ISO 19131 Agri-Environmental Indicator – Residual Soil Nitrogen Data Series – Data Product Specifications

Revision: A

Data product specifications:

Residual Soil Nitrogen Data Series

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Data product specifications: *Agri-Environmental Indicator –Residual Soil Nitrogen and Risk of Water Contamination by Nitrogen Data Series*

1. OVERVIEW

1.1. Informal description

1.2. Data product specification - metadata

This section provides metadata about the creation of this data product specification

Data product specification – title:	Agri-Environmental Indicator – Residual Soil Nitrogen Data Series
Data product specification - reference date:	January 30, 2021
Data product specification - responsible party:	Agriculture and Agri-Food Canada, Science and Technology Branch
Data product specification – language:	English, French
Data product specification - topic category:	Environment

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
RSN	Residual Soil Nitrogen at harvest
NLOSS	Nitrogen Loss in one year cycle
NCONC	Nitrogen Concentration in the leached water

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	Agri-Environmental Indicator – Residual Soil Nitrogen Data Series
Alternate Title	
Abstract	The Agri-Environmental Indicator Residual Soil Nitrogen (RSN) dataset estimates the amount of nitrogen remaining in the soil at the end of the growing season (after harvest) on Canadian agricultural lands annually.
Purpose	The RSN dataset provides an estimate of the level of residual soil nitrogen remaining in Canadian agricultural lands across the country. These results help us identify regions at higher risk where management practices should be examined as well as lower risk which would have minimal environmental impacts. This information would be useful to soil and crop advisors and to help inform policy decisions.
Topic Category	Environment
Spatial Representation Type	Vector, csv, text Table
Spatial Resolution	1:1,000,000
Geographic Description	Bounding coordinates for Soil Landscapes of Canada polygons: North Bounding Coordinate: 59.18 West Bounding Coordinate: -128.88 East Bounding Coordinate: -52.37 South Bounding Coordinate: 41.67
Supplemental Information	
Constraints	Open Government License – Canada (https://open.canada.ca/en/open-government-licence-canada)
Keywords	Thesaurus: Government of Canada Core Subject Thesaurus (http://www.thesaurus.gc.ca/recherchesearch/thes-eng.html) Date: February 1, 2000 Keywords: Environment, Earth sciences Thesaurus: Other January 1, 2013 Keywords: Climate indicators
Scope identification	Series

