

trees and forests of Jasper National Park



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The forests of Jasper are probably the park's least appreciated asset. Trees are such a commonplace feature of our everyday environment that it's easy to take them for granted. This is especially true in the mountain parks where forests are usually perceived only as a background to the more spectacular towering peaks, tranquil lakes, crashing cataracts, timid deer, and brazen mountain sheep. But it's the forests, in large part, that make possible clear, clean water and diversity of wildlife. By preventing soil erosion, forests protect the mountain watersheds that are the source of water not only for campgrounds in the parks but for cities and towns right across the prairies; and they provide both food and shelter for many species of wildlife, some of which are threatened by encroaching humanity. Trees also play a complex role in the life of forest communities comprised of microorganisms, insects, birds, small animals, and many forms of plant life, most of which live out their life cycles within the confines of the forest.

Not least of all the forests provide a pleasant habitat for park visitors themselves. Many people are drawn to the mountain parks by the opportunity to enjoy solitude, scenic splendor, and contact with nature. The forests are instrumental in providing all of these experiences. What would Jasper National Park be like without green-clad mountain slopes, trails shaded and scented by lodgepole pine, and subalpine fir mirrored in a peaceful lake?

If up to now the forests have been only a green blur seen from your car window, this booklet will show you that it isn't as difficult to tell a lodgepole pine from a subalpine fir as you might have thought. Tree descriptions and a simple foliage key help you to distinguish between species, photographs illustrate the major forest zones, and maps show you the location of tree stops where you can leisurely identify individual trees. Many species can be seen right within Jasper townsite. The Canadian Forestry Service hopes that this booklet will encourage you to see both the forests *and* the trees of Jasper National Park.



The icy sweet water in this tumbling mountain stream is a product of the forest.

Though few things may appear as serene and unchanging as a forest, in reality it is the scene of constant and dynamic change. Not unlike the gradual rise, decay, and fall of a human empire, the forest slowly evolves as one type of vegetation gradually supplants another, only to possibly lose dominance to yet another species. This gradual change is called forest succession, the result of constant competition, like warring nations, for sunlight, moisture, and nutrients. Although to our eyes the forests seem the same on each visit to the park, if David Thompson again trekked through the Pyramid-Edith lakes area it would be obvious to him that the Douglas-fir forests he had seen in 1811 have been largely replaced by lodgepole pine and trembling aspen. Today there are only a few scattered stands of Douglas-fir, some with individual trees up to 450 years old.

Occasionally the pace of change is dramatically quickened by major disturbances such as fire or avalanche which kill the existing vegetation. The first species which begin growing on newly cleared areas are aptly called the "pioneer" species, and plants are said to "colonize" an area. Pioneer tree species whose propagation is encouraged by fire include lodgepole pine, black spruce, trembling aspen, and white birch. White and Engelmann spruce, subalpine fir, and Douglas-fir, however, are eliminated from forest stands by fire. Usually the change in a forest is gradual and subtle, requiring 200 years or more for completion. In this case species such as white and Englemann spruce and subalpine fir, which can grow and reproduce in the shade, are favored over the pioneer species. The process of forest succession, whether it occurs rapidly or almost imperceptibly, reflects the growth and reproductive characteristics of the tree species themselves.

Successional changes also affect the presence and abundance of herbs, grasses, and shrubs, which in turn have an effect on animal populations. In general, forests in an early stage of succession provide ample food for a wide range of bird and animal species. As trees mature this lesser vegetation is shaded out. On the other hand, mature forests provide protection against predators and heavy snowfall. The optimum conditions for most wildlife appear to be a variety of tree species and a range of forest communities from young to old.

Three vegetation zones can be distinguished within Jasper: montane, subalpine, and alpine. These can be described as horizontal belts around a mountain or along a mountain range. The character of each zone is determined by factors such as climate, soil, elevation, moisture, and exposure. Over the years certain kinds of trees have adapted to each zone. Although each zone is distinct its boundaries are irregular because of local differences that occur in valleys, along streams, and on different-facing mountain slopes. For example, south-facing slopes which receive more sunlight are warmer and drier than north-facing slopes at the same elevation. As a result, trees which require a warm, dry site can exist on these slopes at higher elevations than usual. Conversely, trees which usually grow at higher elevations may appear lower down the mountain along moist, cool stream banks. Along the edges of the zones mixing of many species is common. The alpine zone is treeless.



