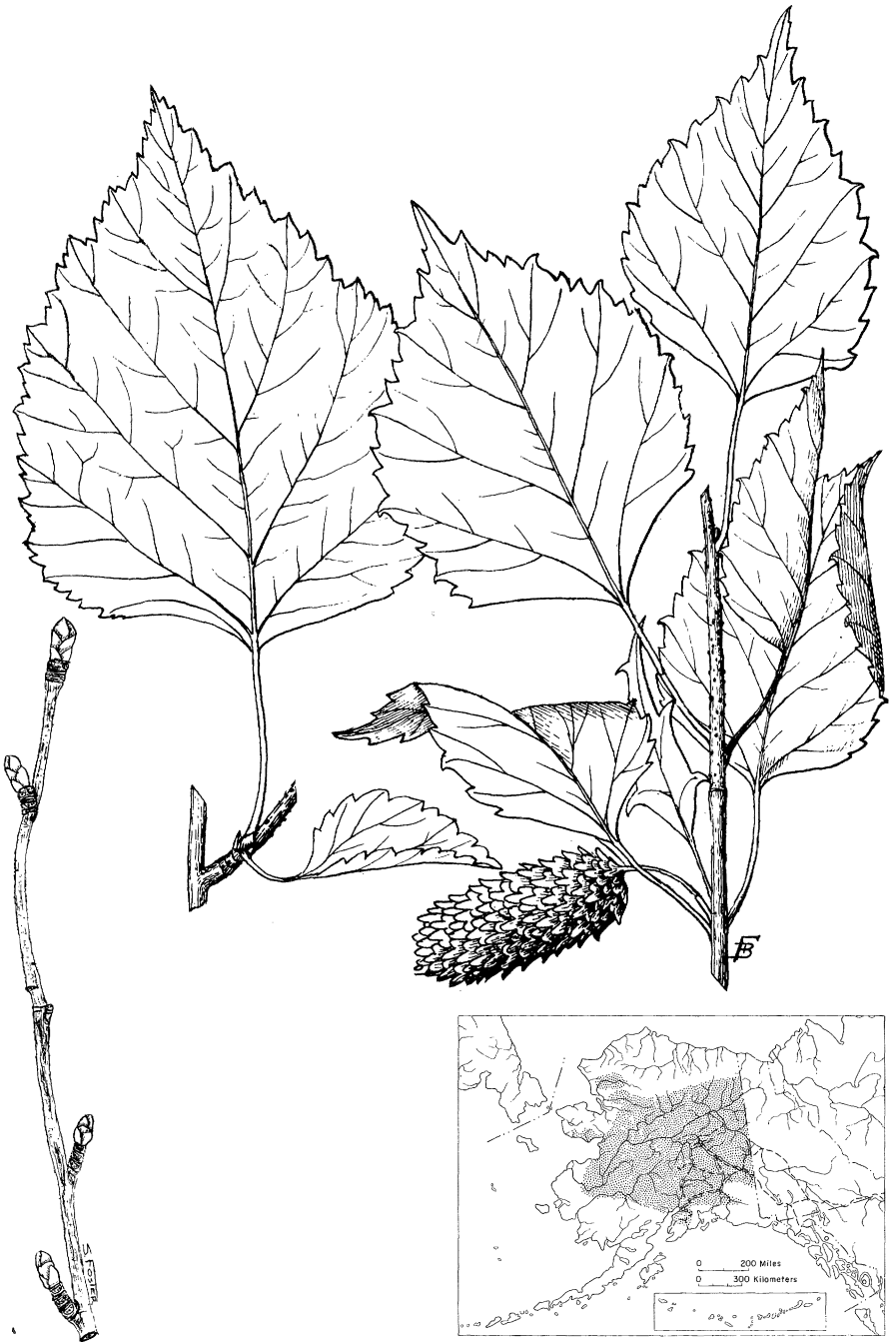


Figure 23b.—Alaska paper birch (*Betula papyrifera* var. *humilis*), natural size, Winter twig at lower left.

(6–18 m.) high and 4–12 in. (10–30 cm.) in trunk diameter, becoming 80 ft. (24 m.) tall and 24 in. (60 cm.) in diameter. **Leaves** with slender petioles $\frac{1}{2}$ –1 in. (1.2–2.5 cm.) long. Leaf blades ovate, $1\frac{1}{2}$ – $3\frac{1}{2}$ in. (4–9 cm.) long, 1 – $2\frac{1}{2}$ in. (2.5–6 cm.) wide, long-pointed or short-pointed at apex, wedge-shaped or rounded at base, coarsely and usually doubly toothed, mostly dull dark green and hairless above, light yellow green and hairless or slightly hairy beneath. **Twigs** slender, hairless, reddish brown with many small whitish dots, with short side twigs (spur shoots) covered by many raised half-rounded leaf-scars, becoming reddish black. **Winter buds** conic, $\frac{1}{4}$ in. (6 mm.) long, long-pointed, dark brown, slightly resinous, covered by 3 overlapping scales. **Bark** smooth, with long horizontal lines (lenticels), thin, separating into papery strips and peeling off, from white to pinkish, coppery brown, or purplish brown in the different varieties; inner bark orange. **Wood** of wide white sapwood and light reddish brown heartwood, fine-textured, moderately hard, and moderately heavy (the densest of Alaska commercial woods).

Flowers male and female on same twig, tiny, in groups of 3 above a scale (bract). Male flowers in narrow catkins partly developed the preceding summer, 1–4 in. (2.5–10 cm.) long composed of calyx and 2 stamens; female flowers in shorter clusters $\frac{3}{8}$ –1 in. (1–2.5 cm.) long, composed of ovary and 2 styles. **Fruits** conelike, cylindric, 1–2 in. (2.5–5 cm.) long and $\frac{3}{8}$ in. (1 cm.) wide, slender-stalked and hanging down. Nutlets (“seeds”) many, $\frac{1}{16}$ in. (1.5 mm.) long, brown, with 2 broad wings. Flowering in May–June, before the leaves, fruit shedding gradually into winter.

Paper birch is one of the most widespread tree species in northern North America and is composed of 6 or fewer intergrading geographical varieties. Widely distributed from northwestern Alaska east across Canada to Labrador and Newfoundland, south in Northeastern States to Pennsylvania and Iowa and in Western States to Montana and northeastern Oregon (locally south to Nebraska and in mountains to North Carolina, South Dakota (Black Hills), and Colorado).

Paper birch is a characteristic species of the interior forests of Alaska, designated as spruce-birch forests, and is associated with white spruce and aspen. In the upper Cook Inlet area, extensive paper birch forests occupy the rolling benchland above the bottoms and extend up the slopes of the foothills to about 800 ft. (244 m.). Growth is moderate to fast. On the more favorable sites, trees 80 to 100 years old attain a height of 60–70 ft. (18–21 m.) and a trunk diameter of 12–14 in. (30–35 cm.) Average diameter is 8–10 in. (20–25 cm.) and maximum about 29 in. (73 cm.). Maximum age recorded is about 230 years.

Near cities and villages in interior Alaska, paper birch has been used primarily for fuel, mainly fireplace wood. It has served locally for mine props. A small amount of lumber is cut and marketed locally in interior Alaska. However, attempts to develop export markets have not yet been successful because of high costs and transportation problems. The wood has been made into cabinets and wall paneling.

The wood of paper birch varieties growing in Alaska is suitable for pulping and papermaking by several processes. It is satisfactory also for furniture, cabinet-

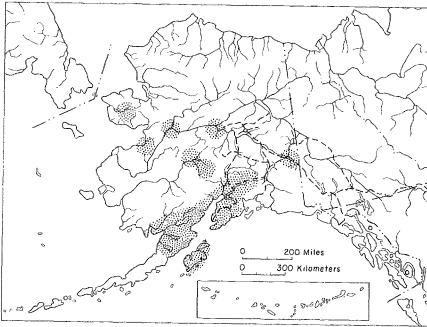
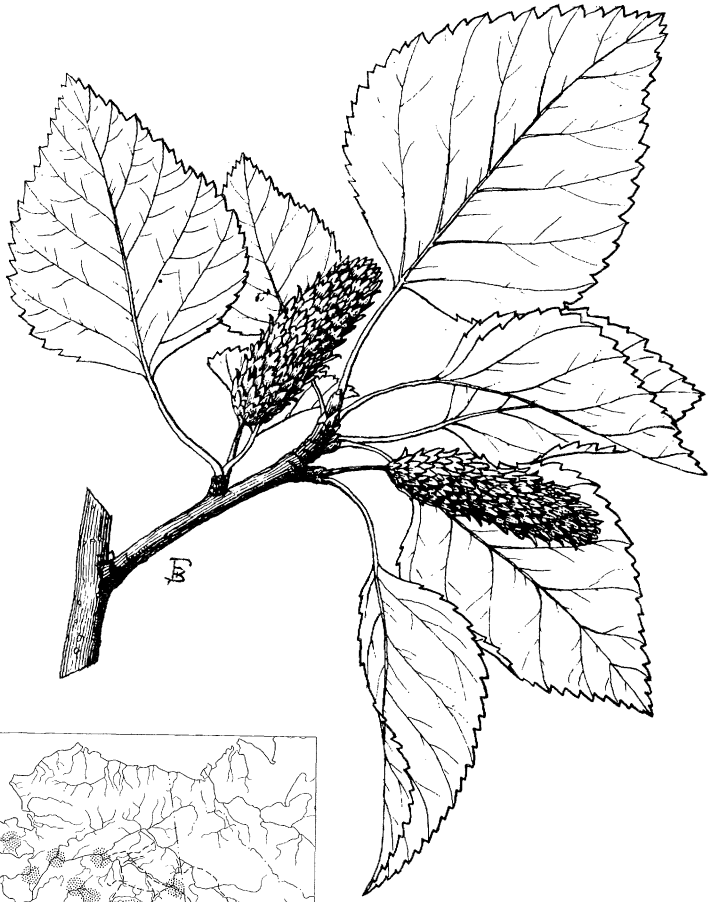


Figure 23c.—Kenai birch (*Betula papyrifera* var. *kenaica*), natural size.

making, veneer and plywood, handles, boxes and crates, clothes pins, spools, and bobbins. Other uses of paper birch southward are turned and carved articles, toothpicks, and toys. The wood works easily and takes finishes and stains satisfactorily. The uniformity of grain is a distinct advantage in the manufacture of veneers and plywoods.

