Canadian National Vegetation Classification (CNVC)
Classification nationale de la végétation du Canada

http://cnvc-cnvc.ca

Acadian Temperate Forest

Macrogroup CM744

Forêts acadiennes de la zone tempérée

Cool Temperate Forest & Woodland

D008 Eastern North American Forest & Woodland

CM014 Eastern North American Temperate Hardwood – Conifer Forest

CM742 Eastern Canadian Temperate Deciduous Forest

CM744 Acadian Temperate Forest

CM744a Typic Acadian Temperate Forest

CM744b Cool Acadian Temperate Forest

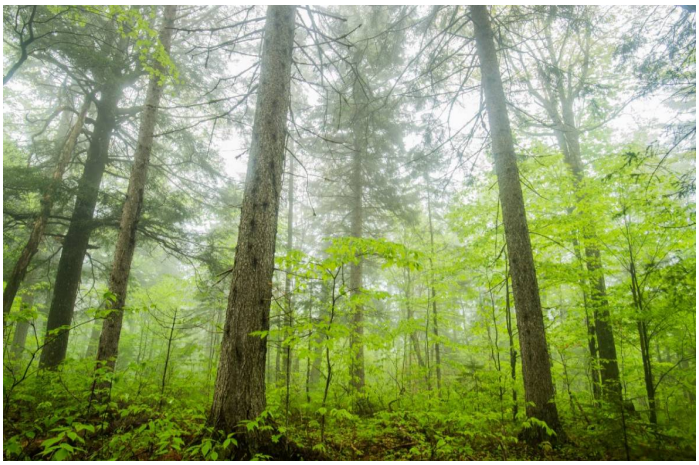
Concept

CM744 describes the upland temperate forests of New Brunswick, Nova Scotia, Prince Edward Island and a small part of the Gaspé peninsula in Quebec. Forest canopies can be evergreen coniferous, cold-deciduous broad-leaved, or a conifer–broad-leaved mixture. Anthropogenic disturbance is the dominant factor determining contemporary forest composition and dynamics. Windthrow, ice loading and insect infestations are the most widespread forms of natural disturbance; overall, fire is not a significant disturbance factor. Dominant tree species include balsam fir (*Abies balsamea*), red maple (*Acer rubrum*), paper birch (*Betula papyrifera*), yellow birch (*B. alleghaniensis*), red spruce (*Picea rubens*), sugar maple (*Acer saccharum*) and white spruce (*Picea glauca*). Black spruce (*P. mariana*) often dominates stands on nutrient-limited sites. Eastern white pine (*Pinus strobus*), eastern hemlock (*Tsuga canadensis*) and American beech (*Fagus grandifolia*) are common canopy associates or dominants in the southern part of the range and at low elevations in the north. Depending on overstory and site conditions, understory shrub and herb layers vary from dense to sparse. In addition to regenerating tree species, understories are generally rich in cold-deciduous broad-leaved shrubs, perennial forbs and ferns. Striped maple (*Acer pensylvanicum*), velvet-leaved blueberry (*Vaccinium myrtilloides*) and Canada fly-honeysuckle (*Lonicera canadensis*) are common shrubs throughout the range. Typical herb/dwarf shrub species include wild lily-of-the-valley (*Maianthemum canadense*), northern starflower (*Lysimachia borealis*), yellow clintonia (*Clintonia borealis*), bunchberry (*Cornus canadensis*), wild sarsaparilla (*Aralia nudicaulis*) and common wood-sorrel (*Oxalis montana*). Wood ferns *(Dryopteris intermedia, D. carthusiana, D. campyloptera)* are also frequent. The bryophyte layer can be particularly abundant, especially under mature conifer canopies and/or in areas with a very humid climate. The most common bryophyte species include red-stemmed feathermoss (*Pleurozium schreberi),* stairstep moss (*Hylocomium splendens*) and three-lobed whipwort (*Bazzania trilobata*).

CM744 occurs at the eastern extent of humid, cool temperate climatic conditions in Canada. Although the macroclimate is broadly considered continental, the Atlantic Ocean surrounds the CM744 range on three sides generating a pronounced maritime influence. Generally, winters are relatively mild and summers are cool and humid. Mean annual temperatures vary from approximately 3.5°C to 7°C. Mean annual precipitation increases from approximately 1000 mm in central New Brunswick to >1675 mm along the outer Atlantic coast of Nova Scotia. Rainfall significantly exceeds snowfall. Elevation grades from >800 mASL in northern New Brunswick to sea level; much of the range is <200 mASL. Regional geologic and topographic features of the Appalachian physiographic region produce an array of local site conditions. All parts of the range experienced late Pleistocene glaciation; soils are mostly Podzols and Luvisols developed in glacial surficial materials.

Two subtypes characterize regional floristic and ecological variation. Subtype CM744a [Typic Acadian Temperate Forest] describes the typical condition, often including sugar maple, American beech, white pine and eastern hemlock. Subtype CM744b [Cool Acadian Temperate Forest] describes forests of colder climatic conditions that occur at higher elevations and in coastal areas, including greater representation of white spruce, balsam fir, mountain ash and mountain maple.

Mixed forest landscape dominated by red spruce (*Picea rubens*), with balsam fir (*Abies balsamea*), eastern hemlock (*Tsuga canadensis*), yellow birch (*Betula alleghaniensis*), red maple (*Acer rubrum*) and, on well-drained upland sites, sugar maple (*A. saccharum*). Southern Hants County, Nova Scotia.
Source: S. Basquill, Nova Scotia Department of Lands & Forestry



Mixed red spruce (*Picea rubens*) stand, with yellow birch (*Betula alleghaniensis*), red maple (*Acer rubrum*), balsam fir (*Abies balsamea*) and eastern hemlock (*Tsuga canadensis*). Tree regeneration, broad-leaved shrubs and evergreen wood fern (*Dryopteris intermedia*) dominate the understory. Ayers Lake, New Brunswick.
Source: N. Hawkins

Acadian Temperate Forest

Macrogroup CM744

Forêts acadiennes de la zone tempérée

Vegetation

Physiognomy and Structure

CM744 includes mainly upland forests with closed canopies, although woodlands can occur on very dry sites. Forest canopies can be evergreen coniferous, cold-deciduous broad-leaved ("hardwood") or a conifer-hardwood mixture ("mixedwoods"). Most CM744 forests are mixedwoods or coniferous, with hardwood stands limited to well-drained upland sites. Vertical stand structure is typically multi-storied and characteristically uneven-aged, but can be single storied after stand-replacing disturbance. On summits and in exposed coastal areas, the tree layer can be stunted, but krummholtz is not typical in CM744 forests. Understory structure varies from dense to sparse and is usually dominated by cold-deciduous broad-leaved shrubs, tree regeneration, perennial forbs and ferns. The bryophyte layer can be well developed, especially under mature conifer canopies or in areas with a very humid climate. Riparian and wetland forests and woodlands within the range of CM744 are described by M504 [Laurentian-Acadian Flooded & Swamp Forest]. Boreal forests within the range of CM744, described by M495 [Eastern North American Boreal Forest], are found at higher elevations and in exposed coastal areas.

