

ISO 19131 AAFC Semi-Decadal Land Use Time Series – Data Product Specifications

Revision: A

Data product specifications:**Data product specifications: AAFC Semi-Decadal Land Use Time Series****- Table of Contents -**

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Data product specifications: AAFC Semi-Decadal Land Use Time Series

1. Overview

1.1. Informal description

The Agriculture and Agri-Food Canada (AAFC) Semi-Decadal Land Use Time Series Maps 2000, 2005, 2010 and 2015 cover all areas of Canada south of 60 degrees north at a spatial resolution of 30x30 metres. The land use classes follow the protocol of the Intergovernmental Panel on Climate Change (IPCC) with further differentiation within some classes where possible:

IPCC and AAFC Land Use Classes	
IPCC Land Use Class	AAFC Land Use Class
Forest	Forest
	Forest Wetland
	Forest Regenerating after Fire (<20 years)
	Forest Regenerating after Harvest (<20 years)
	Forest Wetland Regenerating after Harvest (<20 years)
Settlement	Very High Reflectance Settlement
	High Reflectance Settlement
	Settlement
	Vegetated Settlement
	Settlement Forest
	Roads
Cropland	Cropland
	Annual Cropland (2015 onward)
Grassland	Grassland Managed
	Grassland Unmanaged
Wetland	Wetland
Water	Water
Other Land	Other Land

These data were developed in response to a need for high-accuracy, high-resolution land use map data to meet AAFC's commitments in national and international reporting, including the Federal Sustainable Development Strategy (FSDS), Canadian Environmental Sustainability Indicators initiative (CESI), the annual National Inventory Report (NIR) to the United Nations Framework Convention on Climate Change (UNFCCC), the Agri-Environmental program of the Organization for Economic Co-operation and Development (OECD) and the FAOSTAT component of the Food and Agriculture Organization of the United Nations (FAO).

1.2. Data product specification - metadata

Data product specification – title	AAFC Semi-Decadal Land Use Time Series
Data product specification - reference date:	August 4, 2021
Data product specification - responsible party:	Agriculture and Agri-Food Canada
Data product specification – languages:	English, French
Data product specification - topic category:	Environment; GeoscientificInformation; imageryBaseMapsEarthCover;

1.3. Terms and definitions

- Feature attribute
characteristic of a feature
- Class
description of a set of objects that share the same attributes, operations, methods, relationships, and semantics [UML Semantics]
NOTE: A class does not always have an associated geometry (e.g. the metadata class).
- Feature
abstraction of real world phenomena
- Object
entity with a well-defined boundary and identity that encapsulates state and behaviour [UML Semantics]
NOTE: An object is an instance of a class.
- Package
grouping of a set of classes, relationships, and even other packages with a view to organizing the model into more abstract structures

1.4. Abbreviations

AAFC Agriculture and Agri-Food Canada

2. SPECIFICATION SCOPE

This data specification has only one scope, the general scope.

NOTE: The term 'specification scope' originates from the International Standard ISO19131. 'Specification scope' does not express the purpose for the creation of a data specification or the potential use of data, but identifies partitions of the data specification where specific requirements apply.

3. DATA PRODUCT IDENTIFICATION

3.1. Data series identification

Title	AAFC Semi-Decadal Land Use Time Series
Alternate Title	AAFC Land Use Maps
Abstract	The AAFC Land Use Time Series is a culmination and curated meta-analysis of several high-quality spatial datasets produced between 1990 and 2021 using a variety of methods by teams of researchers as techniques and capabilities have evolved. The information from the input datasets was consolidated and embedded within each 30m x 30m pixel to create consolidated pixel histories, resulting in thousands of unique combinations of evidence ready for careful consideration. Informed by many sources of high-quality evidence and visual observation of imagery in Google Earth, we apply an incremental strategy to develop a coherent best current understanding of what has happened in each pixel through the time series.
Purpose	These datasets time series were developed in response to a need for explicit, high-accuracy, high-resolution land use maps data to meet AAFC's commitments in national and international reporting.
Topic Category	Environment; GeoscientificInformation; imageryBaseMapsEarthCover;
Spatial Representation Type	Grid
Spatial Resolution	30x30 m pixels
Geographic Description	Canada, South of 60 degrees North
Supplemental Information	Citation: Agriculture and Agri-Food Canada, 2021, "AAFC Land Use Time Series 2000, 2005, 2010, 2015", Agroclimate, Geomatics and Earth Observation Division, Science and Technology Branch.
Constraints	Data are subject to the Government of Canada Open Data Licence Agreement available at www.data.gc.ca (https://open.canada.ca/en/open-government-licence-canada)
Keywords	Government of Canada Core Subject Thesaurus (2000-02-01) – Land use, Remote sensing, Satellites, Agriculture, Crops, Crop insurance, Farmlands, Forage crops, Land cover, Geomatics, Geographic Information Systems, Geographic data, maps, Geography
Scope identification	Series

