Ecological Land Classification

Internationally, various systems exist to delineate natural regions based on ecological factors. In Ontario, the Ministry of Natural Resources (MNR) defines ecological units on the basis of bedrock, climate (temperature, precipitation), physiography (soils, slope, aspect) and corresponding vegetation, creating an Ecological Land Classification (ELC) system. This classification of the landscape enables planners and ecologists to organize ecological information into logical integrated units to enable landscape planning and monitoring.

Ontario’s ELC system is founded on Angus Hills’ Site Regions and Districts, first adopted in the 1950s. Since then, MNR has continued to develop and refine the province’s ecological divisions, enhancing their compatibility with national and continental classification systems. The ELC hierarchy and associated products are multi-scale and extend from broad provincial level down to very fine-scale vegetation and substrate levels. Ontario’s ELC system presently is composed of three upper level nested ecological units: ecozones, ecoregions and ecodistricts (Fig. 1) and two non-nested finer scale units, ecosites and ecoelements.

The Ontario ELC system applies to many areas of provincial business including protected area identification, wildlife habitat definition and forest management planning. The lower levels of the hierarchy (ecosites, ecoelements) are particularly relevant to land use planning at the municipal level. As outlined in section 2.1 of the 2005 Provincial Policy Statement (PPS), municipalities must protect natural features and areas. The ELC system provides methodologies for identifying and mapping these areas in a form that is useful for land-use planning.

The broader units of the ELC hierarchy are most applicable to provincial and regional planning, while finer units are used for detailed resource management applications. This factsheet will familiarize you with the broader ELC units that may be relevant to provincial and municipal land-use planning initiatives in central and southern Ontario: ecozones, ecoregions and ecodistricts.

How Ontario’s ELC System is Used

The classification units used in the ELC system exist at a variety of scales. The system has been developed to permit a range of analyses. Noted below are examples of how the ELC system’s broadest classification units are used.

<table>
<thead>
<tr>
<th>Ecozone</th>
<th>Ecoregion</th>
<th>Ecodistrict</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uses: National and coarse-scale provincial reporting such as analyses of climate, demographics and watersheds</td>
<td>Uses: Determining the level of significance or status of wetland classes and certain other natural heritage features (e.g., old growth forest), setting targets for Wilderness Class provincial parks, State of the Forest reporting and studying natural disturbance regimes</td>
<td>Uses: Assessing biodiversity levels, defining seed zones, mapping ecosystem types and setting targets for the identification of natural heritage systems</td>
</tr>
</tbody>
</table>

While municipal planning typically occurs at a scale even more detailed than ecodistricts, the use of ecodistricts in planning promotes coordinated, integrated and comprehensive planning for ecosystems across municipal boundaries. For example, MNR’s Natural Spaces program has been developing an approach for identifying natural heritage systems at a landscape scale based on ecodistricts, which could be used to support coordinated land use planning.

March 2007
Fig. 1: Ecozones, ecoregions and ecodistricts are defined by the characteristics noted, and are nested units in Ontario’s Ecological Land Classification system. The Mixedwood Plains Ecozone, for example, contains two ecoregions (Lake Simcoe - Rideau and Lake Erie- Lake Ontario) which are themselves divided into numerous ecodistricts as shown by the illustration of Lake Erie-Lake Ontario ecodistricts.
Ecozones are very large areas defined by a distinctive bedrock domain. The characteristic bedrock domain, in concert with long-term continental climatic patterns, has a major influence on the ecosystem processes and biota occurring there. 

Ecozones form the broadest units of Ontario’s ELC system, and they reflect environmental variation at a continental scale. From north to south, Ontario’s three ecozones are: Hudson Bay Lowlands, Ontario Shield and Mixedwood Plains.