Contemplative mountain sheep at home in the montane grasslands



(A) Alpine zone, (B) subalpine forest on upper mountain slopes, and (C) montane forest on lower south-facing slopes and valley bottom

Montane zone

The montane zone, with an upper elevation of about 4500 feet (1400 m), extends along the Yellowhead Highway within the Athabasca Valley between Rocky River and Jasper townsites. It is generally warmer and drier than the rest of the park, but includes a range of sites from hot, dry dunes and valley benches to cool, wet bottom lands beside the Athabasca River. Grasslands are interspersed with trees throughout most of this zone.

Douglas-fir and lodgepole pine are characteristic of the montane forest. The large **Douglas-fir** growing here are relics of the days two centuries ago when pure stands of the species dominated the landscape. Today they are found in scattered stands usually mixed with an understory (a lower layer of trees) of large lodgepole pine or trembling aspen, species whose regeneration has been fostered by past ground fires, or in open parklike stands on grassy south-facing slopes. This is the northernmost point in Alberta at which Douglas-fir can survive, and therefore it is particularly susceptible to environmental stress. Over the past 200 years climatic change, heavy browsing by deer and elk, and fires ignited by man have severely limited Douglas-fir regeneration. Unless conditions alter so as to encourage new growth, it appears that Douglas-fir will eventually disappear and be replaced by lodgepole pine, trembling aspen, or grasses.

Lodgepole pine stands, which grow best on upland sites, are normally dense and contain trees of uniform size because they usually originate within a few years after a forest fire. Most stands are pure, but trembling aspen or white spruce may be found in some. **Trembling aspen** grows on sites ranging from dry gravels to wetlands, but does best in well-drained areas. Although seed is produced in abundance most aspen stands originate as suckers from the roots of parent trees destroyed by fire. Large stands of trembling aspen are rare. This species more commonly occurs in clumps scattered along the forest fringe and throughout the grasslands. **Balsam poplar** and **black cottonwood** occur in this zone in localized areas where there is more moisture, typically near streams and lakes. In Jasper these two species occur as scattered individuals or in very small groups.

White birch, which is favored by fire, is found as individual trees or small clumps on well-drained north-facing slopes, frequently mixed with lodgepole pine or white spruce. The single trees originate from seed, and the clumps from stump sprouts produced by the parent tree.



Montane forest of Douglas-fir and lodgepole pine,
Yellowhead Highway near Jasper townsite



Grasslands, trembling aspen, and white spruce,
Athabasca Valley

In stands where lodgepole pine or trembling aspen is the sole pioneering tree species, **white spruce** may seed in and form an understory of smaller trees. Over the next 100 years or so the shade-tolerant spruce will gradually assume dominance and the sun-loving pine and aspen, unable to reproduce in the shade, will die out.

Unexpected in the montane zone are the stands of pure white spruce massed along the Yellowhead Highway from the East Gate to the Snaring River. White spruce grows here on both dry and, surprisingly, wet sites. Pure stands such as these are actually more characteristic of the boreal forest which lies east of the park.

In the slow march of forest succession some trees such as lodgepole pine may gradually invade the grasslands, reducing the amount of grass available to the elk and bighorn sheep which forage here in the winter. Normally chinook winds keep deep snow from accumulating on these grassy lower hillsides located along the Athabasca River, allowing the animals to paw for feed. However, in winters with extremely high snowfall, elk have been forced out of the valley into nearby forests where, for lack of suitable browse, they have eaten the bark on larger trembling aspen. Watch for the characteristic black scars on aspen trunks as you drive south on the Icefields Parkway.