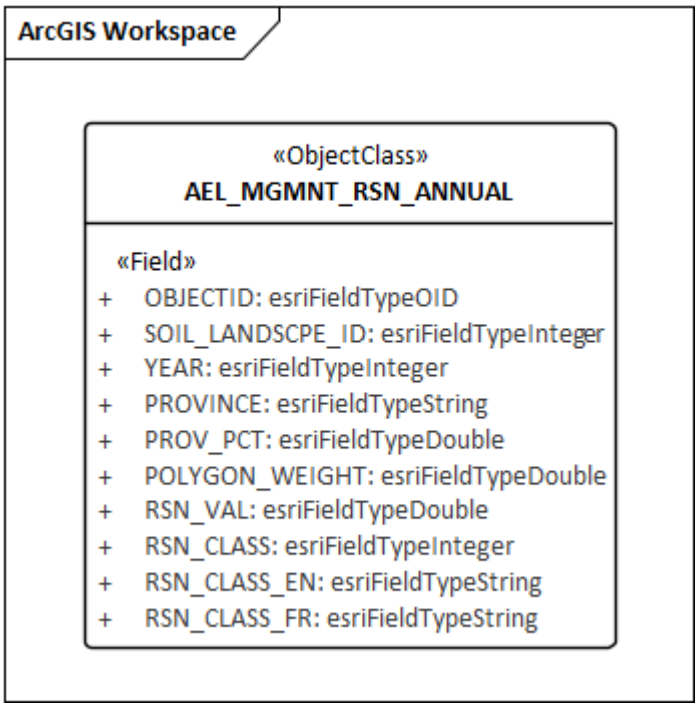
3.2. Data product identification

3.2.1. Residual Soil Nitrogen - Annual

Title	Residual Soil Nitrogen – Annual
Alternate Title	AEI_MGMNT_RSN_ANNUAL
Abstract	The Agri-Environmental Indicator Residual Soil Nitrogen (RSN) dataset estimates the amount of nitrogen remaining in the soil at the end of the growing season (after harvest) on Canadian agricultural lands for the period from 1981 to 2016. High level of the RSN indicates a combination of factors including over application, reduced yields (weather, pests, weeds) or soil deterioration. The low nitrogen-use efficiency may be due to increases in gaseous losses from agricultural soils including nitrous oxide or ammonia volatilization as well as NO3 leaching loss to groundwater in the subsequent non-growing and growing seasons.
Purpose	The dataset provides an estimate of the level of residual soil nitrogen remaining in Canadian agricultural lands across the country. These results help us identify regions at higher risk where management practices should be examined as well as lower risk which would have minimal environmental impacts. This information would be useful to soil and crop advisors and to help inform policy decisions.
Topic Category	Environment
Spatial Representation Type	Csv, text Table
Spatial Resolution	1:1,000,000
Geographic Description	Bounding coordinates for Soil Landscapes of Canada polygons: North Bounding Coordinate: 59.18 West Bounding Coordinate: -128.88 East Bounding Coordinate: -52.37 South Bounding Coordinate: 41.67
Supplemental Information	
Keywords	Thesaurus: Government of Canada Core Subject Thesaurus (https://www.thesaurus.gc.ca/recherchesearch/thes-eng.html) Date: February 1, 2000 Keywords: Environment, Earth sciences Thesaurus: Other January 1, 2013 Keywords: Climate indicators
Constraints	Open Government License – Canada (https://open.canada.ca/en/open-government-licence-canada)
Scope Identification	Dataset
Feature Attribute Names	SOIL_LANDSCAPE_ID, YEAR, PROVINCE, PROV_PCT, POLYGON_WEIGHT, RSN_VAL, RSN_CLASS, RSN_CLASS_EN, RSN_CLASS_FR

4. DATA CONTENT AND STRUCTURE

4.1. Feature-based application schema



4.2. Feature catalogue – Agri-Environmental Indicator – Residual Soil Nitrogen and Risk of Water Contamination by Nitrogen Data Series

Title	Agri-Environmental Indicator – Residual Soil Nitrogen Data Series
Scope	Applies to the Agri-Environmental Indicator – Residual Soil Nitrogen Data Series
Version Number	*1*
Version Date	*July 27, 2020*
Producer	Agriculture and Agri-food Canada, Science and Technology Branch

System-generated attributes (for example, OBJECTID, Shape, Shape Length and Area) are not defined in the feature catalog.

4.2.1. Feature attributes

4.2.1.1. Soil Landscape ID

Name	Soil Landscape ID (SOIL_LANDSCAPE_ID)		
Definition	Soil Landscape of Canada Polygon Identifier		
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

4.2.1.2. Year

Name	Year (YEAR)		
Definition	Year of Data		
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. Province

Name	Province (PROVINCE)		
Definition	The name of the province that data is found within		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	String		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.4. Polygon Weight

Name	Polygon Weight (POLYGON_WEIGHT)		
Definition	The area of the portion of the spatial unit based on which the indicator is evaluated. It is used as the weighting factor when the indicator is scaled up to a larger spatial unit, such as Ecodistrict, EcoRegion EcoZone. For the Residual Soil Nitrogen and Risk of Water Contamination by Nitrogen indicators, it equals the total farmland area in the polygon.		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	Floating		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.5. Province Percent

Name	Province Percent (PROV_PCT)
Definition	The percentage weighting given the portion of the Soil Landscape of Canada polygon (identified by the SOIL_LANDSCAPE_ID) that falls in the identified province. If a Soil Landscape of Canada polygon is split by a provincial boundary, this value will be less than 100.
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

4.2.1.6. Residual Soil Nitrogen

Name	Residual Soil Nitrogen (RSN_VAL)		
Definition	The Agri-Environmental Indicator Residual Soil Nitrogen (RSN) dataset estimates the amount of N remaining in the soil at the end of the growing season on Canadian agricultural lands from 1981 to 2016. High levels of the RSN indicate low nitrogen use efficiency, which may increase the chance of nitrogen gas emissions (N2O, NH3) and NO3 leaching loss to groundwater system in the subsequent non-growing and growing seasons.		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	Real		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.7. Residual Soil Nitrogen Classification

Name	Residual Soil Nitrogen Classification (RSN_CLASS)		
Definition	Classes categorizing the Residual Soil Nitrogen status into 6 different levels according to RSN_VAL.		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	Integer		
Value Domain Type	1 (enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition<
	Very Low	1	*RSN_VAL < 10*
	Low	2	*10 ≤ RSN_VAL < 20*
	Moderate	3	*20 ≤ RSN_VAL < 30*
	High	4	*30 ≤ RSN_VAL < 40*
	Very High	5	*RSN_VAL ≥ 40*
	Not Assessed	0	*Area not evaluated*

4.2.1.8. Residual Soil Nitrogen Classification - English

Name	Residual Soil Nitrogen Classification – English (RSN_CLASS_EN)		
Definition	Textual Description of the Class in English		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	Character		
Value Domain Type	1 (enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition
	Very Low	1	*RSN_VAL < 10*
	Low	2	*10 ≤ RSN_VAL < 20*
	Moderate	3	*20 ≤ RSN_VAL < 30*
	High	4	*30 ≤ RSN_VAL < 40*
	Very High	5	*RSN_VAL ≥ 40*
	Not Assessed	0	*Area not evaluated*