Northern Indians made canoes and various small articles from the smooth thin bark. Because of

its durability and ease of working, bark was used as sheeting under sod on cabin roofs. Birch trees are planted also as ornamentals to display their attractive bark.

23a. WESTERN PAPER BIRCH

(*Betula papyrifera* var. *commutata* (Reg.) Fern.)

Other names: paper birch; *Betula papyrifera* var. *occidentalis* auth. and ssp. *occidentalis* auth., not *B. occidentalis* Hook.

Small to medium-sized tree 20-60 ft. (6-18 m.) high and 4-16 in. (10-40 cm.) in trunk diameter. Trunks often clustered, having originated from sprouts at base of old trees. **Leaf blades** ovate, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. (4-9 cm.) long, $1-2\frac{1}{2}$ in. (2.5-6 cm.) wide, mostly long-pointed or short-pointed at apex, rounded at base, coarsely doubly toothed, dark green and hairless above, beneath slightly hairy, especially in angles of veins; petioles slightly hairy and glandular. **Twigs** orange brown, with few hairs and whitish dots when young. **Bark** on small trunks smooth and usually reddish (coppery or purplish) brown, sometimes blackish, on larger trunks becoming papery and pinkish brown, pinkish, or sometimes whitish.

Male flower catkins 3-4 in. (7.5-10 cm.) long, narrow. **Fruits** cone-like, $1-1\frac{1}{2}$ in. (2.5-5 cm.) long, finely hairy, spreading; nutlets with wings broader than body; bracts with long middle lobe and 2 short lobes, hairy on edges.

Western paper birch is local and uncommon along the mainland coastal river drainages and lakes in the northern part of southeast Alaska, separated from the other Alaska tree birches. It occurs on thin, rocky soils, usually below 1500 feet (457 m.) elevation, often with lodgepole pine, following fire and on poor sites. The wood is not used locally.

Vicinity of Lynn Canal, from Taku River and Juneau to Skagway. North Tongass National Forest. Southern Yukon Territory east to District of Mackenzie and Saskatchewan and south to Montana and Washington. Also in northern Ontario and in Northeast from Labrador and Quebec south to northern New York and Massachusetts.

23b. ALASKA PAPER BIRCH

(*Betula papyrifera* var. *humilis* (Reg.) Fern. & Raup)

Other names: Alaska white birch, Alaska birch, canoe birch, paper birch, white birch; *Betula papyrifera* ssp. *humilis* (Reg.) Hult., *B. papyrifera* var. *neoalaskana* (Sarg.) Raup, *B. alaskana* Sarg., *B. neoalaskana* Sarg., *B. resinifera* auth., not (Reg.) Britton.

Small to medium-sized tree 20-80 ft. (6-24 m.) high and 4-24 in. (10-61 cm.) in trunk diameter. **Leaf blades** ovate, $1\frac{1}{2}$ -3 in. (4-7.5 cm.) long, 1-2 in. (2.5-5 cm.) wide, rather long-pointed, sharply to broadly wedge-shaped at base, coarsely toothed, dark green or yellow green and hairless above, beneath pale yellow green, dotted with glands and usually with angles of lower veins hairy; petioles becoming hairless. **Twigs** with many raised resinous dots. **Bark** white, or pinkish white, sometimes grayish white or yellowish white, papery.

Male flower catkin short, $1-1\frac{1}{2}$ in. (2.5-4 cm.) long, thick, greenish brown. **Fruits** conelike, $1-1\frac{3}{8}$ in. (2.5-3.5 cm.) long, hairless, hanging down or spreading. Nutlets with wings broader than body; bracts with middle lobe usually longer than the blunt, diamond-shaped lateral lobes, hairy on edges.

Alaska paper birch is the variety common through the interior up to tree line. It is best developed on warm slopes with moist porous soils but is also common on cold north slopes and poorly drained lowlands following fires. Birch is generally in a mixture with white or black spruce, which replace it in the successional sequence after fire. At Cook Inlet there are important birch forests. Here paper birch has its best development on



Figure 23.1.—Yukon birch (*Betula glandulosa* × *papyrifera*), natural size. Leafy twig with female catkins and fruits at upper left; leafy twig with male and female catkins at lower left; winter twig at right.

the rolling benchlands and lower foothill slopes up to an altitude of about 800 ft. (244 m.).

Common in spruce-birch forests throughout most of interior Alaska but not in southeast. North to south slopes of Brooks Range and northwest to Kobuk and Noatak Rivers and to coast along south side of Seward Peninsula; south to Unalakleet and Russian Mission on Yukon River. South of Alaska Range in Susitna Valley, Kenai Peninsula, and Copper River valley. Chugach National Forest, Mt. McKinley National Park. East to Yukon Territory and District of Mackenzie and south to Saskatchewan and British Columbia.

23c. KENAI BIRCH

(*Betula papyrifera* var. *kenaica* (W. H. Evans) Henry)

Other names: Kenai paper birch, black birch, red birch; *Betula kenaica* W. H. Evans, *B. kamtschatica* var. *kenaica* (W. H. Evans) Jansson.

Small to medium-sized tree 20–80 ft. (6–24 m.) high and 4–12 in. (10–30 cm.) in trunk diameter, rarely 18 in. (46 cm.). Leaf blades ovate or nearly triangular, 1½–2 in. (4–5 cm.) long, 1–1¾ in. (2.5–4.5 cm.) wide, relatively thick, usually short-pointed, broadly wedge-shaped or rounded at base, margin coarsely and often doubly toothed with white hairs, dull dark green and often slightly hairy above, beneath pale yellow green and dotted with glands and hairy on veins; petioles usually hairless. Twigs reddish brown hairy, and often with resin dots when young, becoming blackish and hairless. Bark usually dark brown, often blackish or reddish brown, sometimes becoming pinkish or grayish white, papery.

Male flower catkins short, about 1 in. (2.5 cm.) long, narrow, dark brown. Fruits conelike, about 1 in. (2.5 cm.) long, erect or spreading. Nutlets with wings slightly narrower than body; bracts, with lobes of about equal length, rounded at apex, side bracts slightly diamond-shaped.

Kenai birch, named from Kenai Peninsula and known only from Alaska, is found in the southern part of the spruce-birch interior forests but not southeast. Cook Inlet, Kenai Peninsula area, and west to Kodiak Island and base of Alaska Peninsula at Kaguyak and Brooks River. Chugach National Forest, Katmai National Monument, Kenai National Moose Range, Kodiak National Wildlife Refuge.

Northward this variety intergrades or hybridizes with Alaska paper birch. Specimens apparently nearer Kenai birch have been reported from interior Alaska along the Tanana, Yukon, and Kuskokwim Rivers, at Unalakleet, and on Seward Peninsula.

23.1. HYBRID BIRCHES

(*Betula* hybrids)

Many plants have characters intermediate between those of the tree and shrub birches described and illustrated here. These hybrid birches can be recognized by their characters between those of their parents growing nearby. In size, the hybrids between a tree and a shrub species are large shrubs or small trees. Bark is like that of the tree parent but does not peel off. Leaves are intermediate in size and vary in shape and margin. The shrubby species hybridize with one another as do the varieties of paper birch, the tree species.