Subalpine zone

Most of the vegetation in Jasper National Park is subalpine forest. This zone can be subdivided into upper and lower forest communities based on elevation and tree species differences. The lower extends between 4500 and 6000 feet (1400-1800 m) and the upper reaches beyond 6000 feet to tree line at approximately 7000 feet (2100 m). Engelmann-white spruce hybrids, black spruce, and lodgepole pine typify the lower subalpine, while Engelmann spruce and subalpine fir characterize the upper area.

In contrast to lodgepole pine, mature **Engelmann spruce** stands are usually more open and contain the full range of stem sizes from small seedlings to monarch-sized trees over 120 feet (36 m) tall. A dense understory of varying-sized **subalpine fir** is also characteristic. In very old stands subalpine fir may become the dominant species. In the lower subalpine zone centuries of interbreeding between white and Englemann spruce have produced **hybrids** which display cone and needle characteristics intermediate to the two species. The pure forms of either spruce occur at an extreme of each species' range: white spruce in the valleys of the montane zone, and Engelmann spruce near tree line in the subalpine zone.

The abundance of **lodgepole pine** is closely related to past forest fires. Only fire produces sufficient heat (45°C) to melt the resin bond and release the seed held in the large number of closed cones that persist on the tree for many years. Along the Icefields Parkway slower-growing **black**



Subalpine forest of Engelmann-white spruce hybrids,
Mt. Edith Cavell Road

spruce of approximately the same age form a dense understory in lodgepole pine stands. Like mature lodgepole pine, black spruce disperse large quantities of seed from closed and partially open cones following crown fires. Small pockets of pure black spruce also occur in and around swampy areas.

A rare tree of the subalpine forest is the **whitebark pine**. It does not grow in large stands, only as individual trees near tree line. It grows well on moist, deep soils, but is reduced to a dwarfed, twisted shrub on thin soils, rocky ledges, and windswept cliffs. Another rare tree is the **tamarack**, which isn't even supposed to occur in either the subalpine or montane forests. This intruder from the boreal forest is found only in a small patch along the Miette Hot Springs Road.

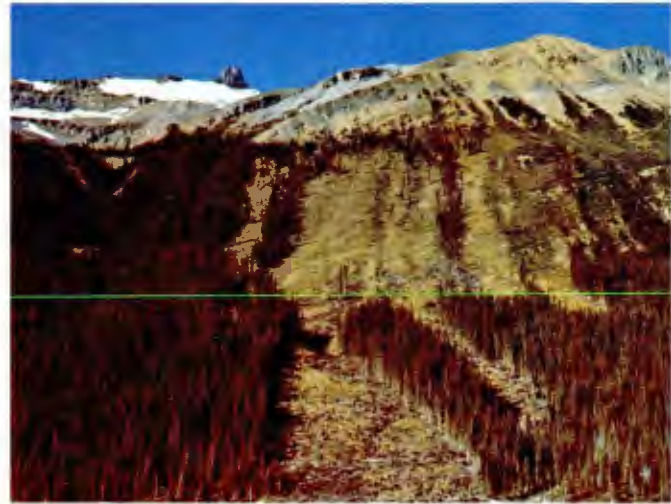
The pattern of irregular shapes and colors of forest communities noticeable on mountainsides is a result of old forest-fire activity. Fires seldom kill every tree in an area. Many escape and may be seen as islands surrounded by new growth. A good example is the darker blue-green patches of old spruce-subalpine fir which stand out against the lighter green of neighboring lodgepole pine. Frequently, old trunks or snags project above the new growth while beneath these new trees may be a tangle of fallen trunks commonly called *brulé*.

The vertical treeless swaths on some mountainsides are avalanche runs where snow thundering down steep slopes has swept away the trees which lay in its path. The conspicuous light green color is due to the ground cover of alpine vegetation which is left unharmed by the avalanche. Willow and mountain alder are usually the first woody species to grow again on the treeless slopes. Recurrent avalanches will stunt and twist these hardy shrubs and prevent trees from reestablishing. However, if there are no further snowslides trees will slowly reinvade and replace the devastated forest.

In your travels throughout the park watch for signs of these and other changes in the forest brought about by flooding, landslides, or windfall.