4.2.1.9. Residual Soil Nitrogen Classification - French

Name	Residual Soil Nitrogen Classification - French (RSN_CLASS_FR)		
Definition	Textual Description of the Class in French		
Aliases			
Producer	Agriculture and Agri-Food Canada		
Value Data Type	Character		
Value Domain Type	1 (enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition
	Très faible	1	*RSN_VAL < 10*
	Faible	2	*10 ≤ RSN_VAL < 20*
	Moyen	3	*20 ≤ RSN_VAL < 30*
	Élevé	4	*30 ≤ RSN_VAL < 40*
	Très élevé	5	*RSN_VAL ≥ 40*
	Elément non évalue	0	*Area not evaluated*

5. REFERENCE SYSTEMS

5.1. Spatial reference system

Horizontal coordinate reference system: WGS84
Map projection: Web Mercator Auxiliary Sphere; EPSG:3857; Version 8.1.4

5.2. Temporal reference system

Gregorian calendar

6. DATA QUALITY

6.1. Completeness

The spatial scope of this data includes the agricultural land within Canada. Agricultural land includes cropland, whether cropped or fallow, and pasture land, whether improved or unimproved.

6.2. Logical consistency

All polygons are classified into one of six risk classes based on the risk value derived by the model. Class values range from 0 to 5 inclusive, where 0 is considered “Not Assessed”. For identifying change in risk, class values range from -2 to +2; where class value represents the number of risk classes the polygon has changed. For instance, a polygon with a -2 change in risk class value, should be interpreted as a polygon that is now 2 or more less classes of risk between the years in question (e.g. 1981 to 2016).
Class descriptions, in English and French, are consistently provided based on the class value.

6.3. Positional accuracy

The positional accuracy of this data is dependent on the positional accuracy of the Soil Landscape of Canada (v3.2) polygons. SLC v3.2 provides soil information at a scale of 1:1 million for the major agricultural regions of Canada. The SLC v3.2 polygons are aligned to the Atlas of Canada 1:1,000,000 scale National Frameworks data.

6.4. Temporal accuracy

The model that derived this data depends directly on the Census of Agriculture. Thus each of the columns denoting a year pertain to the corresponding year the Census of Agriculture from Statistics Canada (i.e. 1981, 1986, 1991, 1996, 2001, 2006, 2011, and 2016).

Where data is provided by year as defined by the “YEAR” column, years consistent with the Census of Agriculture will be based directly on the Census of Agriculture data. Where years are between Census of Agriculture years, the data is interpolated, whilst where years are more recent than the latest Census of Agriculture, the data is extrapolated by the model. For this reason, when a dataset is published on a given Census of Agriculture year, the previously extrapolated years will be interpolated and thus will differ from previous publications.

6.5. Thematic accuracy

This data was calculated using mathematical models and formulas that integrate information on soil, climate and landscape. These models are the product of evidence-based science, incorporating authoritative data sources and have been developed over several decades; and continue to develop as new science and data become available.

6.6. Lineage statement

Lineage Statement	The agri-environmental indicator data was calculated using mathematical models or formulas that integrate information on soil, climate and landscape. This information was mainly derived

	from Soil Landscapes of Canada and information on crops, land use, land management and livestock from the Census of Agriculture and other custom data sets from Statistics Canada, provincial agencies, the private sector, and remote sensing agencies.
Scope	Data Series

7. DATA CAPTURE

The agri-environmental indicator data was mainly derived from:

- Soil Landscapes of Canada (SLC) v3.2, from the Soil Landscapes of Canada Working Group, 2007 (information on soil, climate and landscape) https://open.canada.ca/data/en/dataset/5ad5e20c-f2bb-497d-a2a2-440eec6e10cd
- Census of Agriculture, from Statistics Canada (information on crops, landuse, land management and livestock)
- Annual Crop Inventory

Other custom data sets come from Statistics Canada, provincial agencies, private sector and remote sensing agencies, among others. Some factors used in the calculation of data were compiled and developed by the program researchers. Summarized results from the Census of Agriculture, special surveys such as the Farm Environmental Management Survey (Statistics Canada, 2007) or combinations of these two sources were also used to complement the information provided by agri-environmental indicator data. The agri-environmental indicator data was collected at various temporal and geographical scales and interpreted and integrated into a common geospatial framework. The areas used for most of the primary agriculture indicator model calculations are polygons of the SLC map series.

Indicator	**Unit of Measurement**
Residual Soil Nitrogen	kg N/ha

8. DATA MAINTENANCE

Updates to the data series are tied to the release of new census data, which occurs every 5 years, for the census product. The annual dataset is tied to the release of a new annual crop inventory.

9. PORTRAYAL

Not applicable.

10. DATA PRODUCT DELIVERY

File Geodatabase
format name: Esri Geodatabase (File-based) format version: 10.1
specification: A collection of various types of GIS datasets held in a file system folder. (http://arcgis.com) languages: eng character set: utf8

geoJson
format name: Geographic Javascript Object Notation
specification: https://tools.ietf.org/html/rfc7946
languages: eng
character set: utf8

CSV
format name: *Comma Separated Values*

specification:
languages: *eng*
character set: *utf8*

11. METADATA

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