

ISO 19131 Crop Health Indices – Data Product Specifications

Revision: A

Data product specifications: Crop Health Indices

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Data product specifications: Crop Health Indices

1. Overview

1.1. Informal description

These products represent crop health indices derived from the Versatile Soil Moisture Budget (VSMB) model using crop specific coefficients and station based precipitation and temperature measurements to simulate crop growth. The VSMB model simulates soil moisture dynamics and water stress conditions based on water availability in the soil profile and simulated evapotranspiration during the crop growing season. Crop phenological stages, which are related to crop water use, are determined by a biometeorological time scale model (Robertson, 1968) for cool season crops (wheat, barley etc.) and a Crop Heat Unit (Brown and Bootsma, 1993) algorithm for warm season crops (corn and soybean etc.).

1.2. Data product specification - metadata

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

Data product specification – title:	Crop Health Indices
Data product specification - reference date:	November 27, 2017
Data product specification - responsible party:	Agriculture and Agri-Food Canada
Data product specification – language:	English
Data product specification - topic category:	Climatology Meteorology Atmosphere ,farming

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
VSMB	Versatile Soil Moisture Budget Model
CHU:	Crop Heat Unit

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

3.1.1. Crop Stress Index

Title	Crop Stress Index
Alternate Title	Water Deficit Index Crop Health Index
Abstract	<p>The Crop Stress Index is the ratio of actual evapotranspiration (AET) to potential evapotranspiration (PET) express as: $CSI = 1 - (AET/PET)$</p> <p>AET and PET are calculated within the Versatile Soil Moisture Budget (VSMB) model using temperature and precipitation data and a crop-specific biometeorological time scale model to estimate growth stage (Robertson, 1968), with crop specific phenological and crop water extraction coefficients taken from Chipanshi et al 2013. The WDI ranges between 0 and 1, with a value closer to 1 indicating higher stress</p> <p>Crop Stress Index is modelled for each climate station using measured precipitation and temperature</p>
Purpose	
Topic Category	climatologyMeteorologyAtmosphere , farming
Spatial Representation Type	Raster
Spatial Resolution	5000 metre
Geographic Description	Canada
Supplemental Information	
Constraints	<p>Data are subject to the Government of Canada Open Data Licence : Data are subject to the Government of Canada Open Data Licence : http://open.canada.ca/en/open-government-licence-canada?_ga=2.247636928.658931989.1510863791-1250391076.1510863791</p>
Keywords	<p>Government of Canada Core Subject Thesaurus (2016-07-04) – Climate, Crops, Agriculture,</p> <p>water stess, crop health, hydrology, evapotranspiration, drought</p>
Scope Identification	dataset
Feature Attribute Names	obs_date, metric ("stress_index")

3.1.2. Crop Development Stage

Title	Crop Development Stage
Alternate Title	Crop Stage; Growth Stage; Phenological stage
Abstract	Crop development stage in a numerical scale. All living organisms move from one stage of development to the next over time. For annual crops, its life cycle (growing season) completed within a year. Crop water use differs from one stage to another mostly due to the differences in the amount of green leaves, thus crop stage is closely related to its water consumption and water stress condition. Crop stages are mostly controlled by growing season heat accumulation and regulated by day-length crop some crops. The crop stages provided here are determined by a biometeorological time scale model (Robertson, 1968) for cool season crops (wheat, barley etc.) , and a Crop Heat Unit (Brown and Bootsma, 1993) algorithm for warm season crops (corn and soybean etc.).
Purpose	
Topic Category	climatologyMeteorologyAtmosphere , farming
Spatial Representation Type	Raster
Spatial Resolution	5000 metre
Geographic Description	Canada
Supplemental Information	
Constraints	Data are subject to the Government of Canada Open Data Licence : Data are subject to the Government of Canada Open Data Licence : http://open.canada.ca/en/open-government-licence-canada?_ga=2.247636928.658931989.1510863791-1250391076.1510863791
Keywords	Government of Canada Core Subject Thesaurus (2016-07-04) – Climate, Crops, Agriculture. Growth stage, phenology, climatology, agriculture, biometeorological data
Scope Identification	dataset
Feature Attribute Names	obs_date, metric (“growth_stage“)

4. DATA CONTENT AND STRUCTURE

4.1. Feature-based application schema

Figure <#> - <Insert dataset title> UML Class Diagram

4.2. Feature catalogue – Crop Health Indices

Title	Crop Health Indices
Scope	Data series
Version Number	1
Version Date	November 30, 2017
Producer	Agriculture and Agri-food Canada

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. Observation Date

Name	Observation Date (obs_date)		
Definition	Date of measurement		
Aliases			
Producer	Agriculture and Agri-food Canada		
Value Data Type	date		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.2. Metric

Name	Metric		
Definition	Measurement displayed in raster, either “Stress Index” or “Growth Stage”		
Aliases			
Producer	Agriculture and Agri-food Canada		
Value Data Type	character		
Value Domain Type	1 (enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition
	Stress Index	stress_index	0 to 100 0-25 = No Stress 26-50 = Light Stress 51-75 = Severe Stress 76-100 = Extreme Stress
	Growth Stage	growth_stage	0.0 to 5.0 0.0 Before Planting (corn/soybean and small grains) 1.0 Emergence (corn/soybean and small grains) 2.0 Full cover (corn/soybean); Jointing (small Grains) 3.0 Senescence (corn/soybean); Heading (small grains) 4.0 Maturity/ripen (corn/soybean); Soft dough (small grains) 5.0 Ripening (small grains)

5. REFERENCE SYSTEMS

5.1. Spatial reference system

Horizontal coordinate reference system: WGS 84

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

Data is a continuous time series updated monthly with real time measured data

6.2. Logical consistency

6.3. Positional accuracy

6.4. Temporal accuracy

6.5. Thematic accuracy

6.6. Lineage statement

Lineage Statement	
Scope	

7. DATA CAPTURE

Crop health indices are derived from the Versatile Soil Moisture Budget (VSMB) model using crop specific coefficients and station based precipitation and temperature measurements to simulate crop growth.

Values are generated for Canadian weather station point locations and interpolated into 5km x 5km raster datasets within the Canadian agricultural extent.

The range of stress index values is typically 0.0 to 1.0. To reduce storage requirements and increase performance, values were multiplied by 100 to generate integer raster datasets with a value range of 0 to 100.

8. DATA MAINTENANCE

9. PORTRAYAL

Not applicable.

10. DATA PRODUCT DELIVERY

Delivery medium information:

units of delivery: package
medium name: online via HTTP, online via direct access

Delivery format information:

format name: Comma Delimited
format version: 1.0
specification: A delimited data format that has fields/columns separated by the comma character
languages: eng
character set: utf8

11. METADATA

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