

# The Ecology of the Sub-Boreal Pine-Spruce Zone

The Sub-Boreal Pine-Spruce Zone is an unique landscape dominated by dry lodgepole pine forests and abundant wetlands. There is little agricultural or urban development in the zone, but forestry and ranching are extensive. Cattle range widely through forests, meadows, and wetlands. Although the zone contains fewer tree species than nearly any other part of British Columbia, the dry forest undergrowth with its dwarf shrubs, low herbs, mosses, and rich collection of lichens is unique within British Columbia.



# Location

The Sub-Boreal Pine–Spruce Zone is located on the high, gently rolling Fraser Plateau and the southernmost Nechako Plateau in the central interior of British Columbia. In the west, it extends onto the leeward lower slopes of the Coast Mountains, as well as the lower slopes of the Itcha and Ilgachuz ranges. Although most of the zone occurs west of the Fraser River in the area known as the Chilcotin, a separate strip occurs east of 100 Mile House. The Sub-Boreal Pine–Spruce Zone lies at elevations of 850–1300 m in the north and as high as 1500 m in southern and western parts. There are no major towns in this zone, but numerous lakes, including Tsacha, Anaheim, Charlotte, Palmer, Stum, McIntosh, and Bonaparte, are located here. The lakes are part of a drainage system that includes the Chilcotin, West Road (or Blackwater), Dean, San Jose, and Bonaparte rivers.



# Ecosystems

The Sub-Boreal Pine–Spruce Zone consists of two principal ecosystems – lodgepole pine forests and wetlands. Lodgepole pine is by far the most common tree species here. In fact, it is the only tree species in many extensive forest stands in the high and very dry southwestern part of the zone. In this area, lodgepole pine not only dominates the forest canopy, it is the only tree species in the understory, which indicates that it is the climax tree species here. This seldom occurs in North America.

Other forest ecosystems, though much less extensive than lodgepole pine forests, add important diversity to the Sub-Boreal Pine–Spruce landscape. Stands of white spruce or hybrid white-Engelmann spruce occur on moist sites throughout the zone, but they are usually small and located primarily around the edges of non-forested wetlands and adjacent to streams. In wetter parts of the zone to the north and east, white spruce is occasionally found in the canopy of mature pine stands. It is also common in the understory. Trembling aspen is a common seral

species throughout the zone, but, like spruce, it usually dominates in small stands, primarily in moist areas such as the borders of wetlands and streams.

Douglas-fir, black spruce, and black cottonwood occur occasionally on specific sites. For example, Douglas-fir grows on some warm, south-facing slopes near the boundary with the Interior Douglas-fir Zone, and black spruce appears in northern parts of the zone in cold valley bottoms and wetlands. The floodplains of some rivers contain stands of black cottonwood.

In the very dry southwestern parts of the zone, the pine forest undergrowth consists largely of kinnikinnick, common juniper, soopolallie, pinegrass, and lichens. On especially dry sites, even pinegrass is often either absent or very sparse, and only kinnikinnick, common juniper, and lichens form the undergrowth.