Subalpine forest of lodgepole pine, Maligne Lake.
Note fire-killed trees (snags) from previous stand.



Avalanche runs

[illegible]

For location of tree stops see center map.

Douglas-fir

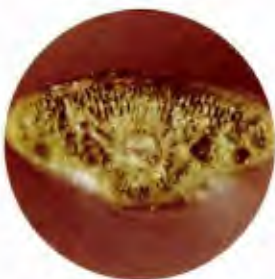
Pseudotsuga menziesii var. *glauca* (Beissn.) Franco



From your car window the dark green-blue foliage of the Douglas-fir stands out in sharp contrast to the brown grasses, particularly in the open parklike stands located on the steep slopes north of Jasper townsite. Watch for the layered, columnar, often flat-topped crown, deeply furrowed thick bark, and gentle sweep of the lower trunk on individual large trees. This tree species, which grows here under dry conditions, is also called Interior or Blue Douglas-fir and is a smaller form of the majestic giants common to the wet coastal forests of British Columbia.



Needles are 3/4 to 1-1/4 inches long, often sharply pointed, and attached to the twig by very short stalks which remain on the needles when they are pulled off the twig. Terminal buds are sharply pointed and nonresinous (not sticky).



Needles which are flat in cross section and difficult to roll between thumb and forefinger distinguish Douglas-fir and subalpine fir from the spruces, whose needles are four-sided in cross section and easily rolled.



Cones, which hang downward, are oval and 2 to 4 inches in length with a unique three-pronged bract protruding from each cone scale.

Subalpine Fir

Abies lasiocarpa (Hook.) Nutt.



The narrow, spirelike crowns of subalpine fir can be seen silhouetted against the sky at high elevations. The bark is smooth and gray, differentiating subalpine fir from Engelmann spruce, which has rough bark with large brownish scales. A close look reveals the presence of conspicuous raised resin blisters on the bark. Subalpine fir is a favorite for seed-eating squirrels which tear open the clusters of large cones held erect on the branches.