Central Ontario’s Shield Ecozone

The Ontario Shield Ecozone occupies approximately 60% of the land base in Ontario, and extends from the contact zone with the Hudson Bay Lowlands to the limestone that underlies the Mixedwood Plains Ecozone. With the exception of local inliers and Eastern Ontario’s complex Frontenac Axis, the Ontario Shield ecozone encompasses all of the Precambrian bedrock found in the province. For the purposes of the 2005 PPS, the limit of the Canadian Shield extends into the Mixedwood Plains ecozone. Please refer to Fig. 1 in the 2005 PPS.

Coniferous forests composed of Black Spruce, Balsam Fir, Jack Pine and Tamarack dominate the north and central parts of the Ontario Shield. Fire, insects and wind are the dominant forces of change in these forests. Moving southward, mixed forests and deciduous forests of tolerant hardwoods (e.g., Sugar Maple and Beech) are more frequent. The composition, structure and dynamics of these ecosystems are determined through small gaps created by individual tree fall (gap-phase dynamics). Wetlands, including peatlands are abundant in this ecozone.

The forests and wetlands of the Ontario Shield support a moderate diversity of wildlife as a result of the combination of northern and southern habitat elements. Woodland Caribou is found in the northern reaches of the ecozone, while White-tailed deer is abundant in the south. Moose, Black Bear, Gray Wolf, Canada Lynx, American Marten, Red Squirrel, Wood Frog, Barred Owl, Boreal Owl, Gray Jay, Pileated Woodpecker, Blackburnian Warbler and White-throated Sparrow inhabit the Shield’s forest ecosystems. Aquatic habitats of the Shield contain species such as Northern Pike, Walleye and Lake Trout.

Southern Ontario’s Mixedwood Plains Ecozone

Ontario’s southernmost ecozone, occupying less than 10% of the province, is defined by the limestone and dolostone bedrock that occurs south of the Precambrian Shield. This ecozone is bounded in the south and west by Lake Huron, Lake Erie, Lake Ontario and the St. Lawrence River. The predominant type of natural disturbance in forest ecosystems is gap-phase dynamics, although major wind events and insect outbreaks can cause more extensive disturbance. In wetland systems, beavers are a major force of change.

Vegetation is diverse, despite the conversion of many natural lands for agriculture and urban development. Mixed forests of deciduous and coniferous trees occur, as well as areas dominated by deciduous tree species as in Carolinian forests. Two globally imperilled ecosystems occur in the ecozone: tallgrass prairie and limestone barrens called ‘alvars’. Wetlands are numerous in certain areas, although many have been drained. Plants and wildlife in this ecozone are among the most diverse in Canada, but they face significant challenges due, in large part, to habitat loss and fragmentation.

Characteristic wildlife in this ecozone include White-tailed Deer, Red Fox, Coyote, Raccoon, Striped Skunk, Eastern Gray Squirrel, Great Blue Heron, Red-tailed Hawk, Black-capped Chickadee, Wood Thrush, Yellow Warbler, Painted Turtle, Redbacked Salamander and Smallmouth Bass. Alien invasive species are an increasing threat to native species in this ecozone.
Ontario Shield Ecozone: Georgian Bay Ecoregion (5E)

An ecoregion is defined by a characteristic range and pattern in climatic variables including temperature, precipitation and humidity. The climate within an ecoregion has a profound influence on the vegetation types, soil formation, other ecosystem processes and biota associated with the ecoregion. Nine ecoregions are nested within the Ontario Shield Ecozone, with Ecoregion 5E occurring in central Ontario. Two ecoregions are nested within Southern Ontario’s Mixedwood Plains Ecozone.

The Georgian Bay Ecoregion is located in south-central Ontario, extending southeast from Lake Superior to the central portion of the Ottawa River valley in the east. The complex Precambrian bedrock is frequently exposed, creating the rugged landscape associated with the region. Where bedrock is not visible, it is covered with ground moraine (till) of variable depth. The ecoregion is dominated by mixed forests. Lakes and rivers cover over 10% of the surface area of the ecoregion. Wetlands are relatively rare and represent only 2.5% of the total land cover.

