

Land Cover

Abstract

This map shows the distribution of land cover types across Canada, based on satellite data obtained in 1995. The land cover map contains 31 classes: 12 forest; 3 shrubland; 7 tundra/grasslands; 7 developed land types including cropland, mosaic and built-up areas; and 2 water cover types.

Each land cover type can be identified by its unique spectral signature. Each signature is identified by a particular colour on the map. A general colour guide to identify land cover classes is shown below.

Colour Guide

- green colours generally represent coniferous forest
- brownish colours portray more northern coniferous forest
- yellow/orange to reddish colours stand for broadleaf and various mixed forest classes
- light greenish yellow to beige represent poorly forested land cover types including wetlands
- bluish colours in the north stand for tundra except for recent burns which are shown in dark blue in the northern part of the coniferous forest
- lighter colours in the south portray grassland and developed land

Detailed descriptions of the land cover classes used on the map are found in the section *Land Cover Classification* located further below.

Origin of the Data

This map is based on satellite data obtained in 1995 by the Advance Very High Resolution Radiometer (AVHRR) on board the NOAA-14 (National Oceanic Atmospheric Administration) satellite. To achieve this image, a complicated data process, which consists of two main phases, is performed. A noise-free data set is prepared and land cover information is extracted. The spatial resolution is about 1 kilometre square. This means that one pixel on the map is equal to one kilometre on the ground.

Land Cover's Role

Land cover plays an important role in many Earth processes: the absorption of solar radiation and its use by the ecosystem and the air near the surface; uptake of carbon dioxide by plants; release of water vapour to contribute to cloud formation; and others. It is important information needed by international environmental conventions including those on climate, biodiversity, and desertification. Land cover type is the main parameter used in computer models of land ecosystems. From the economic and management perspectives, land cover is a key input to resource management and policy decisions.

Land Cover Classification

List of Land Cover Classes

The land cover across Canada has been summarized according to 31 land cover classes including forest, shrubland, barren/grasslands, developed land types and non-vegetated areas. The numbers for each land cover description correspond to the class numbers appearing in the legend of the map.

Forest Land

- Evergreen Needleleaf Forest
- Deciduous Broadleaf Forest
- Mixed Forest
- Burns

Open Land

- Transition Treed Shrubland
- Wetland/Shrubland
- Grassland
- Tundra

Developed Land

- Cropland
- Mosaic Land
- Urban and Built-up

Non-vegetated Land

- Water
- Snow/Ice

Forest Land



Land dominated by vegetation with a tree (woody plants with a height exceeding approximately 5 metres in most cases) crown density (percentage of the surface covered by projected tree crown perimeters) greater than 10%.

Evergreen Needleleaf Forest

Land occupied by forest containing more than 80% needleleaf trees.

High Density (1)



High density coniferous forest cover

Evergreen needleleaf forest (southern boreal) with crown density of the needleleaf species above approximately 60%. Often contains small water bodies in the landscape. Occasionally, it contains stands with less than 80% needleleaf trees (higher proportion of water compensates spectrally for the increased proportion of broadleaf trees).

Medium Density

Evergreen needleleaf forest with crown density of the needleleaf species between approximately 40 to 60%. Due to the low resolution of the data, pixels may include a mosaic of denser and thinner tree cover.

Southern Forest (2)



Southern forest cover

Medium density evergreen needleleaf forest which often occurs within, or adjacent to, high density forest (above). In most cases, it has a higher proportion of broadleaf trees or shrubs (woody plants less than 2 to 3 metres high) than the high density forest. Occurs mostly in the southern part of the boreal forest zone. Occasionally may be confused with younger high density needleleaf tree canopies (higher reflectance of the young needleleaf trees compensates for the higher reflectance of broadleaf trees in the stands).

Northern Forest (3)



Northern forest cover

Medium density evergreen needleleaf forest with shrubs and lichens commonly present in the understory. Occurs in the northern part of the boreal forest zone but in some cases, patches are found in more southern areas after old perturbations such as fire.

Low Density

Evergreen forest with crown density of the needleleaf species approximately 10 to 40%. Due to the low resolution of the data, pixels may contain a mosaic of denser and lower tree cover, including openings such as cut-overs or others.

Southern Forest (4)



Southern forest cover

Low density evergreen needleleaf forest with a higher proportion of broadleaf trees or shrubs species than high density forest (above). Occurs mostly in the southern part of the boreal forest zone, with some latitudinal overlaps with northern low density forest where broadleaf species are more abundant. Occasionally may be confused with younger higher density needleleaf trees canopies (higher reflectance of the young needleleaf trees compensates for the high reflectance of broadleaf trees in the low density stands). In some cases it may also be confused with treed wetlands.