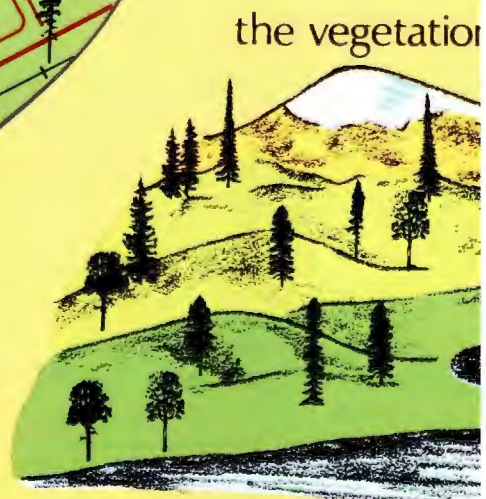
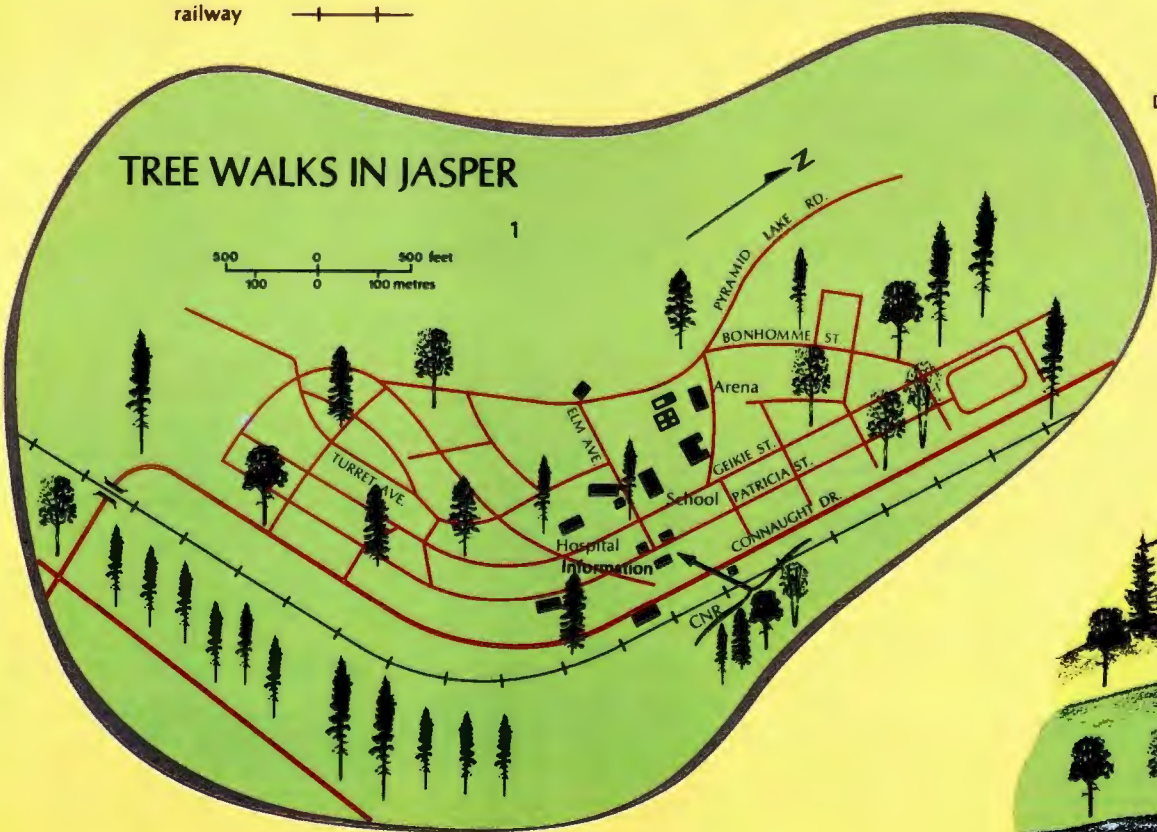
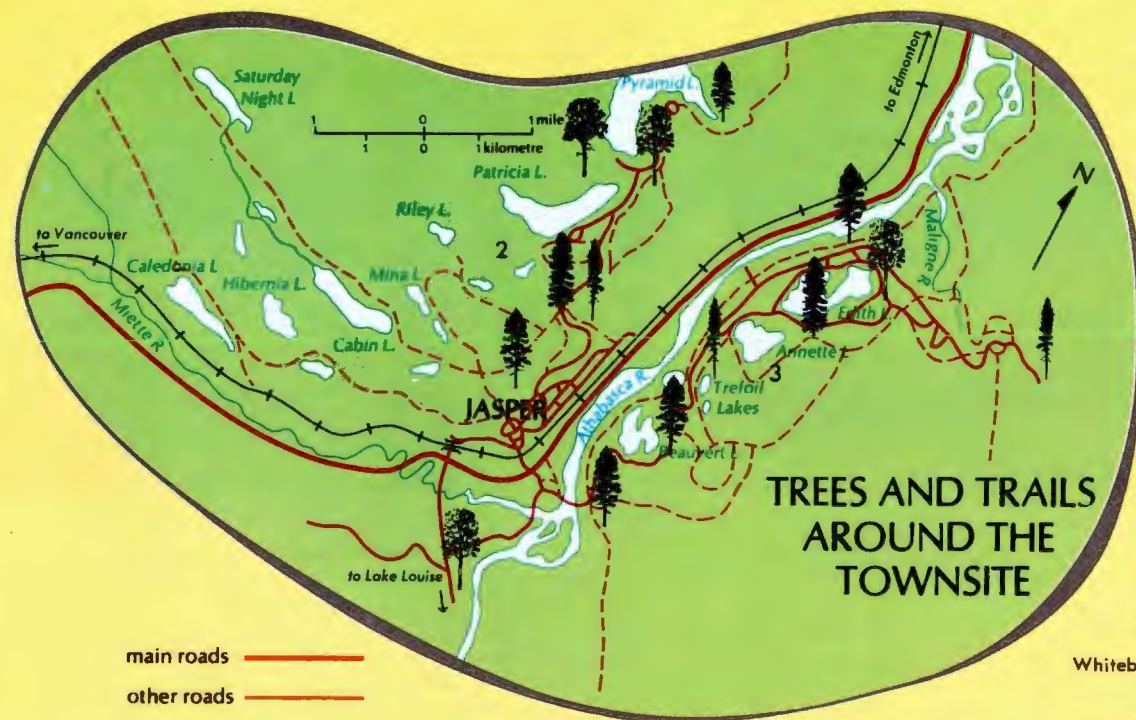
Needles are 1 to 1-3/4 inches in length, rounded or notched at the tip. Terminal buds are rounded and resinous.