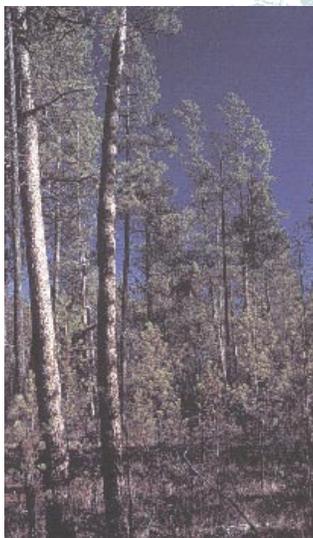
Undergrowth in dryer climate area

Ordeil Steen



F. Boas

Soopolallie  
*Shepherdia canadensis*



Lodgepole pine  
*Pinus contorta*

Ordeil Steen



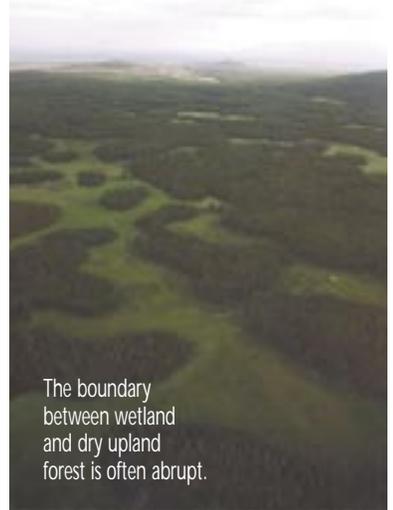
Del Meidinger

Undergrowth in wetter climate area



Del Meidinger

Kinnikinnick – *Arctostaphylos uva-ursi*,  
 pinegrass – *Calamagrostis rubescens*,  
 feathermoss – *Pleurozium schreberi*,  
 and pelt lichen – *Peltigera*



The boundary between wetland and dry upland forest is often abrupt.

Kate Alexander



Mof

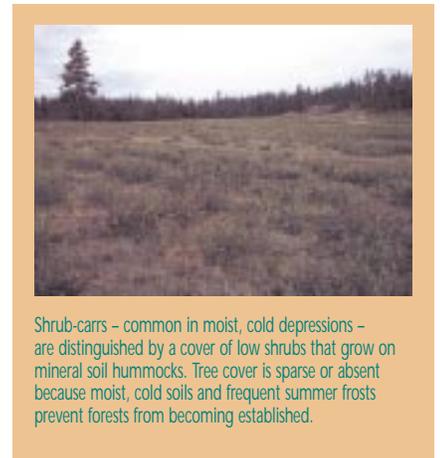
Twinflower  
*Linnaea borealis*

Elsewhere in the zone, where the climate is wetter, mosses (especially red-stemmed feathermoss) rather than lichens cover the soil surface, and there is a wider variety of shrubs and herbs, such as birch-leaved spirea, dwarf blueberry, bunchberry, black twinberry, grey-leaved willow, twinflower, yarrow, and knight's plume.

Small natural grasslands, commonly dominated by needlegrass, occur occasionally on dry, south-facing slopes. Grassy meadows occur in frost pockets that are too cold for trees to grow. Because of its poorly developed drainage systems, the landscape of the Sub-Boreal Pine–Spruce Zone contains abundant wetlands. The most common wetlands are fens and marshes

dominated by sedges and mosses. Most wetlands are devoid of trees, and the boundary between wetland and dry upland forest is often abrupt. In the intervening riparian area, spruce and deciduous forests provide important wildlife habitat. Shrub-carrs are unique wet ecosystems in the Sub-Boreal Pine–Spruce Zone. Vegetation here consists mainly of medium-sized willows and scrub birch as well as drought-tolerant species such as kinnikinnick.

Because of the cold, dry climate, soils of the Sub-Boreal Pine–Spruce Zone are typically thin and weakly developed. Frequent wildfires in the past have also reduced the levels of organic matter in the soils and probably hindered their productivity for tree growth.



Will Mackenzie

Shrub-carrs – common in moist, cold depressions – are distinguished by a cover of low shrubs that grow on mineral soil hummocks. Tree cover is sparse or absent because moist, cold soils and frequent summer frosts prevent forests from becoming established.



Mof

Wildfire in lodgepole pine stand



Pine seedling after fire

Ordbell Steen

## The Wildfire Legacy

In the past, stand-destroying wildfires have swept through forests in this zone on a fairly regular basis, probably on average every 75–125 years. Lodgepole pine trees are highly susceptible to wildfire, but, after a fire, new pine seedlings establish quickly. As a result, few stands in these forests are more than 120 years old, and most consist of dense pine trees, all of the same age. A patchwork of forests of different ages covers the landscape here, and each irregularly shaped patch reflects the extent of a past wildfire, ranging in size from less than a hectare to a few thousand hectares. Following a stand-destroying wildfire, fireweed and grasses occupy the site at first, but soon a dense stand of new trees shades out much of the herbaceous vegetation. As the new stand ages, natural thinning creates openings in the canopy, and the pre-fire vegetation of pinegrass, kinnikinnick, and lichens returns.

