Land Cover, circa 2000-Vector

Data Product Specifications

Edition 1.0

2009-05-04

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RELEASES HISTORY

Date	Version	Description
2009-05-04	1.0	Initial version

These specifications have been produced in compliance with the *International Standard ISO/TC 211, ISO 19131: 2007 Geographic Information/Geomatics – Data product Specifications*, which refers in particular to the *ISO 10115: 2003 Geographic Information – Metadata.*

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1 OVERVIEW

1.1 Title

Land Cover, circa 2000-Vector

1.2 Reference Date

Creation date of the Data product specifications:

2009-05-04

1.3 Responsible Party

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Natural Resources Canada
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1.4 Language

Languages in which the data product specifications are available in accordance with the ISO 639-2 Standard:

eng – English

fra – French

1.5 Terms and Definitions

Attribute

Characteristic of a feature (e.g. *classification code*)

Entity

Digital representation of a feature (e.g. a lake is an entity).

1.6 Abbreviations, acronyms and definitions

AAC	“Agriculture et Agroalimentaire Canada”
AAFC	Agriculture and Agri-Food Canada
ASC	“Agence spatiale canadienne”
CCRS	Canada Centre for Remote Sensing
CCT	“Centre canadien de télédétection”
CFS	Canadian Forest Service
CIRCA 2000	Circa (sometimes italicized to show it is Latin) means "in approximately", generally referring to a year when the dates of events are approximately known. Circa 2000 refer to the year 2000 more or less a few years.
CITS	“Centre d’information topographique, Sherbrooke”
CSA	Canadian Space Agency
CSRS	Canadian Spatial Reference System
CTIS	Centre for Topographic Information in Sherbrooke
EC	Environment Canada
Ecozone	The linear forested ecozone is a tool used by Canadian Forest Service to define the delimitation of Canadian forested product by EOSD.
EOSD	Earth Observation for Sustainable Development is a project being developed to monitor the sustainable development of Canada's forests from space. Two federal partners, the Canadian Forest Service and the Canadian Space Agency, are creating the ten-year project in cooperation with the provinces and territories.
GML	Geography Markup Language
ID	Identifier
ISO 639	Is the set of international standards that lists short codes for language names
ISO 19115	Is the set of international standards that lists how to describe geographical information – Metadata
NLWIS	National Land and Water Information Service
LCC2000-V	Land Cover, circa 2000-Vector
LRS	Linear Referencing System

NAD83CSRS	North American Datum 1983 is based on the Earth's centre of gravity and also is a more accurate mathematical representation (ellipsoid) of the shape of the earth. NAD 83 allows defining the shape of the earth and the positions of features on the earth more precisely. NAD 83 is therefore more compatible with the co-ordinate system used to compute the orbit of satellites.
NID	National Identifier
NRCan	Natural Resources Canada
NTDB	National Topographic Data Base
NTS	National Topographic System
OTDD	"Observation de la Terre pour le développement durable des forêts"
OGC	Open GIS Consortium
SFS	Simple Features Specification (OGC)
TD_ UUID	Unique Universal Identifier
UML	Unified Modeling Language

1.7 Informal Description of the Data Product

Land Cover information is the result of vectorization of raster thematic data originating from classified Landsat 5 and Landsat 7 ortho-images, for agricultural and forest areas of Canada, and for Northern Territories. The forest cover was produced by the Earth Observation for Sustainable Development (EOSD) project, an initiative of the Canadian Forest Service (CFS) with the collaboration of the Canadian Space Agency (CSA) and in partnership with the provincial and territorial governments. The agricultural coverage is produced by the National Land and Water Information Service (NLWIS) of Agriculture and Agri-Food Canada (AAFC). Northern Territories land cover was realized by the Canadian Centre of Remote Sensing (CCRS).

Land Cover data are classified according to a harmonized legend build from the partner's legends. This legend is principally based on the legend described in following publication: EOSD Land Cover Classification Legend Report, on which CFS and AAFC collaborated. Some classes related to Northern environments where added in order to meet the interpretation of the Northern land cover classification experts.

