

*ISO 19131 Vegetation Drought
Response Index (VegDRI) – Data
Product Specifications*

Revision: A

Data product specifications: Vegetation Drought Response Index (VegDRI)

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Data product specifications: Vegetation Drought Response Index (VegDRI)

1. Overview

1.1. Informal description

The Vegetation Drought Response Index (VegDRI) is a hybrid drought index that combines information from climate stations and earth observation satellites to quantify the impact of drought on vegetation health. VegDRI integrates satellite observations of vegetation status, climate data, information on land cover, soil, and other environmental factors, to better understand the specific effects of drought on vegetation.

1.2. Data product specification - metadata

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

Data product specification – title:	Vegetation Drought Response Index (VegDRI)
Data product specification - reference date:	2020-07-10
Data product specification - responsible party:	AAFC, STB, ACGEO
Data product specification – language:	English
Data product specification - topic category:	Geoscientific Information, Farming/Agriculture Climatology/Meteorology/Atmosphere

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
STB	Science and Technology Branch
ACGEO	Agri-Climate, Geomatics and Earth Observation
NDVI	Normalized Difference Vegetation Index
SPI	Standardized Precipitation Index
PDSI	Palmer Drought Severity Index
USGS	United States Geological Survey

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	Vegetation Drought Response Index
Alternate Title	VegDRI, VegéSeche
Abstract	This data represents the dryness of the land surface based on vegetation conditions. The data is created weekly and uses weekly information on precipitation anomalies (namely the Standardized Precipitation Index or SPI) and satellite vegetation condition derived from Normalized Difference Vegetation Index (NDVI) from the MODIS Satellite. These dynamic data sets along with static data sets on land cover, soil water holding capacity, irrigation, ecozones and land surface elevation are used to model the drought severity, based on the Palmer Drought Severity Index (PDSI). The mapcubist model was trained on historical data and applied in real time to the dynamic inputs to produce drought severity ratings. The model is run at a 1km resolution and was developed by the AAFC, the United States Geological Survey and the United States Drought Monitor at the University of Nebraska Lincoln.
Purpose	The data set provides high resolution drought severity ratings that take into account both climate and vegetation condition data. The results represent the severity of drought with regard to its impacts on vegetation.
Topic Category	farming (Farming/Agriculture) climatologyMeteorologyAtmosphere (Climatology/Meteorology/Atmosphere/Climatologie/Météorologie/Atmosphère, environment (Environment/Environnement), geoscientificInformation (Geoscientific Information/Informations géoscientifiques)
Spatial Representation Type	grid
Spatial Resolution	1 km
Geographic Description	Canada agricultural land area
Supplemental Information	Station based precipitation anomalies are derived from a network of stations from federal and provincial agencies across Canada that are quality controlled in real time. Satellite data inputs are provided by AAFC's Canada Agricultural Land Monitoring System (CALMS)
Constraints	Open Data license of the Government of Canada - "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	<i>Drought, Remote Sensing</i>
Scope identification	series

4. REFERENCE SYSTEMS

4.1. Spatial reference system

Horizontal coordinate reference system: WGS84

Map projection:

4.2. Temporal reference system

Julian calendar

5. DATA QUALITY

5.1. Completeness

Measure not used at this time

5.2. Logical consistency

Measure not used at this time

5.3. Positional accuracy

Data are gridded at 1km. Input data sets have various spatial accuracies; climate stations are distributed unevenly geographically in Canada and spatial interpolation using an inverse distance weighting scheme is used to extend these in space. Satellite vegetation condition is derived at a 250m spatial resolution. Soil properties are from the Soil Landscapes of Canada (~90m resolution). Landcover data is derived at 30m resolution. Irrigation is modelled from Statistics Canada Census of Agriculture Data.

5.4. Temporal accuracy

Climate stations measured rainfall daily. Satellite vegetation condition is based on weekly maximum NDVI estimates, based on cloud free acquisitions.

5.5. Thematic accuracy

Data represent scaled Palmer Drought Severity ratings following the scale:

Map Legend	VegDRI Class Names (Operational)	Value Range
1	Exceptional Drought	<-500
2	Extreme Drought	-500 to -400
3	Severe Drought	-400 to -300
4	Moderate Drought	-300 to -200
5	Pre-Drought	-200 to -100
6	Near Normal	-100 to +200
7	Unusually Moist	+200 to +300
8	Very Moist	+300 to +400
9	Extremely Moist	>+400

There are numerous sources of error in the data set, outlined in:

Tadesse, T., Champagne, C., Wardlow, B.D., Hadwen, T.A., Brown, J.F., Demisse, G.B., Bayissa, Y.A., & Davidson, A.M. (2017). Building the vegetation drought response index for Canada (VegDRI-Canada) to monitor agricultural drought: first results. *Giscience & Remote Sensing*, 1-28

5.6. Lineage statement

Lineage Statement	<i>This data set is derived from a number of data sets, including MODIS maximum weekly NDVI, Climate Station Precipitation Anomalies from SPI, the Soil Landscapes of Canada and the National Satellite Landcover</i>
Scope	<i>n/a</i>

6. DATA CAPTURE

The data is based on a model using various input data sets from precipitation, vegetation condition and land cover information. A dynamic model for each week of the year was developed based on training using historical data and applied in real time. More information on model development can be found here:

Tadesse, T., Champagne, C., Wardlow, B.D., Hadwen, T.A., Brown, J.F., Demisse, G.B., Bayissa, Y.A., & Davidson, A.M. (2017). Building the vegetation drought response index for Canada (VegDRI-Canada) to monitor agricultural drought: first results. Giscience & Remote Sensing, 1-28

Brown, J.F., Wardlow, B.D., Tadesse, T., Hayes, M.J., & Reed, B.C. (2008). The Vegetation Drought Response Index (VegDRI): A new integrated approach for monitoring drought stress in vegetation. Giscience & Remote Sensing, 45, 16-46

7. DATA MAINTENANCE

Data are updated on a weekly basis during the growing season. Estimates are not applicable when the land surface is snow covered or vegetation scene sense. Periodic updates to the model are made

8. PORTRAYAL

Not applicable.

9. DATA PRODUCT DELIVERY

TIF

format name: Tag Interleaved File:

version: 6.0

specification: GeoTIFF is format extension for storing georeference and geocoding 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

10. METADATA

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