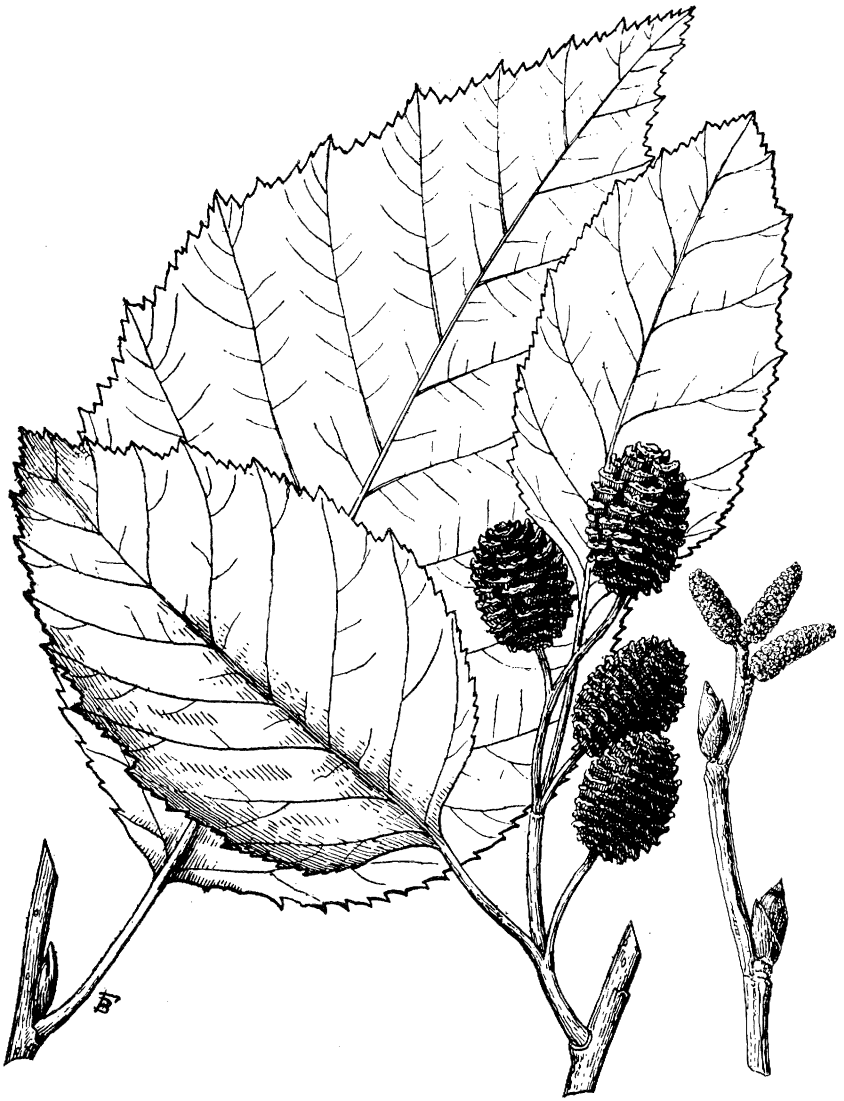
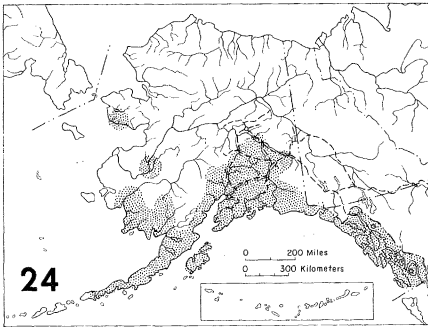


Figure 24.—Sitka alder (*Alnus sinuata*), natural size. Winter twig with buds of male catkins at right.



Yukon birch, the hybrid between resin birch and paper birch (*Betula glandulosa* × *papyrifera*; *Betula* × *eastwoodiae* Sarg., *B.* × *comixta* Sarg., *B. occidentalis* auth.), is the common hybrid birch through interior Alaska, for

example, at Fairbanks. Often found near treeline, where birch trees below meet a band of resin birch shrubs above. Large, spreading clump-forming shrub 10-12 ft. (3-3.7 m.) high, with many stems 1 in. (2.5 cm.) in diameter, sometimes becoming a small tree 15-20 ft. (4.5-6 m.) high and 3-6 in. (7.5-15 cm.) in diameter. Leaves with slender petioles $\frac{1}{4}$ - $\frac{3}{8}$ in. (6-10 mm.) long. Leaf blades elliptic to diamond-shaped, 1-1 $\frac{1}{4}$ in. (2.5-3 cm.) long, $\frac{3}{4}$ -1 $\frac{1}{4}$ in. (2-3 cm.) wide, short-pointed or rounded at both ends, with rounded teeth on edges, thick, becoming hairless. Twigs often densely covered with gland dots. Bark reddish black, smooth and not peeling. Fruits conelike $\frac{3}{4}$ in. (2 cm.) long. Alaska, Yukon Territory, and Alberta.

The hybrid between dwarf arctic birch and paper birch has been named **Horne birch** (*Betula nana* × *papyrifera*; *Betula* × *hornei* Butler, *B.* × *beeniana* A. Nels.).

The tree parent in central Alaska is Alaska paper birch and in southern Alaska, Kenai birch.

ALDER (*Alnus*)

Alaska has 4 kinds of alders, all of which reach tree size. They are treated here as separate species, though 2 intergrade and have been united as varieties of same species. Alders are easily recognized by their smooth gray bark with horizontal lines (lenticels) and the clusters of 3-9 slender-stalked old dead, hard, blackish or dark brown conelike elliptic fruits generally present. Male flowers in narrow catkins, 3 above a scale, composed of 4 sepals and usually 4 stamens. Female catkins short, about $\frac{1}{2}$ in. (12 mm.) long; flowers 2 above a scale, composed of ovary and 2 styles. Alder roots, like those of legumes, often have root nodules, swellings that fix nitrogen from the air and enrich the soil.

Key to the Alaska Species

- A. Leaves dark green above, dull, not sticky when young, edges with short-pointed teeth; stalks shorter than conelike fruits; nutlets with 2 narrow wings or none; winter buds of 3 exposed scales meeting at edges.
 - B. Leaves thick with edges curled under slightly, with rusty hairs along veins beneath; conelike fruits $\frac{1}{2}$ -1 in. (12-25 mm.) long; nutlets with 2 narrow wings ----- 25. red alder (*Alnus rubra*)
 - BB. Leaves thin with edges flat, finely hairy or nearly hairless beneath; conelike fruits $\frac{3}{8}$ - $\frac{5}{8}$ in. (10-15 mm.) long; nutlets almost wingless ----- 26. thinleaf alder (*Alnus tenuifolia*)
 - AA. Leaves yellow green above, shiny on both sides and especially beneath, sticky when young, edges with relatively long-pointed teeth; stalks about as long as conelike fruits; nutlets with 2 broad wings; winter buds of overlapping scales.
 - C. Leaves wavy lobed on edges; conelike fruits $\frac{1}{2}$ - $\frac{3}{4}$ in. (12-20 mm.) long; shrub or small tree of southern and southeast Alaska ----- 24. Sitka alder (*Alnus sinuata*)
 - CC. Leaves not lobed on edges; conelike fruits $\frac{3}{8}$ - $\frac{5}{8}$ in. (10-15 mm.) long; shrub of interior Alaska, rarely a tree ----- 24.1. American green alder (*Alnus crispa*)