Floristics

The main tree species of contemporary CM744 forests include *Abies balsamea*, *Acer rubrum, Betula papyrifera, B. alleghaniensis, Picea rubens, Acer saccharum, Picea glauca, P. mariana, Pinus strobus, Fagus grandifolia* and *Populus* spp. On circum-mesic sites, mature coniferous and mixedwood stands with prominence of *P. rubens, A. balsamea* and/or (especially in warm areas) *Tsuga canadensis* are characteristic of CM744. Common canopy associates in these stands include *B. alleghaniensis*, *A. rubrum*, *P. strobus* and/or *P. glauca*. Mature hardwood stands on circum-mesic sites are typically dominated by *A. saccharum, B. alleghaniensis* and *F. grandifolia*, often in association with *A. rubrum* and scattered conifers (especially *A. balsamea, P. rubrum* and/or *P. glauca*). Thermophilic hardwood species, such as *Fraxinus americana, F. pennsylvanica* and *Ostrya virginiana*, are restricted to southern parts of the CM744 range, while more extreme thermophiles (e.g., *Tilia americana, Juglans cinerea*) are further limited to warm continental areas of west-central New Brunswick. *Thuja occidentalis* is an occasional canopy component in upland mixedwood and coniferous stands throughout New Brunswick, and in localized areas of Prince Edward Island and Nova Scotia. In some areas, upland forests are dominated by *P. mariana*, usually in association with *A. balsamea,* scattered shade intolerant hardwood species (e.g., *A. rubrum, B. papyrifera*), and occasionally *T. occidentalis*. In western Nova Scotia, *P. strobus, Quercus rubra* and *T. canadensis* are notably prevalent; in this area, *T. canadensis* dominates mature stands on circum-mesic sites more frequently than does *P. rubens*. Tree species composition of contemporary CM744 forests has been strongly influenced by the long history of colonial land use. Past and present timber harvest, land clearing and urbanization have favoured *A. rubrum, B. papyrifera, Populus tremuloides, P. grandidentata, Picea glauca* and *A. balsamea,* while decreasing the representation of species like *T. canadensis, Pinus strobus, Picea rubens* and *T. occidentalis.*

Two subtypes describe important floristic and ecological differences along major elevational and oceanic gradients within the CM744 range. *Abies balsamea, Acer rubrum, Picea rubens* and *Betula alleghaniensis* are characteristic of both subtypes. *Acer saccharum, Fagus grandifolia, Pinus strobus and Tsuga canadensis* are more prominent in subtype CM744a [Typic Acadian Temperate Forest], as are thermophilic species like *Fraxinus americana*. *A. rubrum* is usually a minor canopy component in both subtypes, except after stand-replacing disturbance in CM744a forests where it may dominate. *Picea glauca* is a more common canopy associate in subtype CM744b [Cool Acadian Temperate Forest], where *A. balsamea* and *Betula papyrifera* also show increased prominence, particularly after disturbance. *A. balsamea* typically occurs as a late seral canopy dominant only in CM744b, where it forms mixed stands with *P. rubens* and/or *B. alleghaniensis.*

Abies balsamea is a short-lived, mid to late seral conifer species that can re-colonize sites following stand-replacing disturbance or invade existing early or mid-seral stands by seeding in from surrounding areas. It also maintains itself within stands where it is already established. Seeds of *A. balsamea* are able to germinate and survive on seedbeds of mineral soil, litter, moss, thick humus and dead wood as long as substrate moisture is sufficient. It is highly shade tolerant, so seedlings persist under closed canopies for many years and are able to respond to release after long periods of suppression. *A. balsamea* is generally very susceptible to insect predation and to a variety of tree pathogens. In CM744 forests, its abundance is strongly influenced by cyclical outbreaks of eastern spruce budworm (*Choristoneura fumiferana*), particularly in areas where canopy dominance is higher. *A. balsamea* is also intolerant of fire, benefitting from longer fire cycles, and is generally more abundant and more frequently a canopy dominant where maritime or montane influences create colder, more humid climatic conditions. *A. balsamea* is less common in the interior of western Nova Scotia where it appears to be limited by warmer temperatures and acidic soils. It occurs across a range of site conditions, including swamps (described in M504 [Laurentian-Acadian Flooded & Swamp Forest]).

Betula papyrifera and *Populus tremuloides* are short-lived, early seral hardwood species that occur following disturbance and are often prevalent near settlements and in agricultural areas where forest clearing has occurred. After any disturbance that does not kill their roots, they can reproduce vegetatively, *P. tremuloides* from root suckers and *B. papyrifera* from stump sprouts. They also produce abundant, light wind-dispersed seeds that can readily colonize mineral soil seedbeds exposed by disturbance. Both species grow rapidly in full light conditions but are intolerant of shade so do not replace themselves in a stand without further perturbation. *P. tremuloides* is less tolerant of nutrient-limited sites and thus mixes less frequently with species such as *Picea mariana*. *Populus grandidentata* and *Betula populifolia* occur under similar ecological conditions in the southern portion of the range. All of these species are more abundant in contemporary CM744 forests than they were historically because of extensive land clearing and other anthropogenic forest disturbances.

Acadian Temperate Forest

Macrogroup CM744

Forêts acadiennes de la zone tempérée

Floristics (cont'd)

Acer rubrum has a very broad ecological amplitude, occupying a wide range of site conditions and successional stages. Its best growth is on moist, nutrient-rich sites, including swamps (described in M504), but it is able to colonize dry, open, nutrient-poor sites and also maintain itself in closed circum-mesic stands. In CM744 forests, *A. rubrum* is a moderately shade tolerant, early to mid-seral temperate hardwood species that reproduces both vegetatively and by seed. It vigorously sprouts from stumps when stem death occurs and is a prolific seed producer. Seedbed requirements are minimal and it establishes an abundant bank of seedlings that can persist under closed canopies for several years. *A. rubrum* benefits from anthropogenic disturbances, seeding into gaps, clearings and early seral stands of *Populus* spp., *B. papyrifera* and *Acer saccharum*, as well as increasing its abundance in stands where it is already established by aggressive sprouting. It is longer lived than most seral species and may persist as a component of late successional stages in *A. saccharum* hardwood forests or in mixed stands with *Betula alleghaniensis, Abies balsamea, Picea glauca* and/or *P. rubens*. In CM744, *A. rubrum* is also one of the most frequently occurring hardwood species in *P. mariana* dominated forests.

Betula alleghaniensis is a long-lived (>300 years), moderately shade tolerant temperate hardwood species that reproduces primarily by seed. It is a prolific producer of light wind-dispersed seeds and generates heavy seed crops every few years. *B. alleghaniensis* maintains itself in established closed forests by colonizing gaps where fine-scale disturbances expose seedbed patches of mineral soil mixed with humus. It also invades early seral stands with diffuse canopies (especially of *A. rubrum, A. saccharum, A. balsamea* and *B. papyrifera*) by seeding in from surrounding areas. *B. alleghaniensis* occupies well-drained, nutrient-medium to rich circum-mesic sites in the upland forests of CM744, but is susceptible to drought conditions because of its shallow roots; it is tolerant of moist sites and often occurs in wetland forests (described in M504). It is the most cold tolerant temperate hardwood tree species in CM744 forests; at higher elevations and in colder coastal areas, it is usually a component of mixed forests with *A. balsamea, Picea rubens, P. glauca, Tsuga canadensis* and/or *B. papyrifera*.

Acer saccharum is a long-lived (>300 years), shade tolerant, late seral temperate hardwood species that dominates uneven-aged stands on well-drained, nutrient-medium to rich circum-mesic sites in CM744a forests and at lower elevations (<300 mASL) in CM744b. It is also found on rich well-drained alluvial sites characterized by short duration seasonal flooding (described in M504). *A. saccharum* can re-colonize sites following small-scale disturbance or invade existing early or mid-seral stands by seeding in from surrounding areas. It maintains itself within stands with an abundant bank of seedlings that can persist under closed canopies for many years and respond rapidly to release after long periods of suppression. It also reproduces vegetatively following stem death by stump sprouting. *A. saccharum* is less cold hardy than are *B. alleghaniensis* and *A. rubrum*, and occurs less frequently in the northern portions of the CM744 range. *Fagus grandifolia* frequently occurs with *A. saccharum* at elevations <250 mASL, but is almost entirely absent from exposed coastal and highland areas. *F. grandifolia* prevalence has been significantly reduced by beech bark disease in CM744 forests but it still occurs frequently, at least in the understory, throughout most of the range. Other thermophilic tree species (e.g., *Fraxinus americana, Ostrya virginiana*) occasionally occur with *A. saccharum* on richer sites in the southern portion of the range.