3.2. Data product identification

3.2.1. The 2000 AAFC Semi-Decadal Land Use

Title	The 2000 AAFC Semi-Decadal Land Use
Alternate Title	The 2000 AAFC Land Use Maps
Abstract	<p>The 2000 AAFC Land Use is a culmination and curated meta-analysis of several high-quality spatial datasets produced between 1990 and 2021 using a variety of methods by teams of researchers as techniques and capabilities have evolved. The information from the input datasets was consolidated and embedded within each 30m x 30m pixel to create consolidated pixel histories, resulting in thousands of unique combinations of evidence ready for careful consideration. Informed by many sources of high-quality evidence and visual observation of imagery in Google Earth, we apply an incremental strategy to develop a coherent best current understanding of what has happened in each pixel through the time series.</p> <p>The data are split into the respective WGS84 UTM Zones they cover from UTM Zone 07N to UTM Zone 22N.</p>
Purpose	These datasets time series were developed in response to a need for explicit, high-accuracy, high-resolution land use maps data to meet AAFC's commitments in national and international reporting.
Topic Category	Environment; GeoscientificInformation; imageryBaseMapsEarthCover;
Spatial Representation Type	Grid
Spatial Resolution	30x30 m pixels
Geographic Description	Canada, South of 60 degrees North
Supplemental Information	Citation: Agriculture and Agri-Food Canada, 2021, "AAFC Land Use Time Series 2000, 2005, 2010, 2015", Agroclimate, Geomatics and Earth Observation Division, Science and Technology Branch.
Constraints	Data are subject to the Government of Canada Open Data Licence Agreement available at www.data.gc.ca (https://open.canada.ca/en/open-government-licence-canada)
Keywords	Government of Canada Core Subject Thesaurus (2000-02-01) – Land use, Remote sensing, Satellites, Agriculture, Crops, Crop insurance, Farmlands, Forage crops, Land cover, Geomatics, Geographic Information Systems, Geographic data, maps, Geography
Scope identification	Series
Feature Attribute Names	Value, Count, LU2000

3.2.2. The 2005 AAFC Semi-Decadal Land Use

Title	The 2005 AAFC Semi-Decadal Land Use
Alternate Title	The 2005 AAFC Land Use Maps
Abstract	<p>The 2005 AAFC Land Use is a culmination and curated meta-analysis of several high-quality spatial datasets produced between 1990 and 2021 using a variety of methods by teams of researchers as techniques and capabilities have evolved. The information from the input datasets was consolidated and embedded within each 30m x 30m pixel to create consolidated pixel histories, resulting in thousands of unique combinations of evidence ready for careful consideration. Informed by many sources of high-quality evidence and visual observation of imagery in Google Earth, we apply an incremental strategy to develop a coherent best current understanding of what has happened in each pixel through the time series.</p> <p>The data are split into the respective WGS84 UTM Zones they cover from UTM Zone 07N to UTM Zone 22N.</p>
Purpose	These datasets time series were developed in response to a need for explicit, high-accuracy, high-resolution land use maps data to meet AAFC's commitments in national and international reporting.
Topic Category	Environment; GeoscientificInformation; imageryBaseMapsEarthCover;
Spatial Representation Type	Grid
Spatial Resolution	30x30 m pixels
Geographic Description	Canada, South of 60 degrees North
Supplemental Information	Citation: Agriculture and Agri-Food Canada, 2021, "AAFC Land Use Time Series 2000, 2005, 2010, 2015", Agroclimate, Geomatics and Earth Observation Division, Science and Technology Branch.
Constraints	Data are subject to the Government of Canada Open Data Licence Agreement available at www.data.gc.ca (https://open.canada.ca/en/open-government-licence-canada)
Keywords	Government of Canada Core Subject Thesaurus (2000-02-01) – Land use, Remote sensing, Satellites, Agriculture, Crops, Crop insurance, Farmlands, Forage crops, Land cover, Geomatics, Geographic Information Systems, Geographic data, maps, Geography
Scope identification	Series
Feature Attribute Names	Value, Count, LU2005