Unlike the spruces, subalpine fir and Douglas-fir needleless twigs are smooth with only small circular scars marking the point where the needles were attached.



Deep purple cones measure 2-1/2 to 4 inches long. In August they disintegrate, leaving a central core which persists as a prominent spike until the following summer.



Engelmann Spruce

Picea engelmannii Parry



The crown of Engelmann spruce is similar to white spruce but slimmer and spirelike. Branches either dead or alive extend well down the trunk. Positive identification of spruces is impossible at a distance because of hybridization. Cones are the key to determining whether a spruce is white, Engelmann, or a hybrid. If cones are not available on the tree look for them on the ground. Crushed needles of Engelmann spruce have a distinctive pungent odor which once experienced can be a useful identifying feature.



Needles are about 3/4 inch long, slightly curved, and with a strong tendency to point towards the upper side and end of the twig.



Needles on the spruces are four-sided in cross section and easily rolled between thumb and forefinger.



Cones are cylindrical, 1 to 3 inches in length. Open cones are flexible with loose-fitting, finely toothed scales.

White Spruce

Picea glauca (Moench) Voss



White spruce has a uniform dense, conical crown with branches that extend nearly to the ground concealing a tapered trunk with scaly bark, light grayish brown in color. In very dense stands the lower branches die but remain on the tree for years. The lack of cones on white spruce during most of the year helps to differentiate it from black spruce. From late summer through early winter the large yellowish-green-turning-light-brown cones are a useful distinguishing feature. White spruce roots are so pliable that Indians often used them for lacing birch bark on canoes.



Needles are about 3/4 to 1 inch long, straight, and growing more or less at right angles to the twig.



Needles of the spruces are attached singly and spirally to small, woody projections on the twigs. The knobby appearance and rough feel of needleless spruce twigs distinguish them from those of Douglas-fir and subalpine fir.



Cones are cylindrical, about 2 inches long. Open cones, unlike those of Engelmann spruce, are stiff with close-fitting scales whose edges are smooth.

Black Spruce

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



Black spruce can be readily distinguished from either white or Engelmann spruce by its narrow ragged crown, drooping lower branches with upturned tips, and on some trees a distinctive club-shaped top which supports many small cones year-round. The club shape is a result of cone-clipping by squirrels combined with slow branch growth. Black spruce can reproduce by seed or by "layering," which occurs when live branches overgrown by mosses develop roots. The branch then grows upward and develops into a new tree.



Needles are 1/2 inch in length. New shoots are covered by barely visible dense short hairs which make older twigs appear darker.



Cones are small, egg-shaped, about 1 inch long, and clustered at the top of the tree. New cones are purplish. Unlike white and Engelmann spruce which shed cones annually, black spruce retains its cones for many years.



Club top

Tamarack (Larch)

Larix laricina (Du Roi) K. Koch



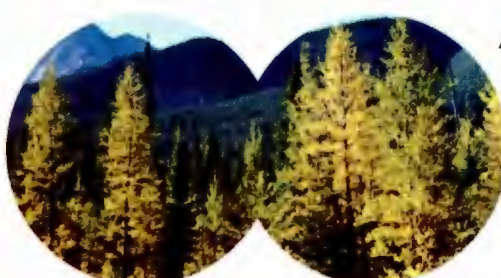
As you drive the Miette Hot Springs Road watch for the distinctive light green of the tamarack foliage standing out against the dark green crowns of the black spruce. In early autumn the needles turn a brilliant yellow and fall off; this is a unique feature of tamarack, which is usually considered along with the spruces and pines as being "evergreen." Tamarack is also unusual because it is one of only two Canadian tree species (the other is birch) which bears some of its foliage in clusters on dwarf branches.