Picea rubens is a mid- to late seral temperate conifer species that usually occurs as a canopy dominant or co-dominant in conifer stands, or as a component of mature mixedwoods with *Betula alleghaniensis* and/or *A. rubrum.* It typically occurs with higher abundance than *Abies balsamea,* except after disturbance or in colder areas (i.e., in CM0744b forests) where relative dominance may be reversed. In warmer parts of the CM744 range, *P. rubens* may mix with *Tsuga canadensis* and/or *Pinus strobus*. On long slopes with at least moderate nutrient enrichment, *P. rubens* may be co-dominant with *Picea glauca* in mature stands. On less fertile upland sites, it co-occurs with *Picea mariana*, with which it readily hybridizes; *Picea mariana x Picea rubens* hybrids occur almost exclusively on sites more typical of *P. mariana* habitat than of *P. rubens*. *P. rubens* seeds are able to germinate and survive on seedbeds of mineral soil, litter, moss, thick humus and dead wood as long as substrate moisture is sufficient. It can establish on mineral seedbeds following disturbance, often seeding into early seral stands where seedlings persist in the understory and eventually grow into the canopy. It is a very shade tolerant species that maintains itself within closed stands, responding to small-scale disturbances where shade is sufficient to reduce competition by faster growing hardwood species. In New Brunswick and Quebec, *P. rubens* occurs across the full elevational range of CM744. It is scarce on Prince Edward Island and on Cape Breton Island. In mainland Nova Scotia, *P. rubens* does not occur in exposed coastal areas and is generally infrequent along the Atlantic shoreline, except the Bay of Fundy.

Picea glauca is a mid- to late seral conifer species that grows best on colder upland sites with greater nutrient availability. It is most frequently a canopy dominant in CM744b forests, where it dominates coniferous stands with lower abundance of *A. balsamea* and mixedwoods in association with *B. alleghaniensis, Acer rubrum* or, less commonly, *Thuja occidentalis*. It may co-dominate with *P. rubens* on the lower portions of long slopes with at least moderate nutrient enrichment. *P. glauca* is also the typical dominant tree species on abandoned farmland.

Picea mariana is a mid- to late seral conifer species that is most common on nutrient-poor sites, tolerating a wide amplitude of site moisture conditions. On upland sites, it forms even- or uneven-aged stands, depending on site characteristics and stand history, as a dominant or co-dominant often associated with *Pinus* spp. and/or various shade intolerant hardwoods (e.g., *A. rubrum, Betula papyrifera* and *Populus* spp). It will also maintain itself as a late successional dominant on sites too nutrient-limited for other tree species. *P. mariana* is usually accompanied by *Abies balsamea* on all but the poorest sites, and may co-occur with *Picea rubens* (with which it frequently hybridizes). *P. mariana* is sometimes a minor canopy associate in mid-seral forests dominated by *Tsuga canadensis* and/or *Pinus strobus.* In western Nova Scotia it may develop under a *Pinus strobus* super-canopy on poorer sites. On moister sites, and in treed wetlands, it may co-occur with low levels of *Larix laricina*, *A. balsamea* and/or *A. rubrum*; *P. mariana* wetlands are described in M504.

Acadian Temperate Forest

Macrogroup CM744

Forêts acadiennes de la zone tempérée

Floristics (cont'd)

Pinus strobus is a long-lived (>200 years), moderately shade tolerant, early to mid-seral temperate conifer species that reproduces entirely by seed. It establishes on open sites following disturbance that exposes mineral soil seedbeds, wherever there is an adequate seed supply. It is also able to invade existing early or mid-seral stands with diffuse canopies (especially of *Populus* spp., *B. papyrifera, Acer rubrum* and *Quercus rubra*) by seeding in from surrounding areas. *P. strobus* is often dominant on drier sites with nutrient-poor coarse-textured or shallow soils. In mixedwood or hardwood stands, it is able to regenerate in canopy gaps if sufficient light and mineral seedbeds are available for seedling establishment and survival. *P. strobus* is often a minor overstory component of mature circum-mesic forests in warmer areas of the CM744 range, and is particularly prevalent in western Nova Scotia.

Pinus resinosa is a shade intolerant, long-lived, early successional temperate conifer species that often dominates even-aged, usually fire-originated, stands. *P. resinosa* is most prevalent on deep, dry sandy and coarse loamy soils where mineral soil seedbeds and full light conditions promote successful establishment of its seedlings; it often maintains itself in open stands on these dry, poor sites. On circum-mesic sites, in the absence of fire, it is usually succeeded by *Picea mariana* and, although older individuals of *P. resinosa* may persist in these stands, it rarely reproduces itself. *Pinus banksiana* is a northern species that usually establishes following fire on dry to mesic, nutrient-poor to medium sites. It can also maintain itself in open woodland stands on rocky or sandy sites, where seeds are released from cones and germinate without fire. *P. resinosa* and *P. banksiana* form small stands at low elevations throughout the range of CM744; the latter species is more common in eastern New Brunswick while *P. resinosa* is mostly confined to southern areas of all three Maritime provinces.

Tsuga canadensis is a long-lived (>300 years), very shade tolerant, late seral temperate conifer species that reproduces entirely by seed. It occupies similar sites as *Picea rubens* and *Abies balsamea* but is slightly more tolerant of drier soils and less humid climatic conditions. *T. canadensis* occurs in both pure and mixed stands, in the latter usually co-occurring with *P. rubens, Pinus strobus, A. balsamea* and, less frequently, *P. mariana*. Generally, it is found in scattered occurrences across warmer parts of the CM744 range in Quebec, New Brunswick and Prince Edward Island, but is most common in southern areas where it can dominate mature coniferous stands on circum-mesic sites and form mature mixedwoods with *Betula alleghaniensis* and/or *Acer rubrum*. In warmer areas, *T. canadensis* also characterizes swamp forests (described in M504). Historical data indicate that *T. canadensis* was once more common in Prince Edward Island and at low elevations in New Brunswick.

Thuja occidentalis is a small, long-lived (>300 years), late seral conifer species that reproduces both by seed and by vegetative layering. It is most common on moist nutrient-rich sites, including swamps (described in M504), but also occupies a variety of dry to moist, nutrient-rich upland sites where it forms a canopy or sub-canopy tree layer often in admixture with any of the species described above. Seedlings are only moderately shade tolerant; in closed stands this species primarily reproduces vegetatively. Upland *T. occidentalis* stands are largely restricted to calcareous areas of New Brunswick and Prince Edward Island; the species is nearly absent from Nova Scotia.

Quercus rubra is a mid-seral temperate hardwood species. In CM744 forests, it is most common in southern areas on warm dry sites with coarse-textured soils where it reproduces both by seed and by stump sprouting. *Q. rubra* often mixes with shade intolerant hardwoods (e.g., *Acer rubrum*, and *Populus grandidentata*) and/or *Pinus* spp. In especially warm parts of the range, it may mix with other temperate hardwoods such as *A. saccharum* and *Fagus grandifolia*.

Understory floristics vary with local site conditions, stand history, adjacent vegetation, forest canopy structure and age, and climatic context. The species composition of tree regeneration reflects successional pathways and available seed sources, and contributes to a contrast between subtypes CM744a and CM744b. High coniferous canopy content and elevated atmospheric humidity, both characteristics of CM744 forests, are often reflected in high abundance and species richness of bryophytes. In very humid areas, species richness of epiphytic lichens is also high.

Cold-deciduous broad-leaved shrubs such as *Lonicera canadensis, Acer pensylvanicum* and *A. spicatum* are frequent only in hardwood forests and hardwood dominated mixedwoods. Conifer and mixedwood forests often support *Vaccinium myrtilloides, V. angustifolium, Kalmia angustifolia, Ilex mucronata* and *Viburnum nudum*, but these species are generally only prominent on nutrient-poor sites. *Gaylussacia baccata* and *Morella pensylvanica* are characteristic of coastal conditions and the interior of western Nova Scotia, where other species like *Ilex glabra* and *Hamamelis virginiana* may be locally common. In southern portions of the range, *Viburnum lantanoides* and *Cornus alternifolia* are more frequent. *A. spicatum* is generally indicative of colder conditions and, together with *Sorbus americana*, is diagnostic of CM744b stands.