# Forest Lichens

Lichens are fungi that have evolved an appetite for algae or cyanobacteria, which they cultivate within themselves. In the Sub-Boreal Pine–Spruce Zone, more than 70 species of lichens intermingle in a complex community interlaced with kinnikinnick, small vascular plants, and a few mosses. Nowhere else in British Columbia are so many lichen species so abundant on the forest floor.

Ground-dwelling lichens have become an integral part of the life history of caribou in this zone. Together with tree-dwelling hair lichens, they form the major part of the caribou's winter diet. Collectively, these lichens allow caribou to survive here.

Illustration: Trevor Goward



F. Boas

Many lichen species depend on older forests that have remained undisturbed for long periods.

Green reindeer lichen  
*Cladina arbuscula* ssp. *mitis*

Dog pelt  
*Peltigera canina*

# The Mountain Pine Beetle Cycle

Mountain pine beetles are always present in pine forests of the Sub-Boreal Pine–Spruce Zone. Their numbers are usually low, especially when cold winters kill most of the over-wintering larvae, and the pine trees are sufficiently vigorous to resist the attacks of the beetle. When winters are warmer and the pine trees are older and less vigorous, the number of beetles can reach epidemic proportions. A mountain pine beetle epidemic in the 1980s killed most pine trees in the forest canopy over thou-



All photos: Canadian Forest Service

Mountain pine beetle  
*Dendroctonus ponderosa*



Pine beetle damage



sands of hectares of the zone. Similar epidemics have probably occurred many times in the past. Natural regeneration of lodgepole pine trees re-establishes a forest of young trees that are less susceptible than the older trees to attack by the mountain pine beetle.

# Wildlife

Relatively few species of birds and mammals inhabit the dry lodgepole pine forests of the Sub-Boreal Pine–Spruce Zone. Red squirrels feed on pine seeds, and birds such as the Boreal Chickadee, Red-breasted Nuthatch, and Brown Creeper eat the insects that live in pine bark. Spruce Grouse feed on needles and buds of the pine trees.



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Red squirrel  
*Tamiasciurus hudsonicus*

Other common birds include Yellow-rumped Warbler, Dark-eyed Junco, and Ruby-crowned Kinglet. The pine forests offer little forage for ungulates. However, in some areas, they provide important winter habitat for populations of northern caribou that depend for food on the lichens that grow on the soil and on the trees. Although aspen forests and mature spruce forests are not common in this zone, they provide cover and food for a relatively large number of insects, birds, and mammals.

Aspen and spruce snags provide important habitats for cavity-nesting birds and mammals. Birds feed on the insects in the wood and on many species of herbs and shrubs that flourish in these forests. Rufous Hummingbird, Red-naped Sapsucker, and Ruffed Grouse occur almost exclusively in the aspen forests.

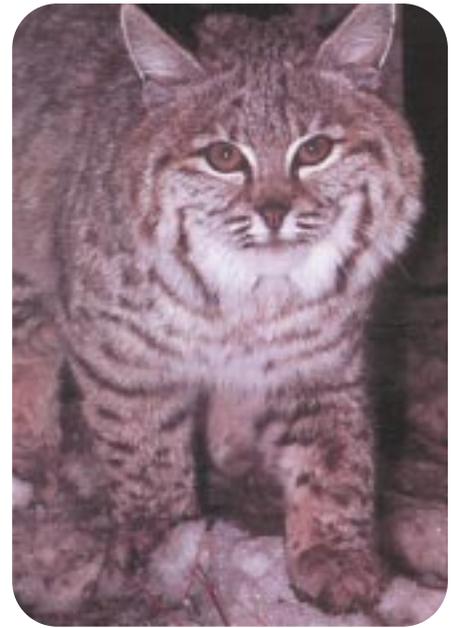
The aspen and spruce forests also provide forage for moose, mule deer, black bear, grizzly bear, and snowshoe hare, and habitat for predators such as grey wolf, coyote, red fox, and lynx.

Wetlands and the adjacent moist meadows are especially important for wildlife. Wetland vegetation provides year-round forage for moose, beaver, and muskrat, plus summer forage for black bear and grizzly bear. Birds and small mammals are abundant and include a wider range of species than on the surrounding dry uplands. Myriad insects swarm over the wetlands and adjacent meadows, making them attractive feeding areas for birds such as Lincoln's



Mark Nyhof

Spruce Grouse  
*Dendragapus canadensis*



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Lynx  
*Lynx canadensis*

Sparrow, Dusky Flycatcher, Marsh Wren, and Common Yellow-throat.