The vegetation in Ecoregion 5E is representative of the Great Lakes – St. Lawrence Forest Region. It is characterized by a mixture of northern and southern species. The deciduous forests of this ecoregion produce the spectacular colours that Ontarians witness each fall.

5E Characteristic Trees and Wildlife:

- Eastern White Pine
- Red Pine
- Eastern Hemlock
- Yellow Birch
- Sugar Maple
- Black Spruce
- Common Loon
- Ruffed Grouse
- Common Raven
- Fisher
- Black Bear
- Eastern Wolf
- Moose
- Beaver
- River Otter
- Painted Turtle
- Brook Trout

Georgian Bay Ecoregion (5E) Ahmic Harbour, Parry Sound area.
Photo credit: P. Kor
The Lake Simcoe – Rideau Ecoregion extends southward from a line connecting Lake Huron in the west to the Ottawa River in the east. The underlying bedrock is primarily dolostone and limestone. Many areas along the northern fringe of this ecoregion are characterized by extensive bare bedrock plains. Alvar species are present on some of these limestone plains. Conversely, the remainder of the ecoregion is draped with thick deposits of glacial and post-glacial sediments in the form of massive moraines (Oak Ridges) and broad till sheets. The Niagara Escarpment, most of which is included in the Lake Simcoe - Rideau Ecoregion, provides an exception to the otherwise relatively flat landscape. Wetlands and water bodies comprise 5% and 4% of the area, respectively.

The ecoregion also falls within the Great-Lakes St. Lawrence Forest Region, with a greater diversity of southern species than the Georgian Bay Ecoregion. Currently, 57% of the ecoregion exists as agricultural land, with deciduous and mixed forests covering a majority of the remaining natural landscape.

**Mixedwood Plains Ecozone: Lake Simcoe - Rideau Ecoregion (6E)**

- Sugar Maple
- American Beech
- White Ash
- Eastern Hemlock
- White Cedar
- Black Ash
- White-tailed Deer
- Groundhog
- Hairy-tailed Mole
- Little Brown Bat
- Wood Duck
- Eastern Towhee
- Northern Cardinal
- Bullfrog
- Spring Peeper
- Muskelunge

Lake Simcoe - Rideau Ecoregion (6E) Baltimore Creek ANSI, Port Hope area.

Photo credit: P. Kor
Bounded by the southern Great Lakes, the Lake Erie-Lake Ontario Ecoregion, also called the Carolinian Forest Ecoregion, is the southernmost ecoregion in the province. The limestone bedrock in this ecoregion is rarely exposed except along the southern portion of the Niagara Escarpment. Rather, till plains and deep, fine grained sediments from glacial and post-glacial lakes blanket the sedimentary bedrock, imparting a very flat relief to much of the ecoregion. Wetlands and water are found on less than 2% of the ecoregion.

The Lake Erie-Lake Ontario Ecoregion is contained within the Deciduous Forest Region and has the greatest diversity of species in Canada. It is estimated that almost 400 bird species, 2,200 species of herbaceous plants and 70 species of trees are found here. Distinctive Carolinian tree species include Tulip Tree, Sycamore, Kentucky Coffee-tree, and the endangered Cucumber Tree and Butternut. The ecoregion also supports the most extensive remnants of tall grass prairie vegetation in the province. The animal species in this ecoregion include many that are at risk or provincially rare, including Spiny Softshell Turtle, Smallmouth Salamander, Karner Blue butterfly, American Badger and Acadian Flycatcher. The area is the province’s most developed ecological region, with 78% and 7% of the land area converted to agriculture and to sub/urban land-uses, respectively.