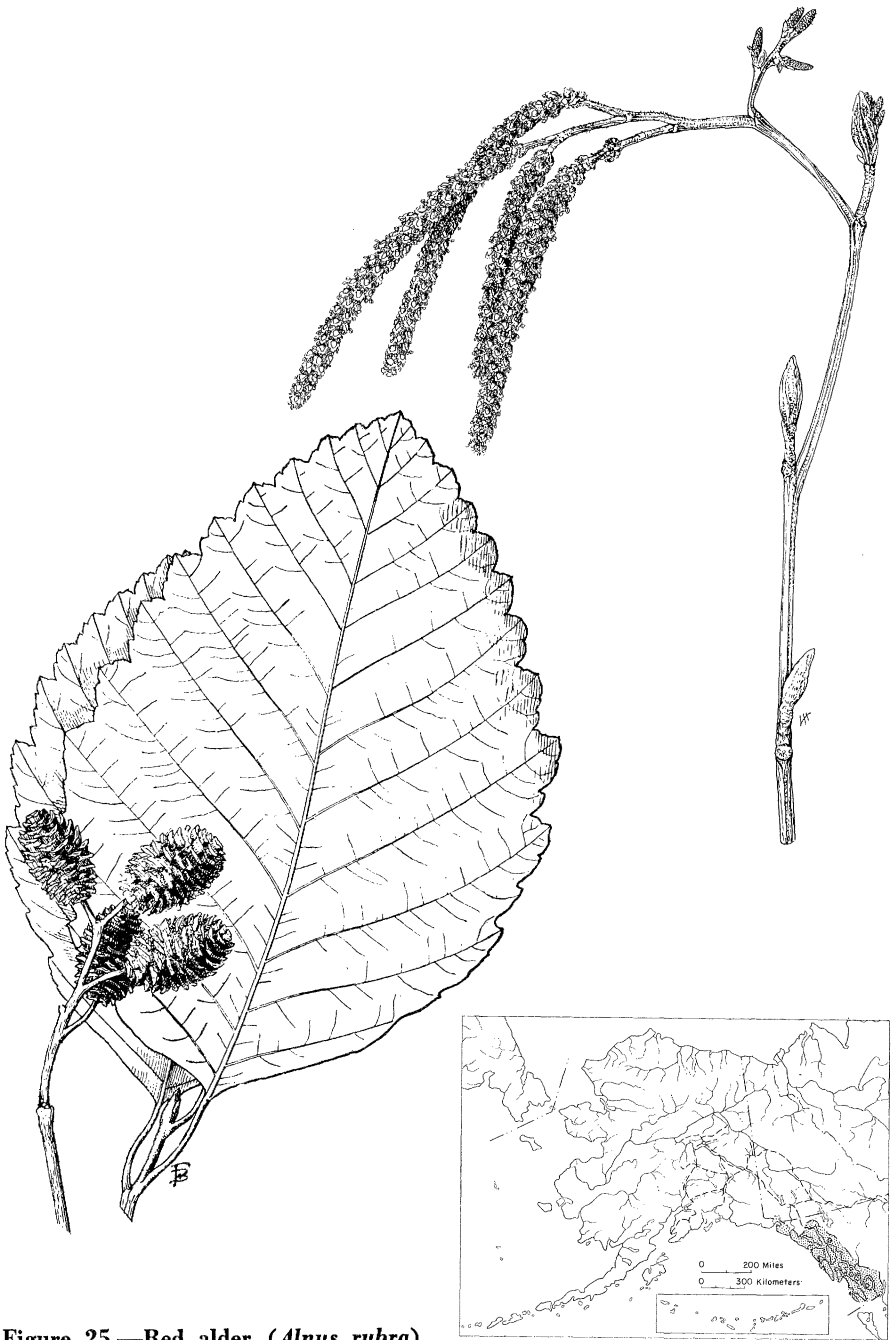


Figure 25.—Red alder (*Alnus rubra*), natural size. Male and female catkins at upper right.

24. SITKA ALDER

(*Alnus sinuata* (Reg.) Rydb.)

Other names: *Alnus crispa* (Ait.) Pursh ssp. *sinuata* (Reg.) Hult., *A. fruticosa* Rupr. var. *sinuata* (Reg.) Hult., *A. sitchensis* (Reg.) Sarg.

Deciduous shrub 5–15 ft. (1.5–4.5 m.) high or a small tree to 30 ft. (9 m.) tall and 8 in. (20 cm.) in trunk diameter. Leaf blades ovate, 2½–5 in. (6–12.5 cm.) long, 1½–3 in. (4–7.5 cm.) wide, short-pointed, rounded at base, shallowly wavy lobed and doubly toothed with long-pointed teeth of 2 sizes, sticky when young, speckled yellow green and shiny above, beneath lighter, shiny, and hairless or nearly so; petioles ½–¾ in. (12–20 mm.) long. Twigs sticky, finely hairy, and orange brown when young, becoming light gray. Winter buds short-stalked to stalkless on young twigs, to ½ in. (12 mm.) long, of overlapping scales. Bark gray to light gray, smooth and thin.

Male flowers in narrow catkins 3–5 in. (7.5–12.5 cm.) long. Fruits ½–¾ in. (12–20 mm.) long, on long slender spreading stalks ⅜–¾ in. (10–20 mm.) long, nutlets elliptic, with 2 broad wings. Flowering in May–June.

Sitka alder often is a spreading shrub, common to abundant, with many stems, forming thickets in marshes, along streams, on landslides, and in clearings, from sea level to the alpine zone above the timberline. It also becomes a small tree, often with many trunks.

This pioneer species follows disturbances such as landslides, logging, or glacial retreat. It requires mineral soil seedbed and develops rapidly on moist sites but grows on soils too sterile for other

trees. Sitka spruce often becomes established at the same time. Alder acts as a nurse tree, improving soil conditions, and adding organic matter and nitrogen. It thrives with overhead light but is intolerant of shade and disappears from the stand when overtopped by Sitka spruce. Being smaller and hence more quickly overtopped, Sitka alder is probably not such a serious competitor as red alder on logged areas. The wood produces good fuel and is used for smoking fish.

Southeast and southern Alaska along the Pacific coast. Throughout southeast Alaska northwest to head of Lynn Canal at Skagway and Yakutat Bay, west along coast to Afognak and Kodiak Islands, Alaska Peninsula, and eastern Aleutian Islands. Also local in western Alaska on Bering Sea (Nushagak and Nome). South Tongass, North Tongass, and Chugach National Forests, Glacier Bay and Katmai National Monuments, Kenai National Moose Range, Kodiak Island and Aleutian Islands National Wildlife Refuges. Alaska and Yukon Territory southeast to southwestern Alberta, western Montana, and northern California. Also in northeastern Asia.

Intergrades with American green alder (*Alnus crispa* (Ait.) Pursh), especially northward in interior, and often treated as a variety or subspecies of that species. Sitka alder reaches larger size than American green alder, becoming a small tree, and has mostly larger leaves with margins wavy lobed as well as toothed, also larger, longer stalked cones.

24.1. American green alder (*Alnus crispa* (Ait.) Pursh). A spreading deciduous shrub 3–13 ft. (1–4 m.) tall, near Fairbanks, rarely a small tree to 20 ft. (6 m.) high and 4 in. (10 cm.) in trunk

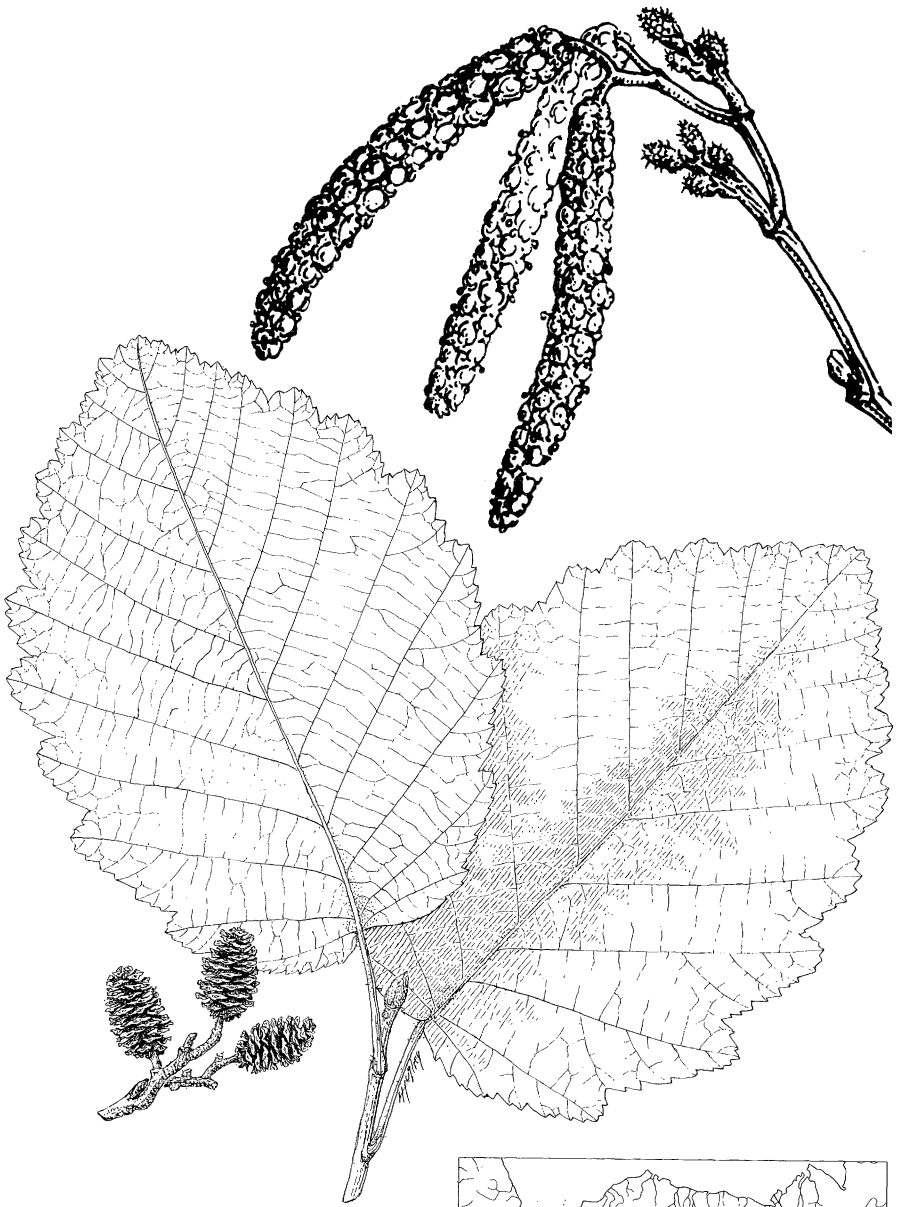
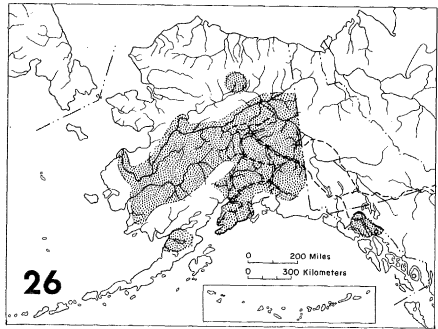


Figure 26.—Thinleaf alder (*Alnus tenuifolia*), natural size. Male and female catkins at upper right.



diameter. **Leaf blades** ovate or broadly elliptic, mostly $1\frac{1}{2}$ -3 in. (4-7.5 cm.) long, 1-2 in. (2.5-5 cm.) wide, relatively thick, short-pointed, rounded or broadly wedge-shaped at base, edges sharply and finely toothed and not lobed, slightly sticky resinous, shiny yellow green above, and tufts of whitish hairs in vein angles beneath. **Male flowers** in narrow catkins $\frac{3}{4}$ -3 in. (2-7.5 cm.) long. **Fruits** conelike, $\frac{3}{8}$ - $\frac{5}{8}$ in. (10-15 mm.) long, on slender stalks of $\frac{1}{4}$ - $\frac{1}{2}$ in. (6-12 mm.). Common and widely distributed in interior of central and northern Alaska. Also Yukon Territory across Canada to Labrador, Newfoundland, and Greenland, south to North Carolina, Michigan, and Oregon and across northern Asia. Intergrades with Sitka alder (*Alnus sinuata* (Reg.) Rydb.), which has been treated also as a variety or subspecies.