3.2.3. The 2010 AAFC Semi-Decadal Land Use

Title	The 2010 AAFC Semi-Decadal Land Use
Alternate Title	The 2010 AAFC Land Use Maps
Abstract	<p>The 2010 AAFC Land Use is a culmination and curated meta-analysis of several high-quality spatial datasets produced between 1990 and 2021 using a variety of methods by teams of researchers as techniques and capabilities have evolved. The information from the input datasets was consolidated and embedded within each 30m x 30m pixel to create consolidated pixel histories, resulting in thousands of unique combinations of evidence ready for careful consideration. Informed by many sources of high-quality evidence and visual observation of imagery in Google Earth, we apply an incremental strategy to develop a coherent best current understanding of what has happened in each pixel through the time series.</p> <p>The data are split into the respective WGS84 UTM Zones they cover from UTM Zone 07N to UTM Zone 22N.</p>
Purpose	These datasets time series were developed in response to a need for explicit, high-accuracy, high-resolution land use maps data to meet AAFC's commitments in national and international reporting.
Topic Category	Environment; GeoscientificInformation; imageryBaseMapsEarthCover;
Spatial Representation Type	Grid
Spatial Resolution	30x30 m pixels
Geographic Description	Canada, South of 60 degrees North
Supplemental Information	Citation: Agriculture and Agri-Food Canada, 2021, "AAFC Land Use Time Series 2000, 2005, 2010, 2015", Agroclimate, Geomatics and Earth Observation Division, Science and Technology Branch.
Constraints	Data are subject to the Government of Canada Open Data Licence Agreement available at www.data.gc.ca (https://open.canada.ca/en/open-government-licence-canada)
Keywords	Government of Canada Core Subject Thesaurus (2000-02-01) – Land use, Remote sensing, Satellites, Agriculture, Crops, Crop insurance, Farmlands, Forage crops, Land cover, Geomatics, Geographic Information Systems, Geographic data, maps, Geography
Scope identification	Series
Feature Attribute Names	Value, Count, LU2010

3.2.4. The 2015 AAFC Semi-Decadal Land Use

Title	The 2015 AAFC Semi-Decadal Land Use
Alternate Title	The 2015 AAFC Land Use Maps
Abstract	<p>The 2015 AAFC Land Use is a culmination and curated meta-analysis of several high-quality spatial datasets produced between 1990 and 2021 using a variety of methods by teams of researchers as techniques and capabilities have evolved. The information from the input datasets was consolidated and embedded within each 30m x 30m pixel to create consolidated pixel histories, resulting in thousands of unique combinations of evidence ready for careful consideration. Informed by many sources of high-quality evidence and visual observation of imagery in Google Earth, we apply an incremental strategy to develop a coherent best current understanding of what has happened in each pixel through the time series.</p> <p>The data are split into the respective WGS84 UTM Zones they cover from UTM Zone 07N to UTM Zone 22N.</p>
Purpose	These datasets time series were developed in response to a need for explicit, high-accuracy, high-resolution land use maps data to meet AAFC's commitments in national and international reporting.
Topic Category	Environment; GeoscientificInformation; imageryBaseMapsEarthCover;
Spatial Representation Type	Grid
Spatial Resolution	30x30 m pixels
Geographic Description	Canada, South of 60 degrees North
Supplemental Information	Citation: Agriculture and Agri-Food Canada, 2021, "AAFC Land Use Time Series 2000, 2005, 2010, 2015", Agroclimate, Geomatics and Earth Observation Division, Science and Technology Branch.
Constraints	Data are subject to the Government of Canada Open Data Licence Agreement available at www.data.gc.ca (https://open.canada.ca/en/open-government-licence-canada)
Keywords	Government of Canada Core Subject Thesaurus (2000-02-01) – Land use, Remote sensing, Satellites, Agriculture, Crops, Crop insurance, Farmlands, Forage crops, Land cover, Geomatics, Geographic Information Systems, Geographic data, maps, Geography
Scope identification	Series
Feature Attribute Names	Value, Count, LU2015