Land Cover vector data are closest as possible to the source (original raster data). Slight differences can occur because the raster data goes through a data portrayal before being vectorized in order to enhance visual representation such as minimum size, smoothness of polygons and geometry.

2 SPECIFICATION SCOPE

This section describes the scope referred to by information provided in subsequent sections which describe the product.

2.1 Scope Identification

Global

2.2 Level

This scope refers to the following level of the ISO 19115 Standard:

006 – Series

2.3 Level Name

LCC2000-V

2.4 Extent

This section describes the spatial and temporal extent of the scope.

2.4.1 Description

Data from this scope cover the totality of the Canadian landmass and are created using data circa 2000.

2.4.2 Vertical Extent

Data are two-dimensional (x, y); there is no elevation (z) component.

2.4.2.1 Minimum Value

Non applicable

2.4.2.2 Maximum Value

Non applicable

2.4.2.3 Unit of Measure

Non applicable

2.4.2.4 Vertical Datum

Non applicable

2.4.3 Horizontal Extent

The horizontal extent of the Land Cover data matches the forested and agricultural areas of Canada

2.4.3.1 West Bounding Longitude

-141

2.4.3.2 East Bounding Longitude

-52

2.4.3.3 South Bounding Latitude

+43

2.4.3.4 North Bounding Latitude

+83

2.4.4 Temporal Extent

The Land Cover data are closest to the year 2000. The unavailability of satellite images at this date introduces a variability in source dates (1997 and 2005) that is one year later or earlier in 80% of the time.

2.4.4.1 Beginning Data

1996

2.4.4.2 Ending Date

2005

2.5 Coverage

Canada

3 DATA PRODUCT IDENTIFICATION

3.1 Title

Land Cover, circa 2000_vector

3.2 Alternate Title

LCC2000-V

3.3 Abstract

This product was created from classified satellite images of forested and agricultural areas and Northern Territories of Canada. The classes in LCC2000-V are based on the EOSD classification legend including NLWIS agricultural classes and the added CCRS Northern classes.

3.4 Purpose

This product aims to offer a Canadian integrated Land Cover base produced from various available classified satellite data. The Land Cover base dating extended from 1996 to 2005 nevertheless 80% of the Land Cover base come from 1999 to 2001 defined by circa 2000.

Because it was produced from classified imagery, LCC2000-V data product is linked to a given thematic data accuracy related to classified images process. This means it is possible that entities may not represent the right classes, for instance, a wetland polygon may be overlapping an agricultural area, or a forest may be in reality a plain. These omission or commissions may either be temporal variations and/or classification errors.

3.5 Topic Category

Product main topics as defined in the ISO 19115 Standard:

010 – imageryBaseMapsEarthCover

3.6 Spatial Representation Type

Type of spatial representation as defined in the ISO 19115 Standard:

001 – Vector

3.7 Spatial Resolution

Spatial Denominators of the Data:

50,000

3.8 Geographic Description

3.8.1 Authority

International Organization for Standardization (ISO)

3.8.1.1 Title

Standard for Geographic Area Codes:

ISO 3166-1:1997 *Codes for the representation of names of countries and their subdivisions – Part 1: Country codes*

3.8.1.2 Date

Reference date of the ISO 3166-1 Standard:

1997-10-01

3.8.1.3 Date Type Code

Date Type in accordance with the ISO 19115 Standard:

002 – Publication

3.8.2 Code

Geographic Region Code covered by the Product in accordance with the ISO 3166-1 Standard:

CA – Canada

3.8.3 Extent Code Type

Delimitation Polygon Extent Code Type in accordance with the ISO 19115 Standard:

1 – Inclusion (inclusive)

3.9 Reference to Specification Scope

Global

4 DATA CONTENT AND STRUCTURE

4.1 Description

The LCC2000-V is a vector product distributed as surface features (polygons) that have descriptive attributes such as the land cover class. This attribute refers to the classification codes found in the LCC2000-V product. The attribute list is described in section 4.2.2.