25. RED ALDER

(*Alnus rubra* Bong.)

Other names: western alder; *Alnus oregona* Nutt.

Small to medium-sized deciduous tree 20-40 ft. (6-12 m.) tall, with straight trunk 4-16 in. (10-40 cm.) in diameter. **Leaf blades** ovate or elliptic, 3-5 in. (7.5-12.5 cm.) long, $1\frac{3}{4}$ -3 in. (4.5-7.5 cm.) wide, short-pointed at both ends, shallow wavy lobed and doubly toothed with both large and small teeth, thick, edges curled under slightly, dark green and nearly hairless above, beneath pale with rusty hairs along veins; petioles $\frac{1}{4}$ - $\frac{3}{4}$ in. (6-20 mm.) long. Twigs hairy when young, becoming dark red with light dots. **Winter buds** stalked, to $\frac{3}{8}$ in. (1 cm.) long, dark red. **Bark** gray, spotted with white, smooth or becoming

slightly scaly, thin. **Wood** nearly white when freshly cut, soon turning to light reddish brown, fine-textured, moderately lightweight, soft.

Male flowers in narrow catkins 3-6 in. (7.5-15 cm.) long. **Fruits** on short stalks $\frac{1}{4}$ - $\frac{1}{2}$ in. (6-12 mm.) conelike, $\frac{1}{2}$ -1 in. (12-25 mm.) long; nutlets elliptic, with 2 narrow wings. Flowering in April-May.

Red alder is common throughout southeast Alaska on stream bottoms with rich, rocky, moist soils and along beaches where creeks enter the sea. On landslides it forms almost impenetrable thickets, often with Sitka alder.

Red alder is a pioneer species on mineral soil, thriving on moist sites. It is common below 1,000 feet elevation and absent at higher elevations, where Sitka alder is frequent. Being larger, red alder is more competitive and requires more time for overtopping. Both species come in along roadsides and where ground is disturbed after logging. They are a problem in road maintenance, requiring continual clearing of shoulders and side slopes. Seeds of both species are produced within five years and being tiny are blown great distances.

Of little economic importance in Alaska at present, red alder is the leading hardwood southward in the Pacific Northwest, where it is a larger tree and is made into furniture. The wood is used also in smoking meat and fish and for wood carving.

Throughout southeast Alaska northwest to Yakutat Bay. South Tongass and North Tongass National Forests, Glacier Bay National Monument. Pacific coast region from southeast Alaska southeast to southern California; also locally east to northern Idaho.



26. THINLEAF ALDER

(*Alnus tenuifolia* Nutt.)

Other names: *Alnus incana* (L.) Moench ssp. *tenuifolia* (Nutt.) Breitung, *A. incana* ssp. *rugosa* var. *occidentalis* (Dippel) C. L. Hitchc.

Deciduous large shrub or small tree 15–30 ft. (4.5–9 m.) high, commonly forming clumps with trunks to 8 in. (20 cm.) in diameter. Leaf blades ovate or elliptic,

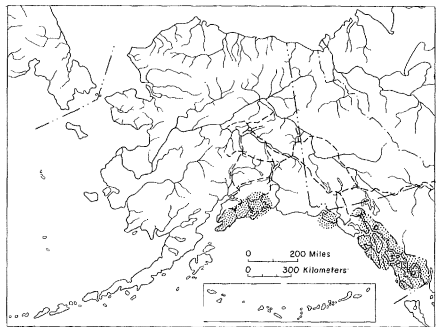


Figure 27.—Oregon crab apple (*Malus diversifolia*), natural size. Winter twigs at right.

2-6 in. (5-15 cm.) long, $1\frac{1}{4}$ - $2\frac{1}{2}$ in. (3-6 cm.) wide, short-pointed, rounded at base, shallowly wavy lobed and doubly toothed with both large and small teeth, thin, dark green and becoming hairless above, beneath pale green and hairy or nearly hairless; petioles $\frac{1}{4}$ -1 in. (6-25 mm.) long. **Twigs** reddish and hairy when young, becoming gray. **Bark** gray to dark gray, smooth, becoming reddish gray, thin and scaly. **Wood** light brown.

Male flowers in narrow catkins $1\frac{1}{2}$ -3 in. (4-7.5 cm.) long. **Fruits** on short stalks less than $\frac{1}{4}$ in. (6 mm.) long, conelike $\frac{3}{8}$ - $\frac{5}{8}$ in. (1-1.5 cm.) long; nutlets elliptic, almost wingless. Flowering in May-June.

Large trunks have been cut for poles. The wood is used for smoking salmon. Thinleaf alder with the larger willows commonly forms thickets along streams in central and southern Alaska. Interior Alaska from Yukon River Valley south to base of Alaska Peninsula at Katmai, Kenai Peninsula, and Copper River Valley. Also north end of southeast Alaska from vicinity of Juneau to Glacier Bay. North Tongass and Chugach National Forests. Glacier Bay and Katmai National Monuments. Alaska and Yukon Territory southeast to southwestern Saskatchewan and south in mountains to New Mexico and California.

By some authors this alder of western North America is treated as a variety or subspecies of European speckled alder (*Alnus incana* (L.) Moench), of Eurasia. It is closely related also to speckled alder (*A. rugosa* (Du Roi) Spreng.), of eastern Canada and Northeastern United States, which also has been united with the Old World species.

ROSE FAMILY

(Rosaceae)

The rose family (Rosaceae) is well represented in Alaska by 22 species and 10 genera of woody plants among the State's 65 native species. Distinguishing characters are as follows: (1) leaves alternate, simple or pinnately or palmately compound, with paired stipules; (2) flowers regular, often large and showy or small and many, with cuplike base, 5 sepals mostly persistent, 5 petals mostly white or less commonly pink, purple, or yellow, many stamens, and usually 1 pistil with 2-5-celled ovary (often inferior) and 2-5 styles (sometimes many simple pistils); and (3) fruit variable, like an apple (pome) or plum (drupe), aggregate of many 1-seeded fruits ("berry"), or many separate fruits. Numerous wild and cultivated fruits and ornamental plants belong to this family. Several native genera produce fruits edible to mankind as well as wildlife, for example, serviceberry (*Amelanchier*), crab apple (*Malus*), raspberry (*Rubus*), and strawberry (*Fragaria*). Others, such as mountain-ash (*Sorbus*), mountain-avens (*Dryas*), and spiraea (*Spiraea*) are ornamentals. Rose (*Rosa*) is both ornamental and edible, rose hips being a good source of vitamin C.

Four native species of the rose family and another naturalized species become small trees in Alaska. All belong to the apple sub-family and have juicy or mealy fruits resembling small apples. These species are western serviceberry (*Amelanchier alnifolia*), Oregon crab apple (*Malus diversifolia*), Greene mountain-ash (*Sorbus scopulina*), Sitka mountain-ash (*Sorbus sitchensis*), and the naturalized European mountain-ash (*Sorbus aucuparia*).

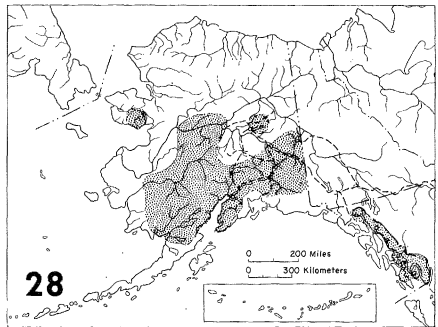


Figure 28.—Greene mountain-ash (*Sorbus scopulina*), one-half natural size. Winter twig at right.

27. OREGON CRAB APPLE (*Malus diversifolia* (Bong.) Roem.)

Other names: western crab apple, wild crab apple, *Malus fusca* (Raf.) Schneid., *M. rivularis* (Dougl.) Roem., *Pyrus diversifolia* Bong., *Pyrus fusca* Raf.

Deciduous small tree to 25 ft. (7.5 m.) high, with usually several trunks to 5 in. (12.5 cm.) in diameter, much branched, or a shrub forming thickets. **Leaves** with slender petioles 1–2 in. (2.5–5 cm.) long, ovate, elliptic, or lance-shaped, 1½–4 in. (4–10 cm.) long, short-pointed, sharply toothed and sometimes slightly 3-lobed toward apex, shiny green and becoming hairless above, beneath pale and usually slightly hairy. **Twigs** hairy when young, becoming red and shiny and later brown or gray, the side twigs or



spurs short and spinelike. **Winter buds** very small, 1/16 in. (1.5 mm.) long, rounded, brown, composed of many scales. **Bark** gray, smooth to slightly scaly, thin. **Wood** light brown, heavy, hard, fine-textured.