Northern Forest (5)



Northern forest cover

Low density evergreen needleleaf forest with shrubs and lichens commonly present in the understory. Occurs mostly in the northern part of the boreal forest zone. When the tree crown density is low (near 10%), this class may consist of treed muskeg or wetlands. Occasionally, it may contain lower tree crown density (less than 10%, south of the treeline) or treeless cover (north of the treeline) where abundant water bodies are present (water reflectance has a similar effect as a denser needleleaf tree cover). In some cases (mostly after perturbations (burns) or on more humid sites), there is some latitudinal overlap with southern forest (above) because of the similarity of the ground cover (especially regarding low shrubs).

Deciduous Broadleaf Forest (6)



Broadleaf forest cover

Concentrated occurrence of deciduous broadleaf forest, generally with a high crown density. In Quebec and Ontario, this class represents primarily the shade-tolerant hardwood species (maples, yellow birch). Due to the low resolution of AVHRR data, most of the broadleaf forest elsewhere in Canada is included in the mixed forest classes (mainly mixed broadleaf, class 10).

Mixed Forest

Land occupied by forest containing 20 to 80% evergreen needleleaf or deciduous broadleaf trees (determined as the percentage of the number of the trees present, not as tree crown density). Due to the low resolution of the data, pixels may contain a mosaic of needleleaf and broadleaf cover types.

Mixed Coniferous Forest (7)



Mixed Coniferous Forest Cover

Mixed forest with the proportion of evergreen needleleaf trees exceeding approximately 60% (as % of all trees present). Occasionally may contain a higher proportion of needleleaf trees (more than 80% of the tree population) but in a younger canopy (higher reflectance of the young needleleaf trees compensates for the higher reflectance of broadleaf trees in older stands).

Mixed Intermediate Forest

Mixed forest having a proportion of evergreen needleleaf (or deciduous broadleaf) trees of approximately 40 to 60% (as proportion of all trees present). The proportion of needleleaf trees may be higher in young stands (higher reflectance of the young needleleaf trees compensates for the higher reflectance of broadleaf trees in older stands).

Mixed Uniform Forest (8)



Mixed Uniform Forest Cover

Mixed intermediate forest with a relatively uniform distribution of trees in the landscape, typically with a higher crown density.

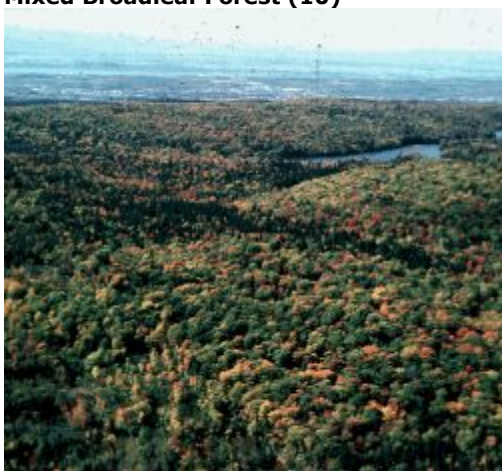
Mixed Heterogenous Forest (9)



Mixed Heterogenous Forest Cover

Mixed intermediate forest with a lower crown density or forest with a patchy distribution of trees in the landscape, typically after old disturbance (due to natural or human intervention). Patches may vary in size from tens to hundreds of metres. This class generally contains younger canopies.

Mixed Broadleaf Forest (10)



Mixed Broadleaf Forest Cover

Mixed forest with the proportion of deciduous broadleaf trees exceeding approximately 60% of all trees present. Due to the low resolution of AVHRR data, most of the broadleaf forest in Canada is included in this mixed class.

Burns

Land previously occupied by forest which was subjected to fire. At present it may contain broadleaf or needleleaf trees with a tree crown density of less than 10% or standing dead trees. Occasionally this category may contain vegetated landscape with concentrations of water bodies. Depending on site conditions, fire intensity and age, land cover after burns may be quite variable. It varies from bare soil to vegetation cover approaching low density forest canopy. This is the reason why some burns or parts of burns, after few years, are classified as low density northern forest with a shrubby ground cover; or as another type of open land. Usually, the typical patchy pattern of post-burn cover types is diagnostic. Burn classes are more reliable in the northern forest types where vegetation regrowth is slower while in more southern areas, the change from burn to other classes can be quite rapid (within less than 5 years).