4.2 Feature Information

4.2.1 Application Schema

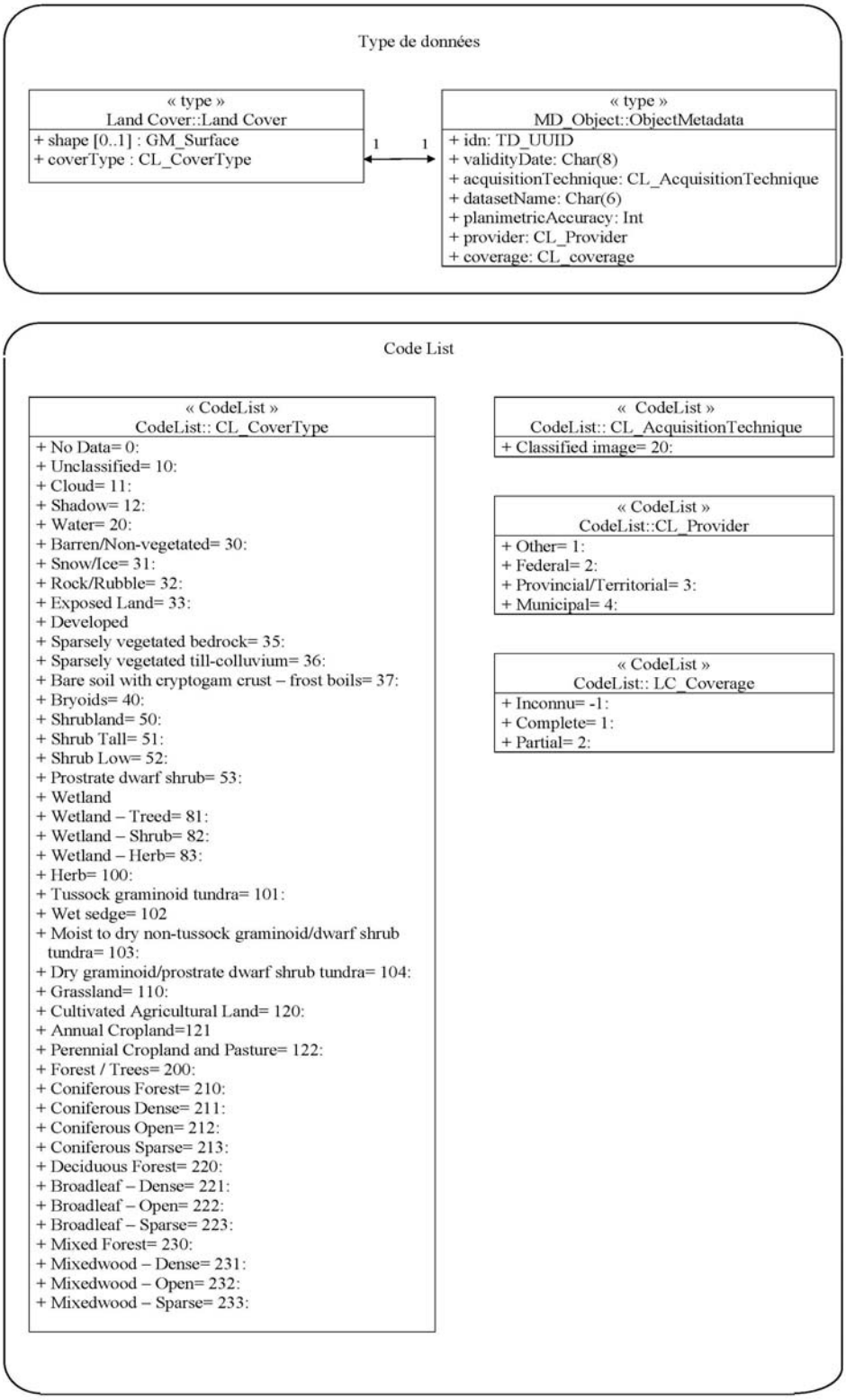

Figure 1 : Conceptual Model

4.2.2 Feature Catalogue

The feature catalogue is accessible through GeoBase Web Site (http://www.geobase.ca/)

4.3 Reference to Specification Scope

Global

5 REFERENCE SYSTEMS

5.1 Spatial Reference System

Spatial data are expressed in latitude (φ) and longitude (λ) geographic coordinates in reference to the North American Datum 1983 into Canadian Spatial reference System (NAD83CSRS). The longitude is stored as negative number to represent a position west of the prime meridian (0°). The coordinates measuring unit is the degree expressed as a 7-decimal real value.