Acadian Temperate Forest

Macrogroup CM744

Forêts acadiennes de la zone tempérée

Floristics (cont'd)

Herb/dwarf shrub species such as *Maianthemum canadense, Lysimachia borealis, Clintonia borealis, Cornus canadensis* and *Aralia nudicaulis* are ubiquitous in CM744 forests. Wood ferns (*Dryopteris intermedia, D. carthusiana, D. campyloptera*), *Oxalis montana* and whorled wood aster (*Oclemena acuminata*) are common on all but the most nutrient-impoverished sites. *Coptis trifolia, Linnaea borealis* and *Gaultheria hispidula* are largely limited to coniferous and mixedwood forests, while *Huperzia lucidula, Streptopus lanceolatus, Medeola virginiana* and numerous other herbs are more strongly associated with hardwood forests. In southern portions of the range, hardwood forests on nutrient-rich soils often include *Polystichum acrostichoides, Maiathemum racemosum, Trillium erectum, Polygonatum pubescens* and a broad diversity of other herbaceous species. The warm continental areas of western New Brunswick support additional thermophilic species that are infrequent or absent elsewhere in the CM744 range, including *Adiantum pedatum, Dryopteris goldiana, D. clintoniana, Carex plantaginea, Asarum canadense, Galearis spectabilis, Phryma leptostachya* and *Sanicula trifoliata*. *Dryopteris campyloptera, Solidago macrophylla* and higher abundance of *Oxalis montana* are diagnostic of forests in colder temperate conditions, described by CM744b.

The bryophyte layer in both coniferous and mixedwood forests includes *Pleurozium schreberi, Hylocomium splendens*, *Dicranum scoparium* and *Bazzania triolobata*. Forests in colder environments, described by CM744b, feature more frequent occurrences of *Hylocomiastrum umbratum, Ptilium crista-castrensis* and *Rhytidiadelphus loreus*, the latter species more so in very humid areas. Bryophyte species richness is also notable in hardwood forests but is more limited to epiphytes.

Dynamics

Environmental site characteristics, plant species autecology, seed/propagule availability, and disturbance history (i.e., type, severity and frequency) influence secondary succession trends within the forests of CM744. Successional patterns across the range have shifted markedly in the 400+ years since European settlement. Primary disturbances prior to settlement included gap-phase tree mortality, ice storms, pathogens, insect infestations, wildfires and, particularly in areas near the coast, hurricanes. Subsequently, forest harvesting, agricultural land clearing and conversion, plantation forestry, urbanization, and industrial and recreational development (e.g., lakeside and coastal housing) have become the main disturbance factors. Differences between historic and modern disturbance regimes have changed contemporary stand and landscape dynamics, with concomitant effects on ecosystem structure and function.

For CM744 in general, site moisture and nutrient status are important determinants of secondary succession following stand removal. Elevated levels of atmospheric humidity and precipitation help to promote natural regeneration after disturbance. On nutrient-rich mesic to moist sites, intense competition from tree saplings, shrubs and herbs immediately following windthrow, logging or land clearing limits the availability of microsites suitable for seed germination and early growth of tree seedlings; root or stump-regenerating hardwood species, such as *Populus* spp., *Acer rubrum*, *Fagus grandifolia*, *Quercus rubra*, *Fraxinus americana* and *Betula* spp., are less affected by this competition. *Abies balsamea* and, in some areas, *Picea glauca* are similarly successful after disturbance, developing from existing regeneration or seeding in from adjacent areas. Where mineral seedbeds exist on less fertile dry to mesic sites, light conditions are usually suitable for seed germination and growth of *Pinus* spp., *Picea mariana*, *Populus grandidentata* and *Betula papyrifera*. *P. glauca*, and to a lesser extent, *A. balsamea, Larix laricina, Pinus strobus, Thuja occidentalis, Populus* spp., and occasionally other tree species are old-field colonizers in the CM744 range. On all but the poorest sites, early seral stands are invaded by *Acer saccharum*, *F. grandifolia, P. strobus*, *Picea rubens* and sometimes *Tsuga canadensis,* which seed in from adjacent undisturbed areas during mid- to late seral stages; over time (usually more than 100 years), these species can grow into the main canopy and eventually become dominant or co-dominant as early seral species decline.

In colder environments, characterized by forests of subtype CM744b [Cool Acadian Temperate Forest], succession patterns are different. Under these conditions, *A. balsamea, P. glauca* and *Betula alleghaniensis* show higher prevalence in all seral stages, and more temperate species such as *A. saccharum, F. grandifolia, P. strobus* and *T. canadensis* are infrequent. Stand dynamics of CM744b forests are also more strongly influenced by cyclical outbreaks of the eastern spruce budworm (*Choristoneura fumiferana*) because of the abundance of *A. balsamea* and *P. glauca.*

In the absence of stand removal, dynamics are more gradual through the process of mortality of individual or small numbers of canopy trees (gap phase replacement). In these cases, small gaps develop in mature forests due to diseases, insects, fine-scale windthrow, ice damage or selection silviculture systems. Under these conditions, *Abies balsamea, Acer* spp., *Fagus grandifolia, Picea* spp. and *Betula* spp. self-replace, either by seed or sprouting, if they were present in the pre-disturbance stand or if seed sources exist nearby. If mineral seedbeds are created by a disturbance, *Pinus strobus* seedlings can establish in these gaps and, depending on the light regime, potentially grow into the canopy. Smaller scale disturbances promote shade tolerant species that are characteristic of mature steady state CM744 forests, such as *Picea rubens, Acer saccharum, Tsuga canadensis* and, in some areas, *Thuja occidentalis.*

Acadian Temperate Forest

Macrogroup CM744

Forêts acadiennes de la zone tempérée

Dynamics (cont'd)

Forests of CM744 are among the least fire prone in Canada. Over the past several decades (1960-2017), the density of lightning fires documented within the range is the second lowest of any forested vegetation zone in Canada, greater only than the deciduous forests of southern Ontario and Quebec. Within this period, almost 80% of the lightning fire records in CM744 forests occurred in New Brunswick; many of these were in the rain shadow of the highland regions of northern New Brunswick, an area where fire plays a greater role in stand dynamics. Modern fire suppression programs have reduced wildfire to a relatively minor driver of dynamics in contemporary CM744 forests, except in parts of northern New Brunswick and on some dry sites (both microclimatically and edaphically) throughout the range.

CM744 forests are subject to a variety of diseases and insects that typically cause mortality to individual or small groups of trees but are also capable of creating changes in tree species dominance at both stand and landscape scales. Tomentosus root disease (*Inonotus tomentosus*) and Armillaria root rot (*Armillaria* spp.) are widespread in forests of CM744, causing mortality of young trees and increasing the susceptibility of older trees to windthrow and insect attack. Hardwood trunk rot (*Phellinus igniarius*) affects *Acer* spp. and other temperate hardwood tree species. White pine blister rust (*Cronartium ribicola*) is an introduced fungal pathogen that has contributed to the decline of *Pinus strobus*. Beech scale (*Cryptococcus fagisuga*) and beech bark disease (*Neonectria faginata*) constitute an introduced insect-fungus complex that has caused extensive mortality of mature *Fagus grandifolia* in CM744 forests. Sirococcus shoot blight (*Sirococcus conigenus*) affects *Pinus resinosa,* and scleroderris canker *(Gremmeniella abietina)* causes mortality in *Pinus banksiana* and *P. resinosa*. *Abies balsamea* is host tree for balsam fir tip blight (*Delphinella balsameae*). In New Brunswick, butternut canker (*Ophiognomonia clavigignenti-juglandacearum*) is an introduced fungal pathogen that has killed a large portion of the butternut (*Juglans cinera*) population.

Insects such as eastern spruce budworm, hemlock looper (*Lambdina fiscellaria fiscellaria*), whitemarked tussock moth (*Orgyia leucostigma*), jackpine budworm (*Choristoneura pinus pinus*), balsam fir sawfly (*Neodiprion abietis*) and spruce beetle (*Dendroctonus rufipennis*) are native to the range of CM744. During periodic outbreaks, they can cause extensive mortality of *Picea* spp., *A. balsamea, Pinus* spp.*, Tsuga canadensis* and, sometimes, hardwood tree species. Gypsy moth (*Lymantria dispar*), brown spruce longhorn beetle (*Tetropium fuscum*), balsam twig aphid (*Mindarus abietinus*), larch casebearer (*Coleophora laricella*) and, more recently, hemlock woolly adelgid (*Adelges tsugae*), beech leaf-mining weevil (*Orchestes fagi*) and emerald ash borer (*Agrilus planipennis*) are introduced insects with potential for affecting stand dynamics within CM744 forests.

