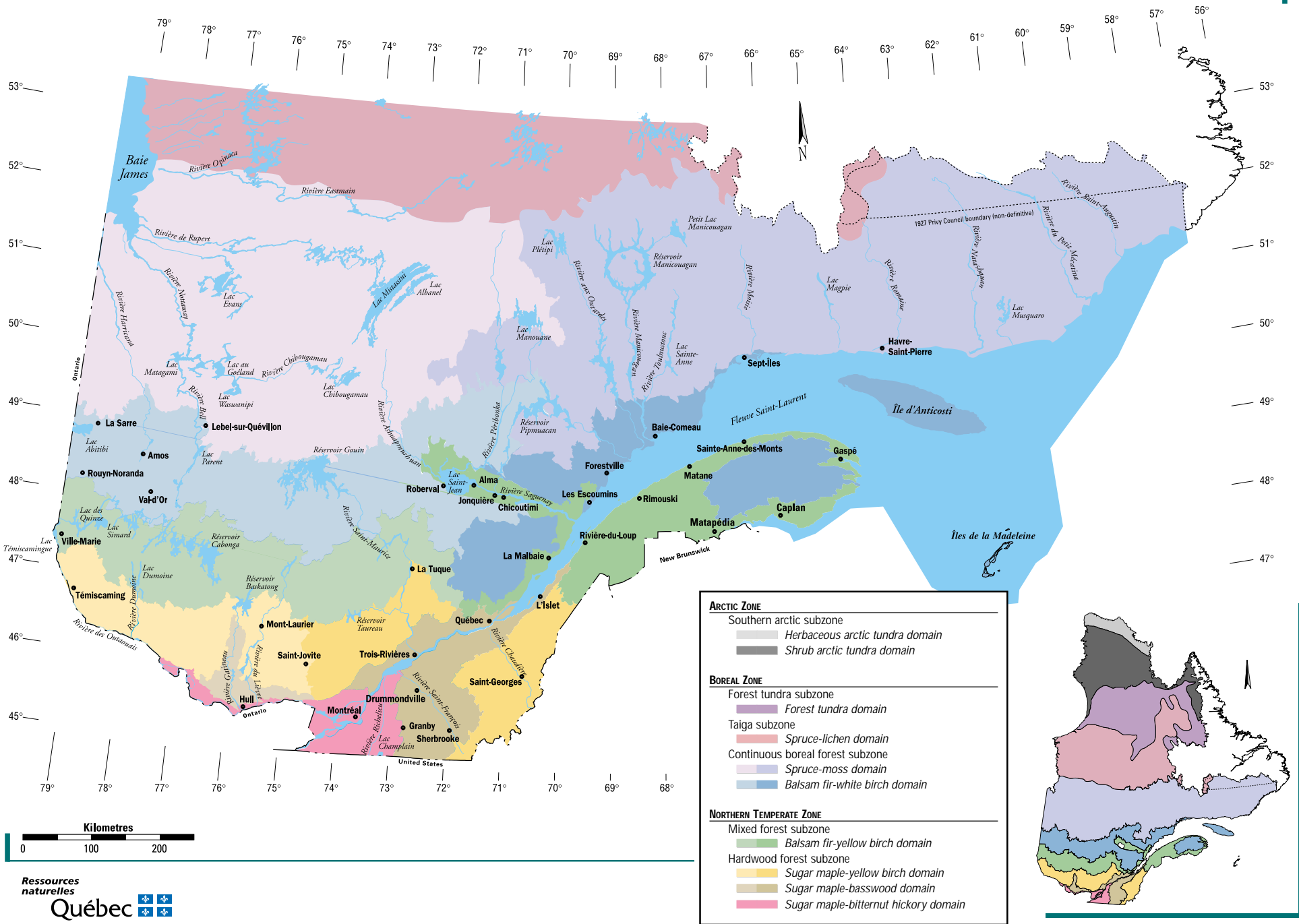


# Vegetation Zones and Bioclimatic Domains in Québec





The distribution of vegetation in Québec is determined mainly by climatic factors, which are generally less favourable the further north one goes. In the St. Lawrence Plain, the climate changes gradually from the southwest to the northeast. In southern Québec, variations in altitude, if significant, can cause changes in vegetation comparable to those occasioned by latitude. Soil type, topography and disturbances such as forest fires, insect epidemics and logging also affect vegetation distribution. These factors determine how plant communities are distributed over the various physical features (hilltops, mid- and lower slopes, etc.) within a given bioclimatic zone.

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Québec

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## VEGETATION ZONES AND SUBZONES

Québec is divided into three vegetation zones, namely the northern temperate zone, dominated by hardwood and mixed stands, the boreal zone, characterized by softwood stands, and the Arctic zone, where the vegetation is mostly made of shrubs and herbaceous plants. These three zones, which reflect Québec's major climatological divisions, harbor their own distinct plant communities. They correspond to world biomes categories.