Flower clusters (cymes) with slender stalks bearing several to many **flowers** ¾ in (2 cm.) broad, composed of 5 pointed hairy sepals, 5 rounded white or pink petals, 20 stamens, and pistil with inferior 2–4-celled ovary and 2–4 styles. **Fruit** oblong, like a small apple (pome), ½–¾ in. (12–20 mm.) long, yellow or red, with thin sour flesh and 2–4 papery lined

cells, each with 1 or 2 large seeds. Flowering in June, fruit maturing August–October.

Where the trees are sufficiently large, the wood is suitable for tool handles. It is also used for smoking salmon but less commonly than alder wood. The crab apples were eaten by the Indians and are used in jellies and preserves.

Commonly a shrub forming thickets or a slow-growing small tree scattered to plentiful on beach meadow and muskeg fringes, river bottoms, low slopes, and heavy wet soils along the Pacific coast of southeast and southern Alaska. From southern end north to Haines and Skagway at Lynn Canal, also at Yakutat and from Prince William Sound southwest to end of Kenai Peninsula. South Tongass, North Tongass, and Chugach National Forests. Alaska and southward near coast to Washington, Oregon, and northwestern California.

MOUNTAIN-ASH (*Sorbus*)

Deciduous shrubs and small trees with stout twigs and large buds with overlapping scales. Leaves alternate, with paired stipules attached to petiole, pinnate with 7–17 toothed leaflets paired except at end. **Flower clusters** (corymbs) terminal, much branched, showy. **Flowers** many, small, white, composed of calyx of 5 triangle persistent sepals, 5 white mostly rounded petals, 15–20 stamens, and pistil with inferior 2–5-celled ovary, 2 ovules in each cell, and 2–5 styles. **Fruits** like a small red apple (pome) with calyx at apex, 2–4 celled with 1–2 flattened seeds in each cell. Alaska has 3 native species, 2 of which become small trees, and 1 introduced and naturalized tree species.

Key to the Alaska Tree Species

Leaflets mostly 11–15, oblong, short-pointed, edges toothed nearly to base.

Leaflets becoming hairless; shrub or rarely small tree
..... 28. Greene mountain-ash (*Sorbus scopulina*)

Leaflets white-hairy beneath; naturalized tree
..... 28.1. European mountain-ash (*Sorbus aucuparia*)

Leaflets mostly 9 or 11, elliptic, rounded or short-pointed at apex, edges not toothed in lowest third

..... 29. Sitka mountain-ash (*Sorbus sitchensis*)

28. GREENE MOUNTAIN-ASH

(*Sorbus scopulina* Greene)

Other names: western mountain-ash; *Sorbus alaskana* G. N. Jones not Hollick, *S. andersonii* G. N. Jones, *Pyrus scopulina* (Greene) Longyear.

Deciduous shrub 3–13 ft. (1–4 m.) high, rarely becoming a small

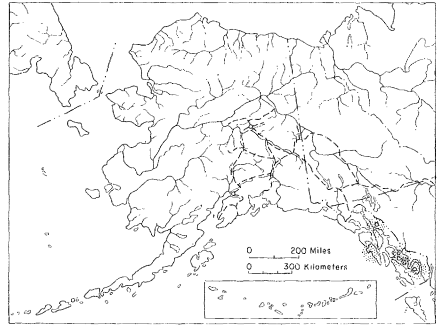
tree to 20 ft. (6 m.) high and 4 in. (10 cm.) d.b.h. Leaves pinnate, 4–9 in. (10–23 cm.) long, with paired, very narrow hairless stipules $\frac{1}{4}$ – $\frac{3}{8}$ in. (6–10 mm.) long. Leaflets 11–15, stalkless, oblong-lanceolate, $1\frac{1}{4}$ – $2\frac{1}{2}$ in. (3–6 cm.) long and $\frac{3}{8}$ – $\frac{3}{4}$ in. (1–2 cm.) wide, unequal and rounded at base, short- or long-pointed at apex, edges sharply toothed almost to base, becoming hairless,



Figure 28.1.—European mountain-ash (*Sorbus aucuparia*), one-half natural size. Fruits at upper left; winter twigs at right.

above shiny dark green, beneath slightly paler. Twigs with whitish hairs when young, with scattered elliptic dots (lenticels). Buds conical, dark reddish brown, inner scales with whitish hairs. Bark gray, smooth.

Flower clusters (corymbs) terminal, rounded, $1\frac{1}{4}$ –3 in. (3–7.5 cm.) broad, bearing on whitish hairy stalks many fragrant flowers $\frac{3}{8}$ in. (1 cm.) across, composed of 5 minute triangular sepals, 5 elliptic petals $\frac{3}{16}$ in. (5 mm.) long, many stamens, and pistil with inferior hairy 3–4-celled ovary and 3–4 styles. **Fruits** fewer than 25, like a small apple (pome), round, less than $\frac{3}{8}$ in. (10 mm.) in diameter, bright shiny red, bitter, with few elliptic brown seeds more than $\frac{1}{8}$ in. (3 mm.) long, persistent in winter. Flowering June–July, fruiting in July.



Openings and clearings in forests. Central interior Alaska from central Yukon River and Bering Sea south to Katmai, southern, and southeast Alaska. South Tongass, North Tongass, and Chugach National Forests, Katmai National Monument. Alaska and British Columbia southeast to Alberta, South Dakota, New Mexico, and California.

This shrubby species was observed at Haines as a small tree 20 ft. (6 m.) high and can be added to Alaska's list of trees.

28.1. EUROPEAN MOUNTAIN-ASH

(*Sorbus aucuparia* L.)

Other name: Rowan-tree.

Deciduous small to medium tree planted as an ornamental in southeast Alaska and sparingly naturalized, 20–40 ft. (6–12 m.) tall and 1 ft. (30 cm.) in trunk diameter, with symmetrical rounded crown. **Leaves** pinnate, 4–8 in. (10–20 cm.) long, with paired 3-angled stipules. Leaflets 9–17, oblong or lance-shaped, 1–2 in. (2.5–5 cm.) long, short-pointed, with edges coarsely toothed except near unequal rounded base, dull green and becoming hairless above, pale and white-hairy beneath. Young twigs and **winter buds** densely white-hairy or woolly, winter buds conical, $\frac{3}{16}$ – $\frac{3}{8}$ in. (5–10 mm.) long. **Bark** dark gray, smooth, with horizontal lines (lenticels), aromatic.

Flower clusters (corymbs) terminal rounded, 4–6 in. (10–15 cm.) across, bearing 75–100 flowers on densely white-hairy stalks. **Flowers** $\frac{3}{8}$ in. (10 mm.) across, composed of 5 triangular white-hairy sepals, 5 white rounded petals $\frac{3}{16}$ in. (4 mm.) long, many stamens, and pistil with inferior hairy ovary and 3–4 styles. **Fruits** many, like a small apple (pome), round, $\frac{3}{8}$ in. (10 mm.) in diameter, bright red; seeds elliptic, light brown, $\frac{3}{16}$ in. (4 mm.) long. Fruits maturing in August–September.

Planted as an ornamental tree at Wrangell, Ketchikan, Craig, Sitka, Juneau, and other towns along the coast of southeast Alaska, where it spreads rapidly from cultivation. Sparingly naturalized along roads and forming thickets. The fruits persist into late fall and early winter and provide food for birds, such as cross-bills, grosbeaks, and cedar wax-

wings, which probably spread the seeds. Numerous crows can be seen eating the fruits in trees of southeastern towns also.

Not a true ash, European mountain-ash is the only introduced or exotic tree to become established in Alaska and grow as if wild. Its specific name, meaning to catch birds, refers to the use of the mucilaginous fruits by fowlers in making birdlime.

Naturalized in southeast Alaska. Native of Europe and Asia but widely planted and naturalized in many places across Canada and northern contiguous United States.

29. SITKA MOUNTAIN-ASH

(*Sorbus sitchensis* Roem.)

Other names: western mountain-ash, Pacific mountain-ash.

Deciduous shrub 4–8 ft. (1.2–2.5 m.) high, or a small tree to 15–20 ft. (4.5–6 m.) high and 6 in. (15 cm.) in trunk diameter, with handsome, round-topped head. In rocky alpine situations at higher altitudes it is a low shrub often only 1–2 ft. (30–61 cm.) high. **Leaves** pinnate, 4–8 in. (10–20 cm.) long, with paired narrow rusty-hairy stipules. Leaflets usually 9 or 11 (sometimes 7 to 13), elliptic or oblong, $1\frac{1}{4}$ – $2\frac{1}{2}$ in. (3–6 cm.) long, rounded or blunt-pointed at apex, with edges coarsely and sharply toothed above the middle, dull blue green and hairless above, pale and hairless or nearly so beneath. **Twigs** stout, rusty hairy when young, becoming gray, with few elliptic dots (lenticels), with odor and bitter taste of cherry. **Buds** oblong, to $\frac{1}{2}$ in. (12 mm.) long, reddish brown, densely rusty hairy. **Bark** gray, smooth. **Wood** pale brown, lightweight, fine-textured.