4. DATA CONTENT AND STRUCTURE

4.1. Feature-based application schema

4.2. Feature catalogue – AAFC Land Use Time Series

Title	AAFC Semi-Decadal Land Use Time Series
Scope	<i>series</i>
Version Number	1
Version Date	June 2021
Producer	Agriculture and Agri-Food Canada, Science & Technology Branch

4.2.1. Feature attributes

4.2.1.1. Value

Name	Value		
Definition	Unique integer value representing each land use class		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	Integer		
Value Domain Type	1 (enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition
	Settlement	21	Urban and rural residential, commercial, industrial, transportation or other built infrastructure use
	High Reflectance Settlement	22	Settlement areas with high spectral reflectance such as pavement, buildings, or other surfaces with little to no observable vegetation
	Settlement Forest	24	Settlement areas mostly or entirely covered by tree canopy
	Roads	25	Primary, secondary and tertiary roads
	Vegetated Settlement	28	Settlement areas with observable vegetation such as lawns, golf courses, and settlement areas with 30-50% tree canopy
	Very High Reflectance	29	Settlement areas with very high
	Water	31	Open water
	Forest	41	Land covered by trees with a canopy cover >10% and a minimum height of 5m, or capable of growing to those measurements within 50 years
	Forest Wetland	42	Wetland with forest cover (canopy cover over 10% and minimum height 5m, or capable of growing to those measurements within 50 years)
	Forest Regenerating after Harvest <20 years	43	Forest regenerating from tree harvesting activity that took place less than 20 years prior

	Forest Wetland Regenerating after Harvest <20 years	44	Wetland with forest cover regenerating from tree harvesting activity that took place less than 20 years prior
	Forest Regenerating after Fire <20 years	49	Forest Regenerating after a fire less than 20 years prior
	Cropland	51	Annual and perennial cropland
	Annual Cropland	52	Annual cropland (identified beginning in 2015)
	Grassland Managed	61	Natural grass and shrubs used for cattle grazing
	Grassland Unmanaged	62	Natural grass and shrubs with no discerned human intervention (eg. perpetual meadows, tundra)
	Wetland	71	Wetland with vegetation at or above the surface of the water
	Other Land	91	Rock, beaches, ice, barren land

4.2.1.2. Count

Name	Count		
Definition	Number of pixels for each unique integer value		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	Integer		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.3. Landuse (LU20##)

Name	Landuse (LU20##)		
Definition	Name of the land use class		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	Text		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

5. REFERENCE SYSTEMS

5.1. Spatial reference system

Horizontal coordinate reference system: WGS 84

Map projection: WGS 84/UTM Zone 07N; EPSG :32607
Map projection: WGS 84/UTM Zone 08N; EPSG :32608
Map projection: WGS 84/UTM Zone 09N; EPSG :32609
Map projection: WGS 84/UTM Zone 10N; EPSG :32610
Map projection: WGS 84/UTM Zone 11N; EPSG :32611
Map projection: WGS 84/UTM Zone 12N; EPSG :32612
Map projection: WGS 84/UTM Zone 13N; EPSG :32613
Map projection: WGS 84/UTM Zone 14N; EPSG :32614
Map projection: WGS 84/UTM Zone 15N; EPSG :32615
Map projection: WGS 84/UTM Zone 16N; EPSG :32616
Map projection: WGS 84/UTM Zone 17N; EPSG :32617
Map projection: WGS 84/UTM Zone 18N; EPSG :32618
Map projection: WGS 84/UTM Zone 19N; EPSG :32619
Map projection: WGS 84/UTM Zone 20N; EPSG :32620
Map projection: WGS 84/UTM Zone 21N; EPSG :32621
Map projection: WGS 84/UTM Zone 22N; EPSG :32622

5.2. Temporal reference system

Gregorian calendar

6. DATA QUALITY

6.1. Completeness

These maps represent all of Canada south of 60°N.

6.2. Logical consistency

Not defined at this time.

6.3. Positional accuracy

Not defined at this time.