The vegetation zones are divided into subzones according to the type of vegetation dominating the landscape at the final stage of succession. For example, the northern temperate zone covers two subzones, namely the hardwood forest (northern hardwood stands dominated by sugar maple) and the mixed forest (a mixture of boreal species, such as balsam fir or black spruce, and southern species, such as yellow birch). The mixed forest subzone is slightly less rich in terms of vegetation diversity than the hardwood forest.

The boreal zone includes three subzones: the continuous boreal forest subzone, where relatively dense stands are composed mainly of boreal softwood species and intolerant hardwoods, the taiga, dominated by open softwood forests on a lichen mat, and the forest tundra, a combination of stands of variable density, and tundra, characterized mainly by shrubs and lichens. The tree line (black spruce, white spruce and tamarack) separates the boreal zone from the Arctic zone. Québec's Arctic zone covers only one subzone, the Southern arctic, characterized by the absence of trees, continuous permafrost and tundra-specific vegetation, which mainly consists of shrubs, herbaceous plants (mostly gramineous like species), mosses and lichens.

## BIOCLIMATIC DOMAINS AND SUBDOMAINS

A bioclimatic domain is an area characterized by a particular type of vegetation that, at the final stage of succession, grows on sites with average soil conditions, drainage and exposure (mesic sites). The balance between vegetation and climate is the main factor that distinguishes one domain from another. The bioclimatic domain boundaries were revised in 1998 by a committee responsible for the map of ecological regions<sup>1</sup>, which established a new ecological land classification system for Québec.

Québec has ten bioclimatic domains. Six of these, namely the sugar maple-bitternut hickory, sugar maple-basswood, sugar maple-yellow birch, balsam fir-yellow birch, balsam fir-white birch and spruce-moss domains, are located in the southern Québec. The four others, namely the spruce-lichen, forest tundra, shrub arctic tundra and herbaceous arctic tundra domains, are located in northern Québec.

Some of the bioclimatic domains found in southern Québec are divided into subdomains because of their distinct vegetation patterns reflecting differences in the precipitation pattern.

## I. NORTHERN TEMPERATE ZONE

### A. Hardwood forest subzone

#### 1. Sugar maple-bitternut hickory domain (14 500 km<sup>2</sup>)

Confined to southwestern Québec, with its more clement climate, the sugar maple-bitternut hickory domain contains Québec's most southerly species, some of which are thermophiles. Its forests are highly diversified. Some of the species found here are at the northernmost limit of their range. This is the case of the bitternut hickory, after which the forest is named, as well as the shagbark hickory, hackberry, black maple, swamp white oak, cork elm, pitch pine and several shrubs and herbaceous plants. The forest also contains other species that extend further north, such as the sugar maple, fir and spruce. It is not divided into subdomains.

#### 2. Sugar maple-basswood domain (31 000 km<sup>2</sup>)

The sugar maple-basswood domain stretches further to the north and east than the sugar maple-bitternut hickory domain. Its plant life is also very diversified, although several species are at the northernmost limit of their range. In areas that are favourable, the basswood, American ash, hop-hornbeam and butternut grow alongside the sugar maple, but they are less common further north. There are two subdomains, distinguished by the abundance of red oak stands and their distinct precipitation systems: one in the west, which is drier, and the other in the east, where precipitation is more abundant.

#### 3. Sugar maple-yellow birch domain (65 600 km<sup>2</sup>)

The sugar maple-yellow birch domain covers the hills bordering the southern Laurentian plateau and the Appalachians, in the northernmost portion of the hardwood forest subzone. Its plant life, less diversified on all but the best sites, includes many boreal species found throughout Québec. On its mesic sites, the yellow birch is one of the most predominant companion species to the sugar maple. The American beech, red oak and Eastern hemlock also grow here, but are rarely found past the forest's northern boundary. This domain also signals the end of the basswood and hop-hornbeam ranges. As for the entire hardwood forest subzone, forest dynamics are attributable mainly to windfall. The sugar maple-yellow birch forest has two subdomains, a drier one in the west and the other in the east, distinguished by their precipitation levels and the abundance of white and red pine stands.

### B. Mixed forest subzone

#### 4. Balsam fir-yellow birch domain (98 600 km<sup>2</sup>)

The balsam fir-yellow birch domain is an ecotone, i.e. a transition zone between the northern temperate zone to which it belongs, and the boreal zone. It stretches westward as far as central Québec, between latitudes 47° and 48°, and

encompasses the Gaspé peninsula, the Appalachian hills east of Québec City, the Laurentian foothills north of the St. Lawrence River and the lowlands of Lake Saint-Jean. Its mesic sites feature mixed stands of yellow birch and softwoods, such as the balsam fir, white spruce and white cedar. The sugar maple is at the northernmost limit of its range here. Spruce budworm epidemics and forest fires are the two main elements of forest dynamics. The presence of yellow birch and pine stands, which diminish towards the east, is the main defining factor for two separate subzones, one in the west, characterized by the omnipresence of yellow birch-balsam fir forests on mesic sites, and one in the east, characterized by balsam fir-yellow birch forests.