Mixedwood Plains Ecozone: Lake Erie - Lake Ontario Ecoregion (7E)

The Lake Erie-Lake Ontario Ecoregion is contained within the Deciduous Forest Region and has the greatest diversity of species in Canada. It is estimated that almost 400 bird species, 2,200 species of herbaceous plants and 70 species of trees are found here. Distinctive Carolinian tree species include Tulip Tree, Sycamore, Kentucky Coffeetree, and the endangered Cucumber Tree and Butternut. The ecoregion also supports the most extensive remnants of tall grass prairie vegetation in the province. The animal species in this ecoregion include many that are at risk or provincially rare, including Spiny Softshell Turtle, Smallmouth Salamander, Karner Blue butterfly, American Badger and Acadian Flycatcher. The area is the province’s most developed ecological region, with 78% and 7% of the land area converted to agriculture and to sub/urban land-uses, respectively.

7E Characteristic Trees and Wildlife:
- Sugar Maple
- American Beech
- White Ash
- Eastern Hemlock
- Eastern White Pine
- Striped Skunk
- White-tailed Deer
- Raccoon
- Green Heron
- Wild Turkey
- Red-bellied Woodpecker
- Eastern Kingbird
- American Toad
- Eastern Garter Snake
- Painted Turtle
- Yellow Perch
- Channel Catfish
Ecodistricts

Alien Invasive Species: An ‘invasive species’ is non-native (or alien) to the ecosystem under consideration and its introduction causes or is likely to cause economic or environmental harm or harm to human health.

Alvar: Naturally open areas of thin soil over essentially flat limestone or marble rock with trees absent or not forming a continuous canopy and characterized by distinctive flora and fauna. Alvars are globally rare ecosystems.

Frontenac Axis: The southern extension of the Precambrian Shield in eastern Ontario, extending from near Gananoque and Brockville along the St. Lawrence River to near Westport. Areas of tilted and alternating layers of erosion-resistant igneous rocks and more easily eroded marbles result in a topography of ridges and valleys. The rock ridges have thin sandy soils that support sparse forest cover, while the intervening valleys sustain many forests, wetlands and lakes.

Inlier: An area or group of rocks surrounded by rocks of younger age.

Limestone, Dolostone: Basic, calcium-rich sedimentary rocks many of which have tiny fragments or impressions of fossil animal shells embedded in them.

Moraine: Mound or ridge of unsorted glacial material, mostly till, deposited by direct action of glacier ice.

Outlier: An area or group of rocks surrounded by rocks of older age.

Precambrian Shield: The largest mass of exposed Precambrian rock on earth, centred on Hudson Bay and extending for 8 million km² over Canada from the Great Lakes to the Canadian Arctic and into Greenland. The rock is the oldest type known, and was formed between 3.8 billion and 544 million years ago.

Tallgrass prairie: Natural grasslands with a great diversity of grasses, wildflowers and animal life maintained by fire. Tallgrass prairie is a globally imperilled ecosystem and one of the most endangered ecosystems in Canada.

Till: Glacial deposits laid down by the ice with little or no transportation or sorting by water.

Glossary

For more information on specific ecodistricts, please contact your local MNR office. To access maps of Ontario’s Ecological Land Classification system including ecoregions, ecoregions and ecodistricts, please contact Land Information Ontario (LIO) at http://www.lio.mnr.gov.on.ca/ or 705-755-1878, or the Ecological Land Classification Program at (705) 946-7478.

Nested within an ecoregion, ecodistricts are defined by a characteristic set of physiographic features, including bedrock and/or surficial geological features and topography. These features play a major role in determining the vegetation of an ecodistrict. They affect successional pathways, patterns of species association and habitats. In addition to physiography, local climatic patterns, such as lake-effect snowfall areas, may characterize ecodistricts.

Ecodistricts are distributed within central and southern Ontario’s ecoregions as follows:

- Georgian Bay Ecoregion (5E): 11 ecodistricts
- Lake Simcoe - Rideau Ecoregion (6E): 16 ecodistricts
- Lake Erie – Lake Ontario Ecoregion (7E): 6 ecodistricts