Needles are 1 inch long, soft and flexible, appearing singly on elongated twigs but more commonly in brushlike clusters of 10-20 on dwarf (1/16-inch) twigs. On needleless branches the dwarf twigs are prominent features.



Cones are dark brown, about 1/2 inch long, and shed their seed in late autumn but remain on the tree over winter and throughout the following summer.



Autumn foliage

Lodgepole Pine

Pinus contorta var. *latifolia* Engelm.



This slender-crowned, straight-boled, fast-growing tree is usually found in dense stands where each tree looks like a xerox copy of the first. Watch for the telltale persistent egg-shaped cones which are found in abundance on both living and dead branches in the upper part of the tree. Unlike the spruces the lower half of the bole is usually devoid of branches. In some stands the orangy brown, finely scaled bark is a useful identifying feature. An understory of smaller white or black spruce is common in older stands. Poles from this tree were used by Indians to support their teepees and lodges, hence the name "lodgepole."



Needles occur in clusters of two, 1 to 3 inches long, very sharply pointed, and often spirally twisted. Needle edges are sharply but minutely toothed.



Cones are egg-shaped, 1-1/2 to 3 inches in length. Cone scales are thickened at the tips and usually bear a curved prickle; new cones are produced at the branch tips.



Mature bark

Whitebark Pine

Pinus albicaulis Engelm.



Hidden in its lofty environment among the more plentiful Engelmann spruce and subalpine fir, whitebark pine is difficult to spot, but once found is easily recognized. The candelabrumlike arrangement of the upper branches and bunching of the five-needle clusters towards the tips of the branchlets are useful identifying features. Bark is smooth chalky white on young trees and on the upper branches of older trees. Clark's Nutcracker, a large gray bird with black and white wings, may be seen feeding on seeds obtained from whitebark pine cones.



Needles occur in clusters of five, are 1-1/2 to 3-1/2 inches long, slightly curved, and smooth-edged.



Cones are egg-shaped to almost globular, 1-1/2 to 3 inches in length. Cone scales are thick with stout, pointed ends but no prickles. On the tree the cones are permanently closed; they fall at maturity and decay to release the seeds.



Clark's Nutcracker

Trembling Aspen

Populus tremuloides Michx.



Trembling aspen commonly occurs in dense stands where the individual trees are slender and graceful with a long, cylindrical, branch-free trunk and a short rounded crown. In contrast to balsam poplar and black cottonwood, the upper trunk of trembling aspen is smooth and the crown finely branched. Open-grown trees have larger crowns extending well down the main stem. A flattened leaf stalk causes the small light-green leaves to flutter in the slightest breeze, hence the descriptive name.



Leaves are nearly circular, about 1-1/2 to 2 inches across with short sharp tips.



Bark on young trees is smooth, varying in color from pale green to almost white. With age the lower trunk becomes gray and furrowed into long flat ridges.



Elk-browsing scars

Balsam Poplar

*Populus
balsamifera* L.

Black Cottonwood

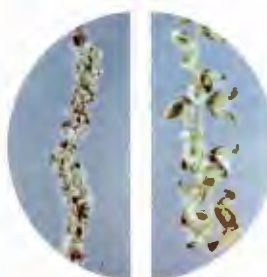
Populus trichocarpa Torr. & Gray



Balsam poplar and black cottonwood are most easily seen growing in the open on moist sites. Mature trees have large crowns with coarse heavy branches which bear the large dark green leaves. Unlike trembling aspen's, mature bark is dark grayish brown, furrowed into flat-topped ridges separated by irregular v-shaped crevices extending well into the crown. Interbreeding is common between poplar and cottonwood, making positive identification difficult except when the fruit pods are newly opened. These poplar commonly reproduce by means of stump sprouts and root suckers.