## II. BOREAL ZONE

### A. Continuous boreal forest subzone

#### 5. Balsam fir-white birch domain (139 000 km<sup>2</sup>)

The balsam fir-white birch domain occupies the southern portion of the boreal zone. The forest landscape is dominated by balsam fir and white spruce stands mixed with white birch on mesic sites. On less favourable sites, black spruce, jack pine and larch often grow alongside white birch or trembling aspen. The yellow birch and red maple grow only in the southern portion of the domain. Forest dynamics are controlled primarily by the spruce budworm, since the balsam fir is abundant here. However, fire is also an important factor. There are two subdomains. The western one has a relatively even topography, with minimal changes in altitude. The fire cycle is also shorter, which explains the abundance of hardwood or mixed stands with intolerant hardwoods (trembling aspen, white birch and jack pine). Precipitation is generally more copious in the eastern subdomain due to the influence of the maritime climate; consequently, the fire cycle is longer here.

#### 6. Spruce-moss domain (412 400 km<sup>2</sup>)

Moving northward, the spruce-moss domain replaces the balsam fir-white birch domain. It stretches approximately to the 52<sup>nd</sup> parallel, and its northern boundary coincides with the boundary of the continuous boreal forest subzone. Forest landscapes are fairly uniform here, since the forest canopy is dominated extensively by the black spruce, often growing in pure stands but also accompanied on occasion by other species, such as the balsam fir. Balsam fir stands are found only on some of the slopes of the domain's hills. Some hardwoods, such as the white birch, trembling aspen and, to a lesser extent, the balsam poplar, also grow here. The undergrowth is composed of hypnaceous mosses and ericaceous shrubs. Herbaceous species are rare. The spruce-moss domain is divided into two precipitation-based subdomains. The fire cycle, which is the main factor in forest dynamics, is much longer in the east, where balsam fir stands are more abundant and the percentage of firs in spruce stands is higher.

### B. Taiga subzone

#### 7. Spruce-lichen domain (299 900 km<sup>2</sup>)

The spruce-lichen domain extends over the entire taiga subzone, which stretches from the 52<sup>nd</sup> parallel to the 55<sup>th</sup> parallel. Its main difference with the spruce-moss forest is its low-density forest cover. The lichen mat is dotted with black spruce trees, whose propagation is favoured by the harsh climate and low precipitation level. The balsam fir and jack pine are at the northernmost limit of their range here. Fire has destroyed vast areas of the spruce-lichen forest.

### C. Forest tundra subzone

#### 8. Forest tundra domain (217 000 km<sup>2</sup>)

The forest tundra bioclimatic domain is the ecotone, or transitional area, between the boreal zone to which it belongs, and the Arctic zone. It extends approximately from the 55<sup>th</sup> parallel to the 58<sup>th</sup> parallel. The landscape resembles a mosaic dominated by shrubby heathland punctuated by forests on sheltered sites. The mosaic is the result of fire and the harsh northern climate with its discontinuous permafrost. The northern boundary of the domain coincides with the tree line. It contains mainly stands of stunted black spruce measuring less than three metres in height.

## III. ARCTIC ZONE

### A. Southern arctic subzone

#### 9. Shrub arctic tundra domain (197 800 km<sup>2</sup>)

The shrub arctic tundra bioclimatic domain extends approximately from the 58<sup>th</sup> parallel to the 61<sup>st</sup> parallel. Here, willows and dwarf birch grow alongside herbaceous species, mostly grass-like plants, as well as mosses and lichens. The domain is characterized by continuous permafrost and a topography resulting from ice activity. The vegetation canopy rarely grows beyond two metres high, and even then, only some species of arctic willow are capable of reaching this height. Pockets of vegetation resembling the shrub arctic tundra can be found on some of southern Québec's highest summits, including the Chic-Chocs and Groulx mountains.

#### 10. Herbaceous arctic tundra domain (38 200 km<sup>2</sup>)

The herbaceous arctic tundra domain is Québec's northernmost bioclimatic domain. The regional climate is so harsh that even shrubs are scarce and very small. Cyperaceous and gramineous species (sedges and grasses) mix with mosses and lichens to dominate landscapes where the bedrock and mineral soil are often bare. The entire area is covered with continuous permafrost.

1. The committee responsible for mapping ecological regions (Comité sur la carte des régions écologiques) was composed of Jean-Pierre Saucier, f.eng., D.Sc. (committee leader), Pierre Grondin, f.eng., M.Sc., André Robitaille, geomorphologist, M.Sc., and Jean-François Bergeron, biologist, M.Sc.