Wetlands also provide habitat for waterbirds such as Sandhill Crane, sandpipers, dabbling and diving ducks, Canada Goose, and loons.



Tom Hall

White Pelican  
*Pelecanus erythrorhynchos*

## Endangered Species

The only nesting colony of White Pelican in British Columbia occurs on Stum Lake in this zone. More than 200 pelicans return each spring from California to nest on islands in this lake and feed in surrounding lakes. The area surrounding this lake has been designated a provincial park.



Stum Lake

Ordiell Steen

## Resources

Due to the cold, dry climate and the past frequency of wildfires, timber productivity in the Sub-Boreal Pine-Spruce Zone is low. However, harvesting is efficient here because the trees are generally small and the terrain is gentle and dry. In recent years, salvage harvesting of trees killed by mountain pine beetle has greatly increased the amount of timber taken from this zone. Cattle grazing is widespread in the zone and relies primarily on wetlands



Ordiell Steen

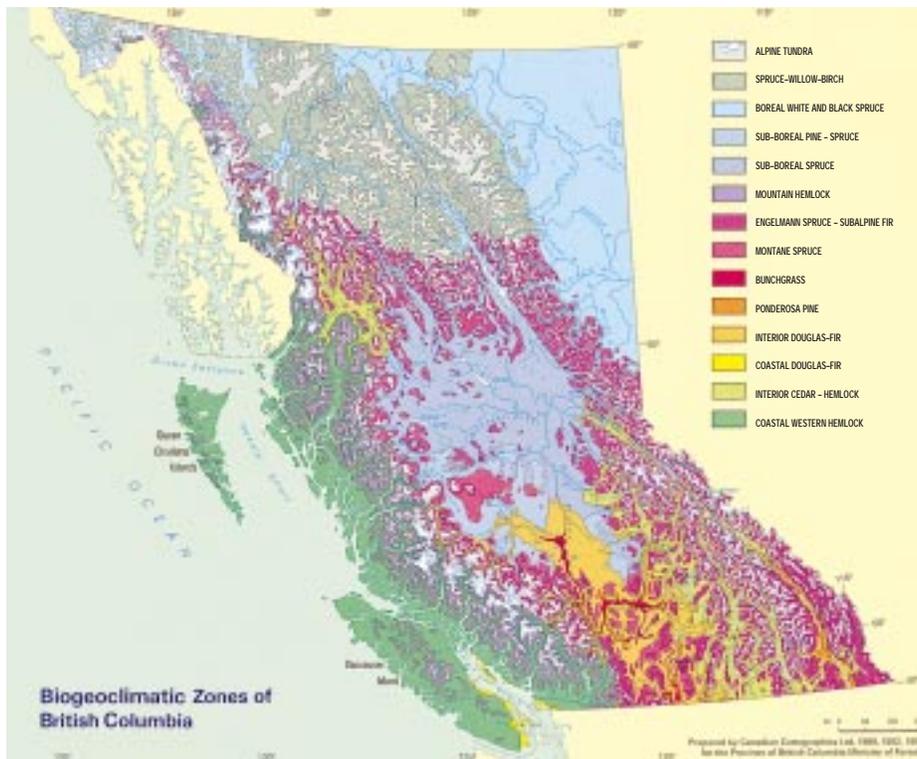
Felled, bunched trees.

and riparian meadows for forage. Ranchers often control the drainage in these areas in order to grow hay for cattle. Fur harvesting in this zone is among the highest in the province.



Feller buncher

MoF



The Sub-Boreal Pine–Spruce Zone is one of fourteen biogeoclimatic or ecological zones within British Columbia. These zones are large geographic areas that share a similar climate within the province. Brochures in this series explore each zone.



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Detail on British Columbia's Biogeoclimatic Zones  
is available in:

Ecosystems of British Columbia  
Special Report Series #6  
D. Meidinger and J. Pojar  
Ministry of Forests Research Branch, Victoria, B.C.

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