Leaves are egg-shaped, 3 to 5 inches long with finely toothed margins. Brownish resin blotches may be found on the undersurface. Unlike trembling aspen's the leaf stalk is rounded in cross section, and buds are resinous.



The fruit of the poplars is a catkin made up of numerous individual pods. In early summer the small egg-shaped, hairless pods of balsam poplar (*Right*) break into two parts to release the seed. The pods of black cottonwood (*Left*) are circular, hair-covered, and split into three parts.



Mature bark

White Birch

Betula papyrifera Marsh.



White birch is found as widely scattered individual trees and in the more readily identified multistemmed birch clumps. On large trees the smooth creamy white bark with conspicuous horizontal markings called lenticels and a crown of many ascending branches carrying dull green leaves provide positive identification. This tree is also called Paper Birch because on young trees the outer bark peels off in thin papery layers, and Canoe Birch because Indians used the bark to build their canoes.



Leaves are about 3 inches long, egg-shaped to triangular. Leaf margins are more deeply toothed than poplar leaves, with large teeth alternating with smaller ones. Leaves occur singly or in clusters of two to four on dwarf twigs. Buds are not resinous.



Bark on small trees is a pronounced reddish brown, also with lenticels. Young trees can easily be confused with two similar-appearing shrubs—mountain alder or water birch.



Mature Bark

Common shrubs



Buffalo berry



Mountain alder



Water birch



Willow

Common juniper



Tree features to watch for



Red belt injury near Jasper, April 1974. Rapid changes in air temperature desiccate or freeze the foliage; trees are seldom killed.



Dwarf mistletoe (a parasitic plant) on lodgepole pine



Woodpecker nest in white spruce snag



Fire scar on lodgepole pine

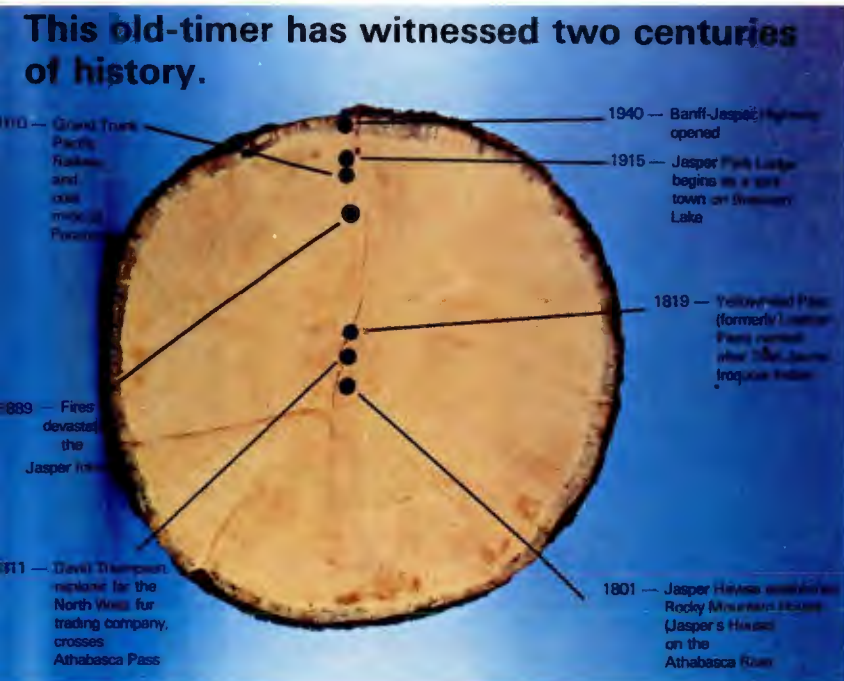


Antler-rubbing scar on lodgepole pine

FOLIAGE



Note: To confirm identification check all features given in the individual tree descriptions.



Credits

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Map drafted by Graphics Production Unit, Environment Canada



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