6.4. Temporal statement

Each land use map in the time series represents the year named, but should be considered as circa that date. To align with census years, each map was designed to best represent the named year if possible, and if not then the year after it. For example, Land Use 2010 can be considered to represent circa 2010–2011. Every effort was made to make the data accurate for the year named, and is currently the best approximation available for each year.

Where the Land Use Time Series shows change through time, the pixels of change will always be a combination of real change and uncertainty in the data. Calculating the difference between maps is not an adequate way to quantify land use change unless accompanied by an accuracy assessment of the change pixels.

6.5. Thematic accuracy

Not defined at this time.

6.6. Lineage statement

Lineage Statement	<p>While we continue to upgrade our understanding as pertinent new information becomes available, selected elements from the following datasets have been integrated as evidence:</p> <ul style="list-style-type: none"> • Agriculture and Agri-Food Canada Annual Crop Inventories 2010-2020, • Natural Resources Canada EOSD Land Cover 2000, • Agriculture and Agri-Food Canada Land Cover 2000, • NASA Earth Science Enterprise GeoCover 1990, • Natural Resources Canada CanVec, • Land Information Ontario SOLRIS 1.0, • Natural Resources Canada Land Cover 2005 (250m), • Statistics Canada Census of Agriculture, • European Commission Joint Research Center Global Surface Water 1984-2015, • United States Geological Survey Global Tree Canopy 2010, • United States Geological Survey Bare Ground 2010, • Canadian Forest Service Forest Disturbance and Recovery 1985-2011, • Global Forest Watch Global Forest Loss 2000-2012, • Prince Edward Island Corporate Land Use Inventory 2010, • Alberta Biodiversity Monitoring Institute data (Human Footprint, LC Inventory, Photoplot LC), • Nova Scotia Open Topographic Data (Wetlands, Forest, Settlement), • Land Information Ontario SOLRIS 2.0, Proximity to the National Road Network, • German Aerospace Center (DLR) Global Urban Footprint 2012, • Statistics Canada Open Database of Buildings v1.0, • Natural Resources Canada Land Cover 2010 Urban, • Land Information Ontario Waterbodies, • Quebec Wetlands from forestry datasets, • Nova Scotia topographic features, • Global Forest Watch Global Forest Change 2000-2019, • Canadian Forest Service CanLaD Forest Disturbance 1984-2015, • Land Information Ontario SOLRIS 3.0, • University of Maryland GEDI x Landsat Global Forest Height 2019, • Natural Resources Canada HRDEM, • University of Maryland GLAD Landsat Analysis-Ready Data 2000 and 2019.
Scope	<i>Series</i>

7. DATA CAPTURE

This Land Use Time Series is a culmination and curated meta-analysis of many high-quality spatial datasets produced by other researchers between 1990 and 2021 using a variety of methods as techniques and capabilities have evolved (see references). The information from the input datasets was lined up and embedded within each 30m x 30m pixel to create consolidated pixel histories, resulting in thousands of unique combinations of evidence ready for careful consideration. Informed by many sources of high-quality evidence and visual observation of imagery in Google Earth, we apply an incremental strategy to develop a coherent best current understanding of what has happened in each pixel through the time series.

The empirical approach we developed for understanding what is happening in each consolidated pixel history follows poet Mary Oliver's instructions for living: "Pay attention. Be astonished. Tell about it." We examine what is happening in pixels that share a unique combination of consolidated attributes, using visual observation of imagery through time in Google Earth. We then update our land use maps to best reflect what is indicated by this empirical evidence. In this way, it is a method of becoming continuously better-informed, updating the maps through careful consideration of new evidence as it becomes available. Priority is given to widespread unique pixel histories where the evidence suggests there is either anthropogenic land use change or high uncertainty, because these offer the most valuable potential improvements for the investment of time.

8. DATA MAINTENANCE

Updates to the series are currently ongoing.

9. PORTRAYAL

Not applicable.

10. DATA PRODUCT DELIVERY

GeoTIFF

Format name: Tag Interleaved File

Version: 6.0

Specification: GeoTIFF is format extension for storing georeferenced information in a TIFF 6.0 compliant raster file by tying a raster image to a known model space or map projection.

Languages: eng

Character set: utf8

11. METADATA

The metadata requirements follow the Government of Canada's Treasury Board Standard on Geospatial Data (ISO 19115).