5.1.1 Authority

5.1.1.1 Title

Coordinate Reference System Registry:

EPSG Geodetic Parameter Dataset

5.1.1.2 Date

Reference Date:

2007-02-08

5.1.1.3 Date Type Code

Date Type in accordance with the ISO 19115 Standard:

002 – publication

5.1.1.4 Responsible Party

OGP (International Organisation of Oil and Gas Producers)

URL: http://www.epsg.org

5.1.2 Code

Coordinate Reference System Identifier (CRSID):

4617

5.1.3 Space Code

EPSG - European Petroleum Survey Group

5.1.4 Version

6,12

5.2 Reference to Specification Scope

Global

6 DATA QUALITY

6.1 Completeness

The LCC2000-V data offers continuous, homogeneous and standardized land cover data for the whole of Canada. LCC2000-V is distributed as 1:250 000 scale National Topographic System (NTS) tiles.

When Land cover data produced by NLWIS (AAFC) and EOSD (CFS) have overlapping data, agricultural classes and urban classes from NLWIS are chosen; otherwise all other classes come from EOSD. In Northern areas there is no integration between data from EOSD and data of the Northern territories from CCRS. Each of them keeps their own classes on both sides of the linear forested ecozone of Canada[1]. When the linear forested ecozone go through an EOSD tile, classes from CFS are chosen for the whole tile.

6.1.1 Commission

Commissions are not verified. These are closely linked with the estimated classifier performance which is under the responsibility of the land cover data producer. All information pertaining to methodology assessment of classifier performance and quality of classified data can be found in the metadata from the original data that was vectorized to produce the LCC2000-V.

6.1.2 Omission

Omissions are not verified as they are closely linked with the estimated classifier performance which is under the responsibility of the data producer (CFS and AAFC). All information pertaining to methodology assessment of classifier performance and quality of classified data can be found in the metadata from the original data that was vectorized to produce the LCC2000-V.

6.1.3 Conceptual Consistency

The physical implementation of the LCC2000-V product was done according to the LCC2000-V conceptual model described in section 4.2.1.

6.1.4 Domain Consistency

Attribute values are validated with the XML schema containing the definition of authorized domain values as described in the feature catalogue.

The combination of authorized attribute values are validated with software developed in-house.

[1] http://atlas.nrcan.gc.ca/site/english/maps/environment/forest The linear forested ecozone is a tool used by Canadian Forest Service to define the delimitation of Canadian forested product by EOSD.

6.1.5 Format Consistency

The LCC2000-V data comply with the distribution formats described in the document: *Land Cover Data, Circa 2000-vector – Product distribution Formats* accessible on the GeoBase Web site (www.geobase.ca).

6.1.6 Topological Consistency

Topological consistency of LCC2000-V data is validated at production time via spatial integrity constraints between Land Cover in order to detect and correct overlaps, gaps, and intersections within a polygon. The application of the spatial integrity constraints ensures topological consistency between the *LCC2000-V Feature Catalogue* and the *LCC2000*-V product.

6.2 Positional Accuracy

6.2.1 Absolute or External Positional Accuracy

The geometric accuracy of LCC2000-V features is given as the difference between features position in the dataset and their real ground positions measured in reference to the geodetic network. The accuracy may vary from one feature to another. It is thus provided in attribute with each feature and is expressed in accordance with the Circular Map Accuracy Standard (CMAS).

