

## Eastern Temperate Mixed Forest



### General Description

The *Eastern Temperate Mixed Forest* zone covers an area of approximately 354,000 km<sup>2</sup> along the northern edge of eastern North American temperate forests. It extends for over 2,000 km in a band of varying width from southeastern Manitoba to the Gaspé Peninsula. This zone marks the northern extent of the humid temperate climate in eastern North America, and the transition between broad-leaved temperate forests and conifer-dominated boreal forests. Contemporary landcover is dominated by forests and numerous water bodies, but agriculture, settlement and industrial activities are significant contributors to the landscape mosaic.

### Vegetation

Productive closed forests dominate most upland sites, although open forests and woodlands are sometimes associated with very dry sites. Forest canopies are primarily a mixture of cold-deciduous broad-leaved and evergreen coniferous species, although patches of pure broad-leaved or conifer canopies are relatively common. Vertical stand structure is typically multi-storied; tall conifers (especially eastern white pine [*Pinus strobus*] and white spruce [*Picea glauca*]) often occur as emergents above a hardwood canopy. Depending on overstory composition and site conditions, understory shrub and herb layers vary from dense to sparse. Cold-deciduous broad-leaved shrubs, perennial herbs and tree regeneration are the most common understory growth forms.

Currently, anthropogenic disturbance is a dominant factor in forest dynamics, influencing forest composition. Windthrow, ice loading and insect infestations are the most widespread modes of natural disturbance. Stand-replacing fire is a factor in the westernmost portion of the zone where the climate is drier. Forests are characteristically uneven-aged mixedwoods containing multiple species in the tree stratum. However, even-aged stands can develop after stand-replacing disturbance.

The main tree species throughout the zone include balsam fir (*Abies balsamea*), paper birch (*Betula papyrifera*), red maple (*Acer rubrum*), trembling aspen (*Populus tremuloides*) and white spruce. East of the Great Lakes, sugar maple (*Acer saccharum*), red maple and yellow birch (*B. alleghaniensis*) often dominate canopies. West of Lake Superior, trembling aspen is the primary broad-leaved species. Eastern white cedar (*Thuja occidentalis*) is a common companion species throughout the zone. Eastern white pine, red pine (*Pinus resinosa*) and northern red oak (*Quercus rubra*) are common canopy associates in the Great Lakes and western Quebec portions of the zone; red spruce (*Picea rubens*) is an important canopy constituent in the east. East of the Great Lakes, American beech (*Fagus grandifolia*) and eastern hemlock (*Tsuga canadensis*) occur occasionally in southern portions of the zone. Alluvial forests dominated by black ash (*Fraxinus nigra*), eastern white cedar, balsam poplar (*Populus balsamifera*), balsam fir, red maple, paper birch and yellow birch occur on stable floodplain terraces.

In addition to regenerating balsam fir, common understory species throughout the zone include mountain maple (*Acer spicatum*), beaked hazelnut (*Corylus cornuta*), Canada fly-honeysuckle (*Lonicera canadensis*) and northern bush-honeysuckle (*Diervilla lonicera*). Typical herb/dwarf shrub species include bunchberry (*Cornus canadensis*), wild lily-of-the-valley (*Maianthemum canadense*), northern starflower (*Lysimachia borealis*), yellow clintonia (*Clintonia borealis*), wild sarsaparilla (*Aralia nudicaulis*) and rose twisted-stalk (*Streptopus lanceolatus*). Vernal ephemeral forbs like spring beauty (*Claytonia* spp.) and trout lily (*Erythronium americanum*) are characteristic of maple-dominated stands east of the Great Lakes. Bryophytes are most common on tree boles, and only occur as significant ground cover under conifer canopies. The most common moss species is red-stemmed feathermoss (*Pleurozium schreberi*). On dry sites, especially under open canopies, ground lichens (especially clad lichens [*Cladonia* spp.] and reindeer lichens [*Cladina* spp.]) are prevalent.

Wetlands are common on the landscape in poorly drained locations, especially in bedrock basins on the Shield, on low gradient floodplains and along Great Lakes shorelines. All wetland classes (swamps, marshes, fens and bogs) occur. Peat accumulation occurs under nutrient-poor hydrological conditions. Swamps develop where seepage provides higher nutrient status. Marshes and rich fens occur at the margins of shallow water bodies and in areas of permanently elevated water tables.

Nutrient-rich treed swamps are dominated by black ash, eastern white cedar, balsam poplar, balsam fir, red maple, paper birch or yellow birch; black spruce (*Picea mariana*) and tamarack (*Larix laricina*) are prevalent in nutrient-poor wetlands. Shrub swamps, annually active floodplains and hummocky fens include speckled alder (*Alnus incana* ssp. *rugosa*), mountain holly (*Ilex mucronata*), common winterberry (*I. verticillata*), sweet gale (*Myrica gale*), white meadowsweet (*Spiraea alba*), black chokeberry (*Aronia melanocarpa*), red-osier dogwood (*Cornus sericea*) and a variety of willows (e.g., sandbar willow [*Salix interior*], tea-leaved willow [*S. planifolia*]) and graminoids (e.g., tall mannagrass [*Glyceria grandis*]).