Invasive plant species can outcompete native flora, alter vertical and horizontal stratification, and shape successional pathways. Most invasive plants occupy anthropogenic habitats, but a few are notable in upland forests across the range of CM744. *Frangula alnus* and *Sorbus aucuparia* are two woody species that often reach densities in the subcanopy that are sufficient to displace native species. Exotic herbaceous species are usually less invasive but *Hieracium lachenalii, Ranunculis repens* and a few other species can be abundant, replacing native flora and altering stand dynamics. Invasive tree species such as *Pinus sylvestris*, *Robinia pseudoacacia, Quercus robur, Populus alba* and *Acer platanoides* can attain canopy dominance in and around settlements, and spread to natural forests.

Acadian Temperate Forest

Macrogroup CM744

Forêts acadiennes de la zone tempérée

Environment

Climate

CM744 forests develop at the eastern limit of humid, cool temperate climatic conditions in Canada. Prevailing winds are westerly, and in most of the range the climate is generally considered continental. However, the CM744 range is surrounded by the Atlantic Ocean on three sides and a pronounced peninsular and island geography increases exposure to oceanic influences. A climatic gradient extends from more continental areas in Quebec and west-central New Brunswick to a hypermaritime climate along the outer Atlantic coast of Nova Scotia.

Latitude, topography and the movement of continental air masses are primary determinants of regional macroclimatic conditions, but proximity to the Atlantic Ocean provides a strong secondary influence. The ocean affects insolation, fog, precipitation, seasonal temperatures, frost-free days and atmospheric humidity. Overall, it moderates seasonal temperatures and establishes cool humid conditions, distinguishing the prevailing climate of CM744 from that of the adjacent CM014 [Eastern North American Temperate Hardwood – Conifer Forest].

Temperatures are generally less severe than those of the boreal region to the north, although parts of northern New Brunswick and adjacent areas of Quebec experience colder winter temperatures and higher snowfall than elsewhere in the CM744 range. In general, winters are relatively mild and summers are cool and humid. The warmest areas in the range include the interior of west-central New Brunswick and large protected valleys in Nova Scotia. In these areas, growing degree days above 5°C (GDD) may exceed 1800, while the coldest parts of northern New Brunswick average 1300 GDD. Mean annual temperatures vary from 3.5°C in northern New Brunswick and adjacent parts of Quebec to 5.3°C in parts of the Saint John River valley to 6.9°C in the upper Annapolis Valley. Mean annual precipitation increases from (approximately) 1000 mm in west-central New Brunswick to >1675 mm along the outer Atlantic coast of Nova Scotia. Rainfall significantly exceeds snowfall.

Physiography, Geology, Topography and Soils

CM744 occurs in the eastern portion of the Appalachian physiographic region in mainland Canada (i.e., excluding insular Newfoundland). It occupies a small part of the lower elevations of the Notre Dame Mountains, most of the Chaleur Uplands, the New Brunswick and Atlantic Highlands, the Maritime Plain, the Annapolis Lowland, and all but the highest Cape Breton elevations of the Nova Scotia Highlands.

Most highland landforms are characterized by erosion-resistant rocks, derived from early Paleozoic mountain-forming events. In Quebec and northern New Brunswick, these landforms include igneous and older sedimentary formations, while the highlands of Cape Breton are mostly composed of metamorphic and plutonic rocks. Calcareous bedrock is much more common in New Brunswick than in other parts of the range. Heavily eroded rock strata of varying lithology form the upland relief and younger, usually sedimentary, bedrock underlies the lowlands. These physiographic features have been further modified by uplifting, dissection and abrasion associated with both tectonic movement and glaciation. A general topographic gradient, marked by a series of parallel peneplains, tilts from the highest elevations (>800 mASL) in northern New Brunswick towards (and under) the Atlantic Ocean. Much of the range of CM744 is <200 mASL and, while relief is generally not pronounced, topographic changes may be abrupt. The terrain varies from gently rolling plains with little relief to rugged, often deeply dissected, plateaux with steep slopes.

The entire range of CM744 was affected by late Pleistocene glaciation, and surficial landscape expression is dominated by glacial features and bedrock-controlled terrain. Till veneers are typical in the uplands and some highland areas, while exposed bedrock is common along the outer Atlantic coast of Nova Scotia and at the highest elevations in Quebec, New Brunswick and Cape Breton Island. Deeper till deposits mostly occur in lowland areas and often coincide with greater agricultural potential; these sites are generally more common in New Brunswick and Prince Edward Island. Depositional landforms, such as drumlins, morainal ridges, flutes and hummocks are important determinants of local topography. Karst topography is notable in parts of eastern Nova Scotia and southern New Brunswick. In coastal areas and river valleys, glaciofluvial, fluvial, marine and aeolian deposits characterize some of the less common but ecologically significant site conditions. The variable topography produces significant changes in local site moisture and nutrient status over short distances. Upland mineral soils are typically well to imperfectly drained Podzols (coarser textures) and Luvisols (finer textures), with Gleysols and some peat deposits in moist, poorly drained locations. In very humid areas along the outer Atlantic Coast and on the Cape Breton Highlands, Folisols are a notable soil component.

Acadian Temperate Forest

Macrogroup CM744

Forêts acadiennes de la zone tempérée

Distribution and Geographic Range

CM744 includes the upland cool temperate forests and woodlands of the Maritime Provinces (New Brunswick, Nova Scotia and Prince Edward Island) and of ecological subregions 4f-M and 4f-S in the Gaspé peninsula of Quebec.

Related Concepts

CM744 includes upland forests and woodlands that have been described in provincial/regional publications for New Brunswick, Nova Scotia and Prince Edward Island, and for ecological subregions 4f-M and 4f-S of the Balsam Fir – Yellow Birch (east) bioclimatic subdomain in Quebec. CM744 approximates the Acadian Forest Region of Halliday/Rowe.

CM744 describes the Canadian expression of upland forests and woodlands that are included (in part) in USNVC M014 [Laurentian-Acadian Mesic Hardwood – Conifer Forest] and USNVC M159 [Laurentian-Acadian Pine – Hardwood Forest & Woodland].

Riparian and wetland forests and woodlands within the range of CM744 are described by M504 [Laurentian-Acadian Flooded & Swamp Forest].

Comments

CM744 describes the easternmost upland cool temperate forests of Canada, occurring in a heavily maritime-influenced continental climate. These forests are characterized by general presence of *Abies balsamea* in combination with *Acer rubrum, Betula papyrifera, B. alleghaniensis, Picea rubens, A. saccharum, P. glauca* and/or *P. mariana.* In some areas, *Pinus strobus, Tsuga canadensis* and *Fagus grandifolia* are important constituents of these forests. CM014 [Eastern North American Temperate Hardwood – Conifer Forest] describes mixed upland hardwood – conifer forests in more continental climates to the west of the range of CM744, characterized by higher importance of *A. saccharum, B. alleghaniensis* and *P. glauca,* and general absence of *P. rubens* and *P. mariana*. Upland boreal forests in eastern Canada, described by M495 [Eastern North American Boreal Forest], are distinguished by general absence of temperate species like *B. alleghaniensis, A. rubrum, A. saccharum, P. strobus, P. resinosa, P. rubens* and *T. canadensis*. Understories in CM744 also include species with more southerly distributions (e.g., *Acer pensylvanicum*).

Acadian Temperate Forest

Macrogroup CM744

Forêts acadiennes de la zone tempérée

Source Information

Number of Source Plots for CM744: 4606 (Canadian National Vegetation Classification. 2015. CNVC Master Database [VPro13/MSAccess 2010 format]. Natural Resources Canada, Sault Ste. Marie, ON.)

Information Sources (data):
Basquill, S.P. (compiler). 2015. Maritime provinces of Canada regional forest ecosystem plot database. Standardized forest ecosystem plot data compilation and classification from N.B. Dept. Nat. Resour.; P.E.I. For., Fish, & Wildlife Div., Dept. Commun., Land, & Environ.; N.S. Dept. Nat. Resour.; N.S. Environ.; Parks Can.; the Atlantic Can. Conserv. Data Centre; and other sources. Atlantic Can. Conserv. Data Centre, Sackville, NB. (4224 plots)

Ministère des Ressources naturelles, de la Faune et des Parcs, Forêt Québec. 2003. Base de données des points d'observation écologique (version 2003). Gouv. du Qué., Min. des Res. nat., de la Faune et des Parcs, Forêt Qué., Dir. des inv. for., QC. (382 plots)

Concept Authors: K. Baldwin, S. Basquill, K. Chapman, M. Major, J-P. Saucier, P. Uhlig
Description Authors: S. Basquill, K. Baldwin
Date of Concept: November, 2016
Date of Description: January, 2020

References

Abrahamson, I. 2015. Picea glauca. In: Fire Effects Information System. U.S. Dept. Agric., For. Serv., Rocky Mt. Res. Stn., Fire Sci. Lab., Missoula, MT, US. Available: http://www.fs.fed.us/database/feis/plants/tree/picgla/all.html (accessed: October 2, 2015).