The LCC2000-V aims a CMAS of 30 meters or better. This value is based on accuracy of the Landsat 7 orthoimages and the GeoBase Data Alignment Layer (GDAL)

Standard Circular Error: $\sigma_c = 0.7071 (\sigma_x^2 + \sigma_y^2)^{½}$
σ_x: standard deviation in the X-axis
σ_y: standard deviation in the Y-axis

Circular Map Accuracy Standard: CMAS = 2.1460 σ_c

Since the LCC2000-V is created from available existing data (e.g. federal data, provincial data), the horizontal accuracy of an LCC2000-V dataset depends on the source data used. If the accuracy exceeds this threshold (30 m), a planimetric correction is applied on the erroneous data set.

6.2.2 Relative or Internal Positional Accuracy

Unknown

6.3 Temporal Accuracy

6.3.1 Accuracy of a Time Measurement

Not applicable

6.3.2 Temporal Consistency

Not applicable

6.3.3 Temporal Validity

Not applicable

6.4 Thematic Accuracy

6.4.1 Classification Correctness

Non applicable

6.4.2 Non Quantitative Attribute Correctness

The correctness of non-quantitative attributes of LCC200-V data is validated at production step. The values extracted from the source data are then validated and any detected error is corrected.

6.4.3 Quantitative Attribute Accuracy

The correctness of quantitative attributes of LCC2000-V data is validated at production step. The values extracted from the source data are then validated and any detected error is corrected. The validation methodology depends nevertheless on the source data.

6.5 Reference to Specification Scope

Global

7 DATA CAPTURE

7.1 Description

LCC2000-V data is created using the best available data provided from NLWIS and/or EOSD and CCRS. The various data sources used are described in the data set metadata of each LCC2000-V NTS tile.

Source data (classified images) is supplied by these principal partners:

- Canadian Forest Service (CFS),
- Agriculture and Agri-Food Canada (AAFC), and
- Canadian Centre for Remote Sensing (CCRS).

Centre for Topographic Information in Sherbrooke (CTIS) integrates the land cover data into a single classification system and converts it to vectors automatically. Horizontal accuracy is validated with the GeoBase Landsat 7 orthorectified Imagery. If the LCC2000-V vector does not conform to this layer, a planimetric correction is applied.