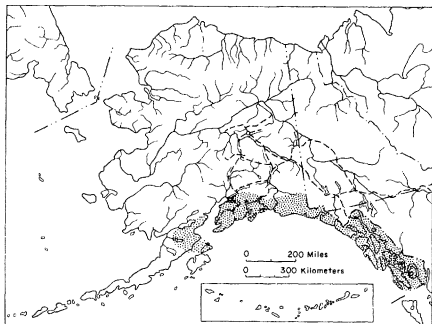
Flower clusters (corymbs) terminal, rounded, 2–4 in. (5–10 cm.)



Figure 29.—Sitka mountain-ash (*Sorbus sitchensis*), one-half natural size. Fruits at upper left; winter twig at upper right.

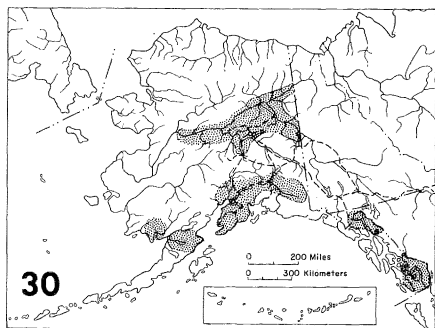
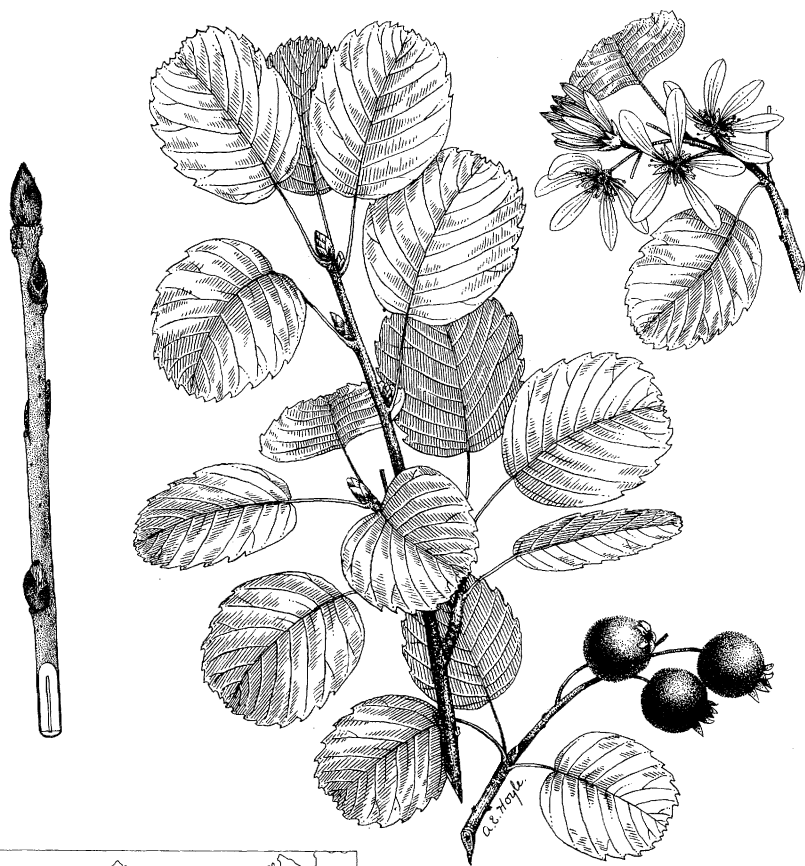
across, bearing 15–60 flowers on rusty-hairy stalks. Flowers small, $\frac{1}{4}$ in. (6 mm.) across fragrant, composed of 5 broadly triangular hairless sepals, 5 white rounded petals $\frac{1}{4}$ in. (5 mm.) long, many stamens, and pistil with inferior hairy ovary and 3–4 styles. Fruits several to many, like a small apple (pome), round, $\frac{3}{8}$ – $\frac{1}{2}$ in. (10–12 mm.) in diameter, red but becoming orange and purple, with few elliptic brown seeds $\frac{1}{8}$ in. (3 mm.) long. Flowering June–August, fruits maturing in August–September.

Uncommon to rare in forests from sea level to timberline, Pacific coast of southeast and southern Alaska. Throughout southeast Alaska from Ketchikan and Hyder north to head of Lynn Canal at Skagway, west along coast to Glacier Bay, Yakutat, Prince Wil-



liam Sound, Cook Inlet, Katmai Region at base of Alaska Peninsula, and Afognak and Kodiak Islands. South Tongass, North Tongass, and Chugach National Forests. Glacier Bay and Katmai National Monuments. Kenai National Moose Range. Alaska southeast along coast to southern British Columbia and in mountains to Washington, central California, Nevada, and northwestern Montana. Reported from Yukon.

Often cultivated as an ornamental north to Anchorage but with less regular form than European mountain-ash. Birds eat the fruits. Sitka mountain-ash is named for Sitka, Alaska, where it was discovered. Hybrids with Greene mountain-ash (*Sorbus scopulina* Greene) are reported.



30. WESTERN SERVICEBERRY

(*Amelanchier alnifolia*
(Nutt.) Nutt.)

Other names: saskatoon serviceberry, northwestern serviceberry, Pacific serviceberry; *Amelanchier florida* Lindl.

Figure 30.—Western serviceberry (*Amelanchier alnifolia*), one-half natural size. Winter twig at left.

Deciduous shrub or small tree to 16 ft. (5 m.) high and 5 in. (12.5 cm.) in trunk diameter. Leaves elliptic or nearly round, $\frac{3}{4}$ –2 in. (2–5 cm.) long, $\frac{5}{8}$ –1 $\frac{1}{4}$ in. (1.5–3 cm.) wide, rounded at both ends with teeth toward apex, above dark green and hairless or nearly so, and beneath paler and often hairy when young, petioles slender, $\frac{3}{8}$ –1 in. (1–2.5 cm.) long. Young twigs reddish brown, becoming hairless. Winter buds narrow, purplish, of several scales. Bark gray or brown, thin, smooth or slightly fissured. Wood light brown, heavy, hard, fine-textured.



Figure 31.—Douglas maple (*Acer glabrum* var. *douglasii*), one-half natural size. Winter twigs at left.

rounded, $\frac{3}{8}$ – $\frac{5}{8}$ in. (1–1.5 cm.) in diameter, purple or nearly black and covered with a bloom, with calyx at apex, sweet, juicy, and edible, with several elliptic flattened brown seeds about $\frac{3}{16}$ in. (5 mm.) long. Flowering June–July, fruiting July–September.

The fruits are eaten fresh or prepared in puddings, pies, and muffins. The dried berries are used like raisins and currants. Birds are fond of the fruits. Listed as suitable for ornamental planting for the white flowers and attractive fruits, spreading freely and forming thickets.

Uncommon in forests and openings, Pacific coast of southeast and southern Alaska in four separate areas: Extreme southeast-

Flower clusters (racemes) $1\frac{1}{4}$ – $2\frac{1}{2}$ in. (3–6 cm.) long, terminal, appearing with or before the leaves. **Flowers** 5–15, fragrant, $\frac{1}{2}$ –1 in. (1.2–2.5 cm.) wide, composed of calyx of 5 narrow lobes, often densely woolly when young, 5 white oblong petals $\frac{3}{8}$ – $\frac{5}{8}$ in. (1–1.5 cm.) long, about 20 short stamens, and pistil with inferior hairy 5-celled ovary and 5 styles. **Fruit** like an apple (pome)

ern Alaska north to Wrangell; from Taku River to Haines and Skagway at head of Lynn Canal; Kenai Peninsula and Cook Inlet area; and base of Alaska Peninsula to Wood River Lakes area north of Dillingham. Northward in interior along Chitina and Copper Rivers, also along Tanana and central Yukon Rivers as far west as Galena. South Tongass, North Tongass, and Chugach National Forests, Katmai National Monument, Kenai National Moose Range. Alaska and Yukon Territory east to western Ontario and Minnesota, south to Iowa, Colorado, and northwestern California.

The serviceberries of Alaska are perhaps best treated as belonging to a single species, though 2 were distinguished in some references including "Alaska Trees and Shrubs."

MAPLE FAMILY (Aceraceae)

The maple family composed of deciduous trees is represented in Alaska by Douglas maple in the southeast part. Maples have the following characteristics for recognition: (1) leaves paired (opposite), long-stalked, broad, 3-lobed or 5-lobed and toothed; (2) flowers male and female on the same or different trees, small, in clusters appearing with the leaves; and (3) fruits, distinctive paired winged, 1-seeded keys. In winter the paired (opposite) U-shaped leaf-scars aid in recognition.

31. DOUGLAS MAPLE

(*Acer glabrum* Torr. var. *douglasii* (Hook.) Dipp.)

Other names: dwarf maple, Douglas Rocky Mountain maple; *Acer glabrum* ssp. *douglasii* (Hook.) Wesmael, *A. douglasii* Hook.; variety of Rocky Mountain maple, *A. glabrum* Torr.