Low Green Vegetation Cover (11)



Low green vegetation cover

Burns with small amounts of green vegetation present, probably burned within the last 5 years (but depends on the fire intensity and site). Standing dead trees are commonly present.

Green Vegetation Cover (12)



Green vegetation cover

Burns with greater amount of green vegetation present, implying earlier fires or more favourable site conditions. Also may occur near the perimeter of the burns when adjacent to undisturbed vegetation.

Open Land

Land with a tree crown density of less than 10%.

Transition Treed Shrubland (13)



Transition treed shrubland

Land in which tree crown density is usually below 10%. This class contains many past disturbances, mainly fires. It occurs mainly in northern boreal forest, but is occasionally found in more southern areas following disturbance. It may include significant proportions of shrubs.

Wetland/Shrubland

Land covered mainly by low (less than 1 metres in height) to intermediate woody shrubs (woody vegetation generally less than 2 to 3 metres high). Generally the proportion of high shrubs is higher than in the tundra classes. May include broadleaf tree canopy in early regeneration stages after perturbations. Most of the large wetlands occur in these classes.

High Density (14)



High density

The cover density of shrubs is higher than 60%. Many wetlands are in this class.

Medium Density (15)



Medium density

Mixture of shrubs (approximately 40 to 60%) and herbaceous cover. Some wetlands are in this class (especially fens).

Grassland (16)



A grassland

Land with herbaceous (non-woody) vegetation cover, tree or shrub cover being less than 10%. This class is limited to the prairie region.

Tundra

Land containing usually less than 10% of tree crown density. It often contains shrubs—mainly low shrubs (less than 1 metre in height), lichen, herbaceous vegetation cover, bare soil, rock, or small water bodies. It is found mostly north of the treeline, but also in mountainous regions and after disturbance in more southern areas. In tundra classes, reflectance depends on the proportions of five main cover types: shrubs, lichens, herbaceous species, bare soil (rock outcrop) and water bodies. The subcategories are differentiated by the dominance of one or more of these cover types.

Shrub and Lichen Dominated

Tundra in which shrubs and lichen are the dominant cover type. Generally, the shrubs are lower than in the Shrubland classes. The next two classes have a latitudinal gradient. They occur mainly north of the treeline, but also in northern boreal forest or mountainous areas sparsely treed.

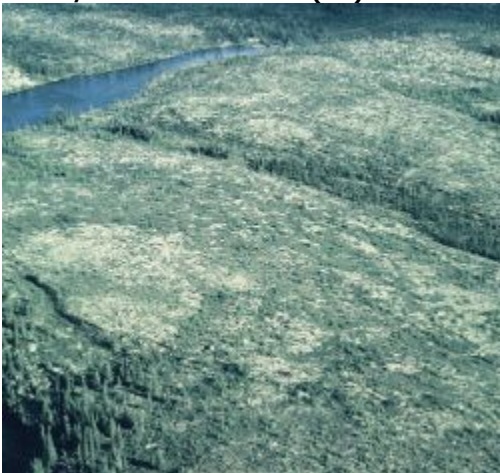
Lichen and Others (17)



Lichens

Varying amount of land cover in which lichens exert a strong effect on reflectance. In northern boreal forest, it may represent low to very low density needleleaf forest with lichen understory. North of the treeline, this class may also include abundant water bodies. This class has a latitudinal gradient. Reflectances are lowered by trees in northern boreal forest, and by small water bodies or rock outcrops north of the treeline.

Shrub/Lichen Dominated (18)



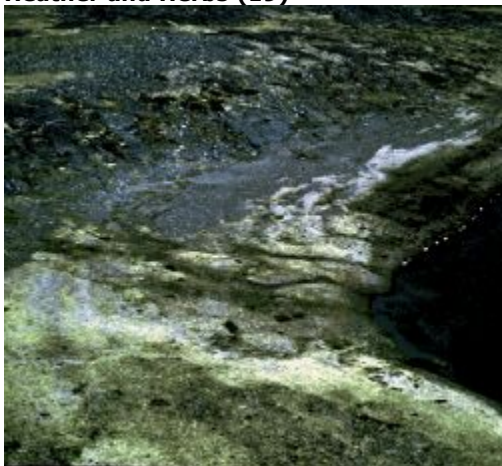
Shrubs/lichens dominated land cover

Shrub-dominated tundra in which lichen exerts some effect on reflectance. South of the treeline, trees are occasionally present in this class. This class has also a latitudinal gradient. It occurs mainly north of the tree-line, but also in mountainous areas or in northern boreal forest, mostly after perturbations.

Treeless

Tundra occurring north of the treeline, but also in mountainous areas.