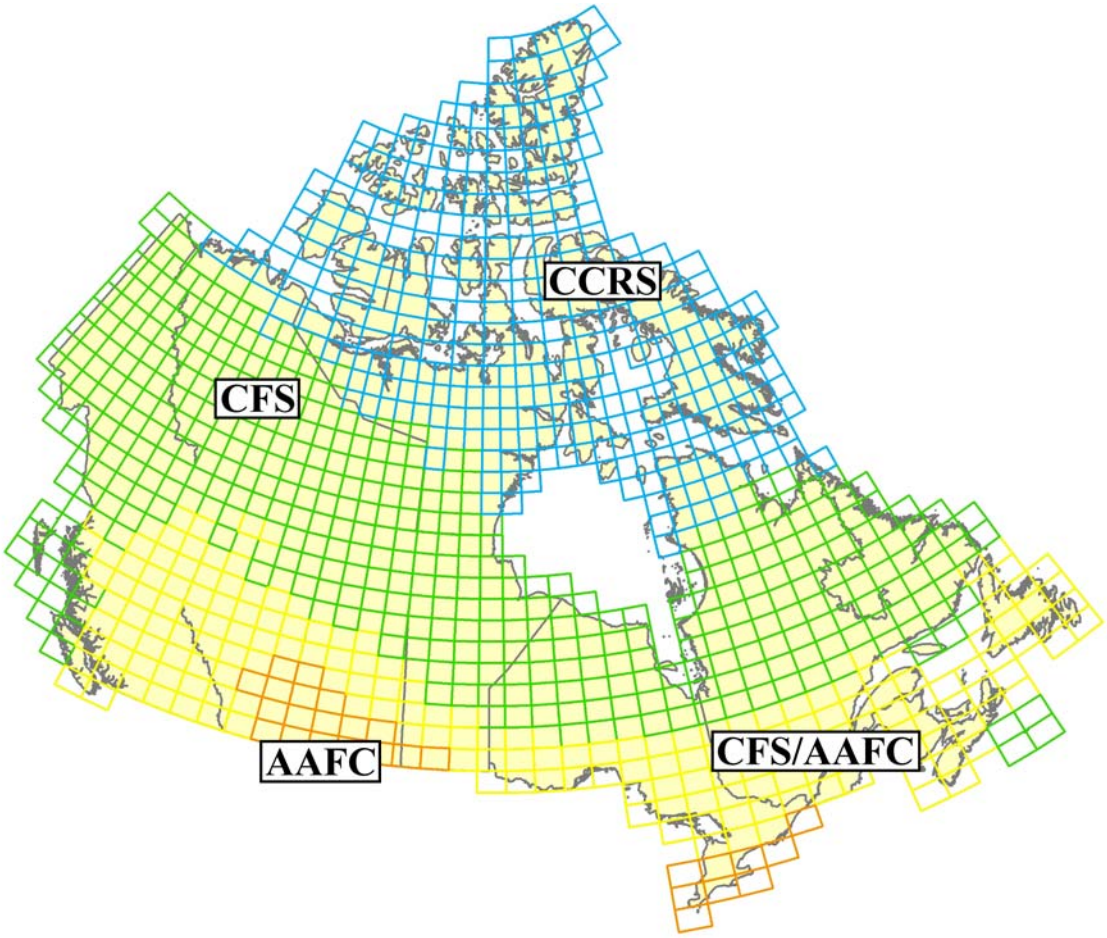

Figure 1 : Land Cover data coverage according to providers (data producers)

Data distribution of the partners over the Canadian territories is shown in figure 1. When there is a superposition between classifications of CFS (EOSD) and AAFC (NLWIS) for a given data set, land cover data is integrated while respecting source authority (NLWIS for agricultural and urban class, and EOSD for the rest) in order to preserve the best details (classes) possible.

Demarcation between EOSD (CFS) and CCRS land cover data is based on the forested ecozones of the Altas of Canada (figure 2) which was used by CFS for the delimitation of the EOSD product. Hence, EOSD tiles at the 1:250,000 scale in contact and inside the forested ecozones prevailed over the CCRS land cover data when both classification are existing for a given tile in order to respect the forest authority of CFS.

Figure 2: Forested ecozone from the Atlas of Canada used by Canadian Forest Service (CFS)

7.2 Reference to the Specification Scope

Global

8 DATA PRODUCT DELIVERY

The output file formats for the LCC2000-V product are: GML (Geography Markup Language) and SHAPE (ESRI™).

8.1 GML Delivery Format Information

8.1.1 Format Name

Geography Markup Language (GML)

8.1.2 Version

2.1.2

8.1.3 Specification

Geography Markup Language – GML – 2.1.2, OpenGIS® Implementation Specifications, 17 September 2002, OGC Document Number 02-069 (http://portal.opengeospatial.org/files/?artifact_id=11339)

8.1.4 Language

Languages used in the dataset in accordance with the ISO 639-2 Standard:

eng – English

fra – French

8.2 SHAPE Delivery Format Information

8.2.1 Format Name

SHAPE (ESRI™)

8.2.2 Version

01

8.2.3 Specification

ESRI Shapefile Technical Description, an ESRI White Paper, July 1998 (http://www.esri.com/library/whitepapers/pdfs/shapefile.pdf)

8.2.4 Language

Languages used in the dataset in accordance with the ISO 639-2 Standard:

eng – English

fra – French

8.3 Delivery Medium Information

8.3.1 Unit of Delivery

NTS tile at the scale of 1:250,000

8.3.2 Medium Name

LCC2000-V data is available via the GeoBase portal. (www.geobase.ca).

8.3.3 Other Delivery Information

Data is subject to the GeoBase Unrestricted Use Licence Agreement.

8.4 Reference to specification scope

Global

9 METADATA

Not applicable

9.1 Reference to specification scope

Global