Deciduous small tree of south-east Alaska becoming 20-30 ft. (6-9 m.) tall and 6-12 in. (15-30 cm.) in trunk diameter but often a several-stemmed shrub 4-6 ft. (1.2-1.8 m.) high. Leaves paired (opposite), ovate, 2-4 in. (5-10 cm.) long and broad, slightly heart-shaped at base, shallowly 3-lobed with the lobes long-pointed, deeply, sharply, and irregularly or doubly toothed, hairless, shiny dark green above, pale beneath with yellowish veins, Petioles 1½-4 in. (4-10 cm.) long, slender, reddish tinged. Twigs paired (opposite), reddish, hairless, with U-shaped leaf scars. Winter buds short-pointed ⅛-¼ in. (3-6 mm.) long, dark red, the side buds paired (opposite). Bark gray, smooth. Wood light brown, heavy, hard, fine-textured.

Flower clusters (corymbs) terminal, appearing with the leaves, with several flowers on slender spreading or drooping stalks. Flowers mostly male and female on different trees (dioecious), about ⅛ in. (3 mm.) long, composed of 4 narrow yellow green sepals as long as the narrow yellow green petals, 7-8 stamens, and in female flowers very short stamens and pistil with 2-celled ovary and 2 styles. Fruit of paired, winged, 1-seeded keys (samaras) ¾-1 in. (2-2.5 cm.) long, usually red until shed, then turning to light brown. Flowering in May, fruit maturing July-August.

Common along shores in south-east Alaska, sometimes fringing tidal meadows or bogs. Occasional in rich moist soils on forested slopes. The trees are seldom large enough for commercial purposes.

Southeast Alaska, common along the coast north to the head of Lynn Canal at Skagway. South Tongass and North Tongass National Forests. Southeast Alaska, southeast to western and southern British Columbia, southern Al-

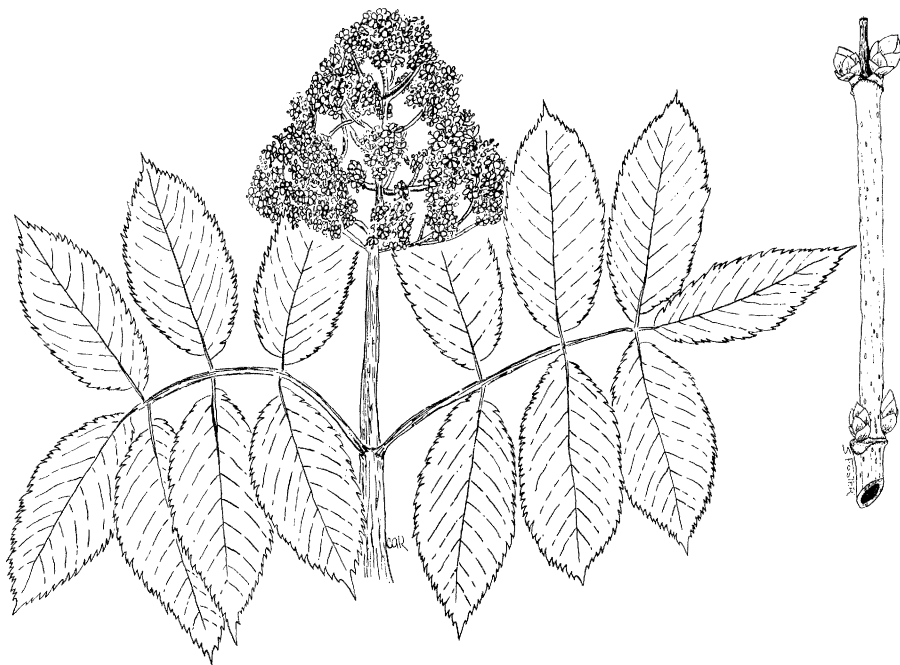
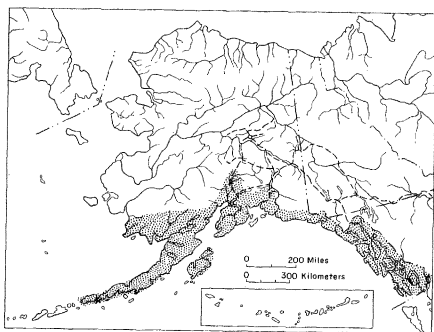


Figure 32.—Pacific red elder (*Sambucus callicarpa*), one-half natural size. Winter twig at right.



berta, western Montana, and northwestern Wyoming, and west to Idaho, Washington, and Oregon. Rocky Mountain maple (*Acer glabrum* Torr., including this and other varieties) extends southward to northwestern Nebraska and in mountains to southern New Mexico and southern California.

Douglas maple is the only member of the maple family (Aceraceae) native in Alaska. Named for its discoverer, David Douglas (1798–1834), Scotch botanical explorer.

HONEYSUCKLE FAMILY (Caprifoliaceae)

Deciduous or evergreen shrubs, sometimes small trees, woody vines, and herbs. Leaves opposite, simple or pinnately compound, without stipules (present in *Sambucus*). Flowers mostly small, regular or irregular, composed of calyx of 4–5 teeth, tubular corolla with 4–5 lobes, 4–5 stamens inserted on tube and alternate with lobes, and pistil with inferior ovary of 2–5 cells and usually 1 ovule in each and 1 style or none. Fruit mostly a berry or berrylike drupe. Five genera in Alaska, each with a single native species.

32. PACIFIC RED ELDER (*Sambucus callicarpa* Greene)

Other names: scarlet elder, red-

berry elder, stinking elder, elder-berry; *Sambucus racemosa* L. var. *arborescens* (Torr. & Gray) Gray.

Deciduous clump-forming shrub 6-12 ft. (2-3.5 m.) high, sometimes large and treelike, with several stems to 2-4 in. (5-10 cm.) d.b.h., rarely a small tree to 20 ft. (6 m.) high and 5 in. (12.5 cm.) d.b.h. **Leaves** opposite, compound, pinnate, 5-10 in. (12.5-25 cm.) long, with small narrow stipules about $\frac{1}{8}$ in. (3 mm.) long soon shedding and leaving ring scar on twig, with unpleasant odor, Leaflets 5 or 7, paired except at end, short-stalked. Blades lanceolate or elliptic, 2-5 in. (5-12.5 cm.) long and 1-2 in. (2.5-5 cm.) wide, long-pointed at apex and short-pointed and often unequal at base, finely and sharply toothed on edges, thin, above green and nearly hairless, beneath paler and hairy. **Twigs** stout, finely hairy when young, gray, with raised brown dots (lenticels), with rings at nodes. **Buds** paired, large, egg-shaped, $\frac{1}{4}$ - $\frac{1}{2}$ in. (6-12 mm.) long, gray, covered by several slightly hairy overlapping scales often persistent around twig. **Bark** light to dark gray or brown, smoothish, becoming cracked or furrowed into small scaly or shaggy plates. Pith thick, whitish on youngest twigs, becoming deep yellow-orange or brown. **Wood** soft, whitish.

Flower clusters (compound cymes) terminal, erect, longer than broad, 2-4 in. (5-10 cm.) long and $1\frac{1}{2}$ -2 in. (4-5 cm.) wide, with many small whitish flowers with unpleasant odor, turning brown on drying. **Flower** composed of minute 5-toothed calyx, white spreading 5-lobed corolla $\frac{3}{16}$ - $\frac{1}{4}$ in. (5-6 mm.) across, 5 stamens inserted at base of corolla and alternate with lobes, and pistil with inferior 3-celled ovary with 1 ovule in each cell, short style,

and 3 stigmas. **Fruit** many berry-like drupes about $\frac{3}{16}$ in. (5 mm.) in diameter with calyx persistent at apex, bright red or scarlet, sometimes orange, containing 3 1-seeded poisonous nutlets. Flowering May-July, fruit maturing July-August.

Elders are easily detected by a strong odor when leaves or stems are crushed. The red fruits are classed as not edible, at least when raw, but are sometimes made into wine. They are eaten by some birds, especially robins and thrushes. The "seeds" (nutlets) are reported to be poisonous, causing diarrhea and vomiting. Plants can be grown as ornamentals but in the interior only in moist situations.

Common locally in moist soil, especially open areas and recently cutover land in coastal forests. Unimak Island in Aleutians, and Pacific coast regions of southwestern, southern, and southeast Alaska. Chugach, North Tongass, and South Tongass National Forests, Katmai and Glacier Bay National Monuments, Kenai National Moose Range, Kodiak and Aleutian Islands National Wildlife Refuges. Pacific coast region from southwest Alaska southeast to western Oregon and mountains of central and southern California.

This elder is added here to the list of native trees in Alaska, rarely reaching the minimum size. Small trees were observed to 20 ft. in height and 5 in. in trunk diameter at Meyers Chuck on Cleveland Peninsula northwest of Ketchikan. Southward in the Pacific States heights of 25-30 ft. and trunk diameters to 1 ft. have been recorded.

The plants of northwestern North America from Alaska to California have been treated also as a variety of European red elder (*S. racemosa* L.)

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