Baldwin, K.; Allen, L.; Basquill, S.; Chapman, K.; Downing, D.; Flynn, N.; MacKenzie, W.; Major, M.; Meades, W.; Meidinger, D.; Morneau, C.; Saucier, J-P.; Thorpe, J.; Uhlig, P. 2019. Vegetation Zones of Canada: a Biogeoclimatic Perspective. [Map] Scale 1:5,000,000. Nat. Resour. Can., Can. For. Ser., Sault Ste. Marie, ON

Bailey, W.G.; Oke, T.R.; Rouse, W.R. (eds.). 1997. The surface climates of Canada. McGill–Queen's University Press. Montreal, QC. 400 p.

Belland, R.J. 2010. Mosses (Bryophyta) of the Atlantic Maritime Ecozone. Pages 179-196 in: D.F. McAlpine and I.M. Smith (eds.) Assessment of species diversity in the Atlantic Maritime Ecozone. NRC Research Press. Ottawa, ON.

Bostock, H.S. 1970. Physiographic subdivisions of Canada. Geol. Surv. Can. Econ. Geol. Rep. No. 1. Pages 10-30 in: R.J.W. Douglas (ed.) Geology and economic minerals of Canada. Geol. Surv. Can., Ottawa, ON.

Boone, C. 2019. Personal communication. Provincial Forest Entomologist, Forest Health Division, Nova Scotia Department of Lands and Forestry.

Boulanger, Y.; Gauthier, S.; Burton, P.J. 2014. A refinement of models projecting future Canadian fire regimes using homogeneous fire regime zones. Can. J. For. Res. 44(4):365-376.

Brandt, J.P. 2009. The extent of the North American boreal zone. Environ. Rev. 17:101-161.

Braun, E.L. 1950. Deciduous forests of eastern North America. The Blakiston Co., Philadelphia, PA, USA. 596 p. + map.

Brouillet, L.; Coursol, F.; Meades, S.J.; Favreau, M.; Anions, M.; Bélisle, P.; Desmet, P. 2010+. VASCAN, the database of vascular plants of Canada. Available: http://data.canadensys.net/vascan/search (accessed: September 2015).

Canadian Forest Service. 2017. Canadian National Fire Database – Agency Fire Data. Natural Resources Canada, Canadian Forest Service, Northern Forestry Centre, Edmonton, AB. Available: http://cwfis.cfs.nrcan.gc.ca/ha/nfdb (accessed: July 23, 2018).

Canavan, T. 1997. Climate of Atlantic Canada: General description. Pages 9-17 in: Shaw, R.W. (ed.) Climate variability and climate change in Atlantic Canada. Workshop Proc., Dec. 3-6, 1996, Halifax, NS. Environ. Can. – Atl. Region, Bedford, NS. Occasional Report No. 9.

Carey, J.H. 1993. Pinus strobus. In: Fire Effects Information System. U.S. Dept. Agric., For. Serv., Rocky Mt. Res. Stn., Fire Sci. Lab., Missoula, MT, US. Available: http://www.fs.fed.us/database/feis/plants/tree/pinstr/all.html (accessed: Mar 16, 2018).

Carey, J.H. 1993. Thuja occidentalis. In: Fire Effects Information System. U.S. Dept. Agric., For. Serv., Rocky Mt. Res. Stn., Fire Sci. Lab., Missoula, MT, US. Available: http://www.fs.fed.us/database/feis/plants/tree/thuocc/all.html (accessed: Mar 16, 2018).

Carey, J.H. 1993. Tsuga canadensis. In: Fire Effects Information System. U.S. Dept. Agric., For. Serv., Rocky Mt. Res. Stn., Fire Sci. Lab., Missoula, MT, US. Available: http://www.fs.fed.us/database/feis/plants/tree/tsucan/all.html (accessed: Mar 16, 2018).

Chen D.; Chen H.W. 2013. Using the Köppen classification to quantify climate variation and change: an example for 1901-2010. Environ. Dev. 6:69-79.

Clayden, S. R. 2010. Lichens and allied fungi of the Atlantic Maritime Ecozone. Pages 153–178 in: D.F. McAlpine and I.M. Smith (eds.) Assessment of species diversity in the Atlantic Maritime Ecozone. NRC Research Press, Ottawa, ON.

Acadian Temperate Forest
Macrogroup CM744

Forêts acadiennes de la zone tempérée

References (cont'd)

Clayden, S. R.; Munro, M.C.; Blaney, C.S.; Vanderkloet, S.P. 2010. Vascular flora of the Atlantic Maritime Ecozone: Some new perspectives. Pages 197–213 in: D.F. McAlpine and I. M. Smith (eds.) Assessment of species diversity in the Atlantic Maritime Ecozone. NRC Research Press, Ottawa, ON.

Clayden, S.R.; Cameron, R.P.; McCarthy, J.W. 2011. Perhumid boreal and hemiboreal forests of eastern Canada. Chapter 4 in: D.A. DellaSala (ed.) Temperate and boreal rainforests of the world: ecology and conservation. Island Press, Washington DC, US.

Coladonato, Milo. 1991. Fagus grandifolia. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/plants/tree/faggra/all.html (2018, March 16).

Delcourt, H.R.; Delcourt, P.A. 2000. Eastern deciduous forests. Chapt. 10, pages 358-395 in: M.G. Barbour and W.D. Billings (eds). North American terrestrial vegetation. 2nd ed. Cambridge Univ. Press. New York, NY, USA.

Dzikowski, P.A.; Kirby, G.; Read, G.; Richards, W.G. 1984. The climate for agriculture in Atlantic Canada. Atlantic Provinces Agriculture Services Coordinating Committee. Publ. No. ACA 84-2-500. Agdex No. 070. 52 p.

Ecological Stratification Working Group. 1995. A national ecological framework for Canada. Agric. and Agri-Food Can., Res. Branch, Centre Land and Biol. Resour. Res., and Environ. Can., State of Environ. Direct., Ecozone Analysis Branch, Ottawa/Hull, ON/QC.

Ecoregions Working Group. 1989. Ecoclimatic regions of Canada. W. Strong and S.C. Zoltai (compilers). Sustain. Dev. Branch, Can. Wildlife Serv., Conserv. and Prot., Environ. Can., Ottawa, ON. ELC Series No. 23.

Environment Canada. 2015. Canadian climate normals, 1961-1990. Gov. Canada. Available: http://climate.weather.gc.ca/climate_normals/index_e.html (accessed: January 29, 2015).

Flora of North America Editorial Committee. 2007+. Flora of North America north of Mexico, vols 27, 28, 29. Oxford University Press, New York and Oxford. Available: http://www.mobot.org/plantscience/bfna/BFNAmenu.htm (accessed: November, 2015).

Fryer, J.L. 2014. Picea mariana. In: Fire Effects Information System. U.S. Dept. Agric., For. Serv., Rocky Mt. Res. Stn., Fire Sci. Lab., Missoula, MT, US. Available: http://www.fs.fed.us/database/feis/plants/tree/picmar/all.html (accessed: May 26, 2015).

Gordon, R.; Bootsma, A. 1993. Analyses of growing degree-days for agriculture in Atlantic Canada. Clim. Res. 3:169–176.

Gosselin, J.; Grondin, P.; Saucier, J-P. 1999. Rapport de classification écologique du sous-domaine bioclimatique de la sapinière à bouleau jaune de l'est (rev.). Min. des Res. nat. du Qué., Dir. des inv. for., QC. 217 p.

Grant, D.R. 1989. Quaternary geology of the Atlantic Appalachian region of Canada. Pages 393-440 in: Fulton, R.J. (ed.) Quaternary Geology of Canada and Greenland. Geology of Canada Series, No. 1.