Marshes dominated by broad-leaved cattail (*Typha latifolia*), common reed (*Phragmites australis*) or

hard-stemmed bulrush (*Schoenoplectus acutus*) occur on the margins of water bodies. In deeper quiet waters, aquatic vegetation often includes fragrant water-lily (*Nymphaea odorata*). Shallow marshes and wetter fens are dominated by sedges (e.g., water sedge [*Carex aquatilis*], woolly-fruit sedge [*C. lasiocarpa*], tussock sedge [*C. stricta*]), water horsetail (*Equisetum fluviatile*), bluejoint reedgrass (*Calamagrostis canadensis*) or mannagrasses (*Glyceria* spp.). Where water tables fluctuate and some root zone drying occurs during the growing season, fens include bog birch (*Betula pumila*), willows (e.g., bog willow [*Salix pedicellaris*]) and stunted tamarack. On these sites, brown mosses like ribbed bog moss (*Aulacomnium palustre*), golden fuzzy fen moss (*Tomentypnum nitens*) and hook mosses (*Drepanocladus* spp.) usually dominate between *Sphagnum* hummocks.

Nutrient-poor bogs and fens include stunted black spruce and tamarack, as well as common Labrador tea (*Rhododendron groenlandicum*), leatherleaf (*Chamaedaphne calyculata*), velvet-leaved blueberry (*Vaccinium myrtilloides*), early lowbush blueberry (*V. angustifolium*), cranberries (*Vaccinium oxycoccus*, *V. microcarpon*, *V. macrocarpon*), pale bog laurel (*Kalmia polifolia*), glaucous-leaved bog rosemary (*Andromeda polifolia* var. *latifolia*) and few-seeded sedge (*Carex oligosperma*).

Upland grasslands and shrublands are rare on the landscape, other than immediately following forest removal or on abandoned fields and very dry sites. Along Great Lakes shorelines, beaches and sand dunes are populated by specialist species like sand cherry (*Prunus pumila*), American beachgrass (*Ammophila breviligulata*) and beach pea (*Lathyrus japonicus*).

## Climate

The *Eastern Temperate Mixed Forest* zone occurs within the continental cool temperate macroclimate of eastern Canada. Temperature extremes are more moderate than are those of the adjacent *Eastern Boreal Forest* zone. In general, the climate is increasingly humid eastwards, varying from subhumid at the western edge of the zone to humid in eastern Ontario and western Quebec to very humid with maritime influences in eastern Quebec. On the Gaspé Peninsula, this zone occurs at low elevations below the *Eastern Boreal Forest* and

*Acadian Temperate Forest* zones. Overall, winters are cold and snowy, and summers are warm and moist.

Mean annual temperatures vary from approximately 1°C along the northern and western edges of the zone (and at higher elevations of the Notre Dame Mountains in Gaspésie) to >5°C at the southern extent of the zone in east-central Ontario and the Quebec Eastern Townships. The growing season averages between approximately 1300 and 1700 growing degree days above 5°C, with the longest period occurring at low elevations in southern Quebec. Mean annual precipitation follows a strong west to east gradient, increasing from approximately 600 mm near the Manitoba border to >1100 mm in some areas of eastern Ontario and Quebec. Rainfall significantly exceeds snowfall.

### **Physiography, Geology, Topography, Soils and Land Cover**

This zone occurs primarily in the southern James and Laurentian physiographic regions of the east-central Precambrian Shield. South of the Shield, in the Appalachian physiographic region, it occurs in the Eastern Quebec Uplands, the Sutton Mountains, the Megantic Hills and at all but the highest elevations in the Notre Dame Mountains and Chaleur Uplands of the Gaspé Peninsula. In the St. Lawrence Lowlands physiographic province, this zone occurs east of approximately Granby, Quebec.

Most of the Shield landscapes in Ontario and western Quebec comprise rolling terrain containing numerous wetlands and lakes, with elevations largely below 500 mASL and local relief rarely exceeding 100 m. However, in the Abitibi Uplands of eastern Ontario and the Laurentian Highlands of Quebec the topography is considerably more rugged and dissected, with elevations up to 800 mASL. The geology consists of Precambrian sedimentary and crystalline rocks.

The dominant features of the highland and mountainous areas in the Appalachian physiographic region are the Notre Dame Mountains and the Eastern Quebec Uplands, developed from an ancient peneplain of Cretaceous age. On the Gaspé Peninsula, this zone occurs below approximately 400 mASL. Southwest of the Gaspé Peninsula, the zone occurs at elevations up to approximately 900 mASL in the Sutton Mountains and Megantic Hills.

The entire zone was affected by late Pleistocene glaciation, and surficial landscape expression is dominated by glacial features and bedrock-controlled terrain. The predominant parent material is glacial till, often occurring as shallow veneers overlying bedrock on upland sites while deeper deposits fill landscape depressions. Coarse-textured glaciofluvial materials (e.g., outwash plains) are relatively common on the Shield, and fine-textured glaciolacustrine and glaciomarine sediments are notable in northwestern Ontario and in the St. Lawrence River Valley in Quebec. Mineral soils are typically Podzols, Brunisols and Luvisols, with Gleysols occurring in moist, poorly drained locations. Organic soils occur where deeper peat deposits accumulate in poorly drained areas.

### **Notes**

The *Eastern Temperate Mixed Forest* zone borders the *Eastern Boreal Forest* to the north and at higher elevations on the Gaspé Peninsula. To the west, it adjoins the *Great Plains Parkland* in southern Manitoba. On the Gaspé Peninsula, the neighbouring zone is the *Acadian Temperate Forest*. In eastern Ontario and southern Quebec, this zone borders the *Eastern Temperate Deciduous Forest* to the south. In north-central Ontario, the zone is divided by Lake Superior. West of Lake Superior and in southeastern Quebec, this zone continues to the south and east into the United States.