Heather and Herbs (19)



Heather and herbs

Treeless tundra in which shrubs, herbs and lichen are the prevalent vegetation cover. The landscape typically consists of a pattern of shrubs, lichen, herbs, bare soil, and rock outcrops.

Low Vegetation Cover (20)



Low vegetation cover

Treeless tundra in which vegetation cover (shrubs, lichen, herbs) do not exceed approximately 40% of the ground cover.

Very Low Vegetation Cover (21)



Very low vegetation cover

Treeless tundra in which vegetation cover (shrubs, lichen, herbs) do not exceed approximately 20% of the ground cover area.

Bare Soil and Rock (22)



Bare soil and rock

Treeless tundra in which bare soil and rock outcrop are the prevalent land covers. Patches of snow cover may occur.

Developed Land

Cropland

Land covered with herbaceous (typically annual) crops which may contain a small proportion (less than 10%) of trees or shrubs.

High Biomass (23)



High biomass cover

Cropland dominated by crops with higher biomass, due to cover type (e.g. corn) or climate (adequate precipitation). May contain small proportions of other vegetation types (less than 10%).

Medium Biomass (24)



Medium biomass cover

Cropland dominated by crops with medium biomass, due to cover type or climate (subhumid). This class occurs mainly in the prairie region.

Low Biomass (25)



Low biomass cover

Cropland dominated by crops with lower biomass, due to cover type (e.g. grain) or climate (semi-arid region). This class occurs mainly in the prairie region.

Mosaic Land

Land containing a mix of cropland, forest, shrubland, grassland or built-up areas in which no one component comprises more than about 70% (by area) of the landscape.

Cropland-Woodland (26)



Cropland-woodland cover

Mosaic land in which cropland is more prevalent than forest cover. Depending on the region, lower cropland biomass may be compensated for by a higher proportion of forest. Occasionally, this class may occur in areas where herbaceous vegetation replaces the cropland component (e.g. in parks).

Woodland-Cropland (27)



Woodland-cropland cover

Mosaic land in which tree cover and shrubs are more prevalent than cropland. This class occurs mainly in the medium biomass portion of the prairie region.

Cropland-Other (28)



Cropland cover

Mosaic land in which cropland is more prevalent than other cover types. These could be forest, shrubland, or built-up areas. Compared to Cropland-Woodland, the common characteristic of these cover types is lower green biomass.

Urban and Built-up (29)



Urban and built-up cover

Land covered by buildings and other artificial structures. In most cases, built-up areas are spectrally similar to various unvegetated or low-vegetated cover types. For larger cities, this class was therefore imported from another data base. However, confusion with other classes occurs for smaller urban areas.

Non-vegetated Land

Land covered with water (in solid or liquid form).

Water (30)



Water cover

Land covered with water in liquid form.

Snow/Ice (31)



Snow/ice cover
Land covered with permanent ice or snow.

Definition of underlined term

Pixel: The smallest subdivision or unit of information in an image composed of discrete elements. Also, each individual cell of a mathematical grid. The term is not valid for continuous tone images, unless referring to the smallest particle of silver salt on a photograph.

Map Sources

Land Cover of Canada (image)

The land cover image contains 31 land cover classes: 12 forest; 3 shrubland; 6 barren land/grasslands; 7 developed land types including cropland, mosaic (a mix of cropland, forest, shrubland, grassland, or built-up areas) and built-up areas; and 2 non-vegetated land cover types. A description of all 31 classes can be seen with the Get Statistics function from the map. This image was compiled by the Canada Centre for Remote Sensing, Natural Resources Canada.

References

Canada. Natural Resources Canada. 1999. *Land Cover of Canada*. National Atlas of Canada Reference Map Series. MCR 103. Ottawa, 1999.
Rowe, J.S. 1972. *Forest regions of Canada*. Environment Canada, Canadian Forest Service, Publication 1300. 172 p.

Related Web sites (1999 – 2009)

Federal Government

Natural Resources Canada. Canada Centre for Remote Sensing. Image Showcase
http://www.ccrs.nrcan.gc.ca/ccrs/data/showcase/showcase_e.html

Natural Resources Canada. Canadian Forest Service. Pacific Forestry Centre.
Canada's National Forest Inventory

http://www.pfc.cfs.nrcan.gc.ca/monitoring/inventory/index_e.html

This site presents authoritative national statements on the distribution and structure of Canada's forests.

Natural Resources Canada. Canadian Forest Service. The State of Canada's Forests
<http://foretsCanada.nrcan.gc.ca/rpt>