Grondin, P.; Gosselin, J.; Saucier, J-P.; Morneau, C. 2013. La dynamique des peuplements et les végétations potentielles. Chapitre 4. pp. 294-393 dans: Min. des Res. Nat. du Qué. (éd.). Le guide sylvicole du Québec, Tome 1 - Les fondements biologiques de la sylviculture. Ouvrage collectif sous la supervision de B. Boulet et M. Huot. Les Publications du Québec. Québec, QC.

Halliday, W.E.D. 1937. A forest classification for Canada. Can. Dept. Mines & Res., Lands, Parks & For. Br. Forest Serv. Bull. 89. Ottawa, ON. 50 p. + map.

Hare, F.K.; Hay, J.E. 1974. The climate of Canada and Alaska. Vol. 11, pages 49-192 in: R.A. Bryson and F.K. Hare (eds.) World survey of climatology. Elsevier Scientific Publishing Company, Amsterdam, The Netherlands.

Hare, F.K.; Thomas, M.K. 1979. Climate Canada, 2nd Edition. John Wiley and Sons Canada Ltd. 230 p.

Hauser, A. S. 2008. Pinus resinosa. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/plants/tree/pinres/all.html (2018, March 16).

Hill, N.M.; Blaney, C.S. 2010. Exotic and invasive vascular plants of the Atlantic Maritime Ecozone. Pages 215-232 in: D.F. McAlpine and I.M. Smith (eds.) Assessment of species diversity in the Atlantic Maritime Ecozone. NRC Research Press, Ottawa, ON.

Howard, J.L. 1996. Populus tremuloides. In: Fire Effects Information System. U.S. Dept. Agric., For. Serv., Rocky Mt. Res. Stn., Fire Sci. Lab., Missoula, MT, US. Available: http://www.fs.fed.us/database/feis/plants/tree/poptre/all.html (accessed: May 27, 2015).

Kenkel, N.C.; Walker, D.J.; Watson, P.R.; Caners, R.T; Lastra, R.A. 1997. Vegetation dynamics in boreal forest ecosystems. Coenoses 12(2-3):97-108.

References (cont'd)

Li, T.; Hélie, R. (compilers). 2014. Ecozones of Canada / Écozones du Canada [map]. Canadian Council on Ecological Areas / Conseil Canadien des Aires Écologiques, CA. Scale 1:25,000,000.

Loo, J.; Cwynar, L.; Freedman, B.; Ives, N. 2010. Changing forest landscapes in the Atlantic Maritime Ecozone. Pages 35–42 in: D.F. McAlpine and I.M. Smith (eds.) Assessment of species diversity in the Atlantic Maritime Ecozone. NRC Research Press, Ottawa, ON.

Loucks, O.L. 1962. A forest classification for the Maritime provinces. Proc. Nova Scotia Inst. Sci. 25: 87-167.

Ministère des Ressources naturelles du Québec, Forêt Québec. 2002+. Les guides de reconnaissance des types écologiques. Gouv. du Québec, Québec, QC. Available: http://www.mffp.gouv.qc.ca/forets/inventaire/guide-types-ecologiques-carte.jsp (accessed: May 2015).

Myren, D.T. (ed.). 1994. Tree diseases of eastern Canada. Nat. Res. Can., Can. For. Serv., Ottawa, ON.

Natural Resources Canada. 2015. Trees, insects and diseases of Canada's forests [online]. NRCan, Ottawa, ON. Available: https://tidcf.nrcan.gc.ca/en/home (accessed: March 14, 2018).

Neily, P.; Basquill, S.; Quigley, E.; Keys, K. 2017. Ecological Land Classification for Nova Scotia. NS Dept. Nat. Res., Renew. Res. Br. DNR report FOR 2017-13.

New Brunswick Department of Natural Resources. 2014. Summary of Forest Pest Conditions in New Brunswick in 2013 and Outlook for 2014. NB Dept. Nat. Res., For. Pest Mgmt Grp. Fredericton, NB.

New Brunswick Department of Natural Resources. 2018. Summary of Forest Pest Conditions in New Brunswick in 2018. NB Dept. Nat. Res., For. Pest Mgmt Grp. Fredericton, NB.

Peel, M.C; Finlayson, B.L.; Mcmahon, T.A. 2007. Updated world map of the Koppen-Geiger climate classification. Hydrology and Earth Sys. Sci. Disc. Eur. Geosciences Union 4: 439-473.

Phillips, D.W. 1990. The climates of Canada. Environment Canada; Supply and Services Canada. 176 p.

Robitaille, A.; Saucier, J.-P. 1998. Les paysages régionaux du Québec méridional. Les Publications du Québec. Québec, QC. 213 p.

Roland, A.E. 1982. Geological background and physiography of Nova Scotia. The Nova Scotia Inst. Sci. Halifax, NS. 311 p.

Rowe, J. S. 1972. Forest regions of Canada. Can. For. Serv., Dept. Environ. Pub. No. 1300. Ottawa, ON. 172 p. + map.

Sanchez-Mata, D.; Rivas-Martinez, S. 2010. Bioclimatic dossier for the 'Circumboreal Vegetation Mapping Project' (CBVM). Pages 42-52 in: S.S. Talbot (ed.) Proc. 7th Intl. Conserv. Arctic Flora and Fauna (CAFF) Flora Grp. Workshop. January 28-February 3, 2011. Akureyri, Iceland. CAFF International Secretariat, CAFF Flora Expert Group (CFG), CAFF Proc. Series Rep. No. 8.

Saucier, J.-P.; Bergeron, J.-F.; Grondin, P.; Robitaille, A. 1998. Les régions écologiques du Québec méridional: un des éléments du système hiérarchique de classification écologique du territoire mis au point par le ministère des Ressources naturelles. L'Aubelle (février-mars). 8 p.

Saucier, J.-P.; Robitaille A.; Grondin, P. 2009. Cadre bioclimatique du Québec. pp. 186-205 dans: Manuel de foresterie, Chapitre Écologie forestière, 2e éd. Éditions Multimondes, Ordre des ingénieurs forestiers du Québec, QC.

Soil Classification Working Group. 1998. The Canadian system of soil classification. NRC Research Press, Ottawa, ON. Agric. and Agri-Food Can. Pub. 1646.

Soil Classification Working Group. 2001. Soils of Canada [map]. Scale 1:6,500,000. Agric. and Agri-Food Can. Res. Br. Available: sis.agr.gc.ca/cansis (accessed: May 12, 2016).

Sullivan, Janet. 1993. Picea rubens. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/plants/tree/picrub/all.html (accessed: March 16, 2018).

Sullivan, Janet. 1994. Betula alleghaniensis. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/plants/tree/betall/all.html (accessed: March 16, 2018).

Tirmenstein, D. A. 1991. Acer rubrum. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/plants/tree/acerub/all.html (accessed: March 16, 2018).

Tirmenstein, D. A. 1991. Acer saccharum. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/plants/tree/acesac/all.html (accessed: March 16, 2018).

Acadian Temperate Forest

Macrogroup CM744

Forêts acadiennes de la zone tempérée

References (cont'd)

Uchytil, R.J. 1991. Abies balsamea. In: Fire Effects Information System. U.S. Dept. Agric. For. Serv. Rocky Mt. Res. Stn., Fire Sci. Lab., Missoula, MT, US. Available: http://www.fs.fed.us/database/feis/plants/tree/abibal/all.html (accessed: May 26, 2015).

Uchytil, R.J. 1991. Betula papyrifera. In: Fire Effects Information System. U.S. Dept. Agric., For. Serv., Rocky Mt. Res. Stn., Fire Sci. Lab., Missoula, MT, US. Available: http://www.fs.fed.us/database/feis/plants/tree/betpap/all.html (accessed: May 27, 2015).

USNVC [United States National Vegetation Classification]. 2016. United States National Vegetation Classification Database ver. 2.0. Fed. Geogr. Data Comm., Veg. Subcomm., Washington DC, US. Available: http://usnvc.org (accessed: March 10, 2016).

Weaver, J.E.; Clements, F.E. 1938. Plant Ecology. McGraw-Hill, New York, NY, USA. 601 p.

Webb, K. 1989. Atlantic region, Quaternary resources in Canada. Pages 674-675 in: Fulton, R.J. (ed.) Quaternary geology of Canada and Greenland. Geol. Surv. Can. Geology of Canada Series, No. 1. 839 p.

Wein, R.W.; Moore, J.M. 1977. Fire history and rotations in the New Brunswick Acadian Forest. Can. J. For. Res. 7: 285-294.

Wein, R.W.; Moore, J.M. 1979. Fire history and recent fire rotation periods in the Nova Scotia Acadian Forest. Can. J. For. Res. 9: 166-178.

Wheeler, J.O.; Hoffman, P.F.; Card, K.D.; Davidson, A.; Sandford, B.V.; Okulitch, A.V.; Roest, W.R. (compilers). 1996. Geological map of Canada (CD-ROM): Geol. Surv. Can., Earth Sci. Sect., Nat. Res. Can. Ottawa, ON. Map D1860A.

Williams, H. 1995b. Geology of the Appalachian-Caledonian orogen in Canada and Greenland. Geol. Surv. Can. Ottawa, ON. Geology of Canada Series, No. 6. 944 p.

Zelazny, V.F. (ed.) 2007. Our landscape heritage: The story of ecological land classification in New Brunswick, 2nd edition. New Brunswick Dept. Nat. Res.

The information contained in this factsheet is based on data and expert knowledge that is current to the date of description. As new information becomes available, the factsheet will be updated.

Suggested Citation: Basquill, S.; Baldwin, K. Acadian Temperate Forest [online]. Sault Ste. Marie, Ontario, Canada: Canadian National Vegetation Classification. January 2020; generated January-31-2020; cited ENTER DATE ACCESSED. 14 p. Canadian National Vegetation Classification Macrogroup: CM744. Available from http://cnvc-cnvc/ca. System Requirements: Adobe Acrobat Reader v. 7.0 or higher. ISSN 1916-3266.

Acadian Temperate Forest

Macrogroup CM744

Forêts acadiennes de la zone tempérée

Comparison of Vegetation Characteristics for Eastern Temperate Forest Macrogroups

		n=2525	n=7705	n=4606	
Lifeform	**Species Name**	**CM742 Deciduous**	**CM014 Mixed**	**CM744 Acadian**	**Species Common Name**
Tree	*Tsuga canadensis*	****			eastern hemlock
	Quercus rubra	■■■■			northern red oak
	Tilia americana	■■■■			basswood
	Fraxinus americana	■■■■			white ash
	Fagus grandifolia	■■■■	****	****	American beech
	Acer saccharum	■■■■■	■■■■■	■■■■■	sugar maple
	Acer rubrum	■■■■	■■■■	■■■■	red maple
	Betula alleghaniensis	■■■■	■■■■	■■■■	yellow birch
	Abies balsamea	■■■■	■■■■	■■■■	balsam fir
	Betula papyrifera	****	■■■■	■■■	paper birch
	Picea glauca	***	■■■	■■■■	white spruce
	Pinus strobus	****	****	***	eastern white pine
	Picea rubens		****	■■■■■	red spruce
	Picea mariana			*****	black spruce
Shrub	*Cornus alternifolia*	**			alternate-leaved dogwood
	Viburnum lantanoides	***	■■■	***	hobblebush
	Acer pensylvanicum	■■■■	■■■■	■■■	striped maple
	Corylus cornuta	■■■	■■■■	■■■	beaked hazelnut
	Lonicera canadensis	■■	■■	■■	Canada fly-honeysuckle
	Acer spicatum	***	■■■■	■■■	mountain maple
	Diervilla lonicera		■■■		northern bush-honeysuckle
	Sorbus americana + S. decora		■■■	**	mountain-ashes
	Viburnum nudum		■■■	■■	wild raisin
	Vaccinium myrtilloides		***	■■■	velvet-leaved blueberry
	Kalmia angustifolia			***	sheep laurel
Herb/ Dwarf Shrub	*Arisaema triphyllum*	**			Jack-in-the-pulpit
	Polygonatum pubescens	■■			hairy Solomon's seal
	Maianthemum racemosum	■■			large false Solomon's seal
	Trillium erectum	**	**		red trillium
	Eurybia macrophylla	***	■■■		large-leaved aster
	Maianthemum canadense	■■■	■■■	■■	wild lily-of-the-valley
	Lysimachia borealis	■■	■■	■■	northern starflower
	Streptopus lanceolatus	**	■■	■■	rose twisted-stalk
	Clintonia borealis		■■■	■■■	yellow clintonia
	Cornus canadensis		■■■	■■■	bunchberry
	Oxalis montana		■■■	■■■	common wood-sorrel
	Coptis trifolia		■■■	■■	goldthread
	Linnaea borealis		***	■■	twinflower
	Trillium undulatum			■■	painted trillium
	Gaultheria hispidula			**	creeping snowberry
	Gaultheria procumbens			***	eastern teaberry
	Oclemena acuminata			**	whorled wood aster
Moss/Lichen	*Pleurozium schreberi*	**	■■■	■■■■	red-stemmed feathermoss
	Bazzania trilobata		**	■■■	three-lobed whipwort
	Hylocomium splendens			■■■	stairstep moss

Legend

Constancy:	Black bar >= 50%	*Cover:*	5 bars >= 25%	2 bars >=1%
	Grey bar >= 30%		4 bars >= 10%	1 bar <1%
	Asterisk >= 20%		3 bars >= 3%	

Acadian Temperate Forest

Macrogroup CM744

Forêts acadiennes de la zone tempérée

Comparison of Vegetation Characteristics for Macrogroup Subtypes in CM744

		n=2212	n=513	
Layer	**Species Name**	**CM744a Typic**	**CM744b Cool**	**Common Name**
Tree	*Tsuga canadensis*	****		eastern hemlock
	Picea mariana	****		black spruce
	Pinus strobus	***		eastern white pine
	Fagus grandifolia	▪▪▪▪		American beech
	Acer saccharum	▪▪▪▪▪	***	sugar maple
	Picea rubens	■■■■■	■■■■	red spruce
	Betula alleghaniensis	■■■	■■■■	yellow birch
	Acer rubrum	■■■	■■■	red maple
	Abies balsamea	■■■■	■■■■■	balsam fir
	Betula papyrifera	▪▪▪	■■■	paper birch
	Picea glauca	***	■■■■	white spruce
Shrub	*Kalmia angustifolia*	***		sheep laurel
	Vaccinium myrtilloides	▪▪▪	▪▪	velvet-leaved blueberry
	Acer pensylvanicum	▪▪▪	▪▪	striped maple
	Lonicera canadensis	▪▪	▪▪	Canada fly-honeysuckle
	Sorbus americana	**	■■	American mountain-ash
	Acer spicatum	**	■■■	mountain maple
	Corylus cornuta	**	▪▪	beaked hazelnut
Herb/ Dwarf Shrub	*Polystichum acrostichoides*	**		Christmas fern
	Dennstaedtia punctilobula	***		eastern hay-scented fern
	Gaultheria procumbens	**		eastern teaberry
	Medeola virginiana	**		Indian cucumber-root
	Oclemena acuminata	**	**	whorled wood aster
	Trillium undulatum	▪▪	**	painted trillium
	Aralia nudicaulis	■■	■■	wild sarsaparilla
	Clintonia borealis	■■	■■	yellow clintonia
	Cornus canadensis	■■■	■■■	bunchberry
	Dryopteris spp.	■■■	■■■	wood ferns
	Coptis trifolia	▪▪	■■	goldthread
	Oxalis montana	▪▪▪	■■■	common wood-sorrel
	Linnaea borealis	▪▪	■■	twinflower
	Rubus pubescens		▪▪	dwarf raspberry
	Solidago macrophylla		**	large-leaved goldenrod
Moss/Lichen	*Pleurozium schreberi*	■■■■	■■■■	red-stemmed feathermoss
	Bazzania trilobata	■■■	■■■	three-lobed whipwort
	Hylocomium splendens	▪▪▪	■■■■	stairstep moss
	Ptilium crista-castrensis	***	■■■	knight's plume moss
	Hylocomiastrum umbratum		***	shaded wood moss

Legend

Constancy:	Black bar >= 50% Grey bar >= 30% Asterisk >= 20%	*Cover:*	5 bars >= 25% 4 bars >= 10% 3 bars >= 3%	2 bars >=1% 1 bar <1%