



Natural Resources
Canada

Ressources naturelles
Canada

Floods in Canada / International Floods Product Specifications

2021-10-31

**Natural Resources Canada
Strategic Policy and Innovation
Canada Centre for Mapping and Earth Observation
Emergency Geomatics Services**

Client Services

Telephone: 1-800-661-2638 (Canada and USA)

E-mail: egs-sgu@nrcan-rncan.gc.ca

URL: <https://open.canada.ca/en/open-maps>

Canada

Copyright notice

© Her Majesty the Queen in Right of Canada, Department of Natural Resources.
All rights reserved.

RELEASE HISTORY

Date	Description
2020-03-19	Original version
2020-08-31	<p>3.2.1 : Addition of a River Ice acquisition methodology</p> <p>4.1 : Description update</p> <p>4.2.3 : Adjustment of value domains</p> <p>9 : Delivery format</p>
2021-10-31	<p>Corrected assorted typographic errors throughout.</p> <p>Add a table list</p> <p>Split original section 2.1 into 2.1 and 2.2, for domestic and international products, respectively. Added descriptions elsewhere for both product regions.</p> <p>3.7.2 Included ISO 3166-2 subdivision code</p> <p>4.2.2.1 Expanded attribute table list to include new fields introduced with internationalization</p> <p>4.2.3.1 Added Unclassified designation that applies to older products in the collection</p> <p>4.2.3.3 Added eventTypeDomain</p> <p>4.2.3.4 Added sensorNameDomain</p> <p>4.2.3.5 Added sensorTypeDomain</p> <p>5.1, 5.1.2 Replaced Canada Atlas LCC with WGS84, web services with Web Mercator</p> <p>9.4.1 Changed ZIP file name format to include country code and replace province code with subdivision code</p> <p>9.4.3, 9.4.4, 9.5.3 Included HTTPS URL to download products</p>

TABLE OF CONTENTS

LIST OF TABLES.....	V
1 OVERVIEW	1
1.1 TITLE	1
1.2 REFERENCE DATE	1
1.3 RESPONSIBLE PARTY	1
1.4 LANGUAGE	1
1.5 ABBREVIATIONS AND ACRONYMS	1
1.6 INFORMAL DESCRIPTION OF THE DATA PRODUCT	2
2 SPECIFICATION SCOPE	3
2.1 DOMESTIC PRODUCTS.....	3
2.1.1 <i>Scope identification</i>	3
2.1.2 <i>Level</i>	3
2.1.3 <i>Level name</i>	3
2.1.4 <i>Extent</i>	3
2.2 INTERNATIONAL PRODUCTS	4
2.2.1 <i>Scope identification</i>	4
2.2.2 <i>Level</i>	4
2.2.3 <i>Level name</i>	4
2.2.4 <i>Extent</i>	4
2.2.5 <i>Temporal extent</i>	5
2.3 COVERAGE.....	5
3 DATA PRODUCT IDENTIFICATION.....	6
3.1 TITLE	6
3.2 ABSTRACT	6
3.2.1 <i>Product and Methodology Description</i>	6
3.3 OBJECTIVE	10
3.4 TOPIC CATEGORY	11
3.5 SPATIAL REPRESENTATION TYPE.....	11
3.6 SPATIAL RESOLUTION.....	11
3.7 GEOGRAPHIC DESCRIPTION	11
3.7.1 <i>Authority</i>	11
3.7.2 <i>Code</i>	12
3.8 REFERENCE TO SPECIFICATION SCOPE	12
4 DATA CONTENT AND STRUCTURE	12
4.1 DESCRIPTION	12
4.2 DATA MODELLING SCHEMA.....	13
4.2.1 <i>Application schema</i>	13
4.2.2 <i>Feature catalogue</i>	13
4.2.3 <i>Attribute Domain Definitions</i>	15
4.3 REFERENCE TO SPECIFICATION SCOPE	21

5	REFERENCE SYSTEMS.....	21
5.1	SPATIAL REFERENCE SYSTEM.....	21
5.1.1	<i>Authority.....</i>	21
5.1.2	<i>Code</i>	22
5.1.3	<i>Code space.....</i>	22
5.2	REFERENCE TO SPECIFICATION SCOPE	22
6	DATA QUALITY.....	22
6.1	COMPLETENESS	22
6.1.1	<i>Commission.....</i>	22
6.1.2	<i>Omission.....</i>	23
6.2	CONSISTENCY	23
6.2.1	<i>Conceptual Consistency.....</i>	23
6.2.2	<i>Domain Consistency</i>	23
6.2.3	<i>Format Consistency.....</i>	23
6.2.4	<i>Topological Consistency.....</i>	24
6.3	POSITIONAL ACCURACY	24
6.3.1	<i>Absolute or external accuracy.....</i>	24
6.3.2	<i>Relative or internal accuracy.....</i>	24
6.4	TEMPORAL ACCURACY	24
6.4.1	<i>Accuracy of a Time Measurement.....</i>	24
6.4.2	<i>Temporal Consistency.....</i>	24
6.4.3	<i>Temporal Validity.....</i>	24
6.5	THEMATIC ACCURACY	24
6.5.1	<i>Classification Correctness.....</i>	24
6.5.2	<i>Non Quantitative Attribute Correctness.....</i>	24
6.5.3	<i>Quantitative Attribute Accuracy.....</i>	25
6.5.4	<i>Reference to specification scope.....</i>	25
7	DATA CAPTURE.....	25
7.1	DESCRIPTION	25
7.2	REFERENCE TO SPECIFICATION SCOPE.....	25
8	DATA MAINTENANCE	25
8.1	DESCRIPTION	25
8.2	REFERENCE TO SPECIFICATION SCOPE	26
9	DATA PRODUCT DELIVERY.....	26
9.1	DELIVERY FORMAT INFORMATION: SHP.....	26
9.1.1	<i>Format Name.....</i>	26
9.1.2	<i>Version.....</i>	26
9.1.3	<i>Specification.....</i>	26
9.1.4	<i>Language.....</i>	26
9.2	DELIVERY FORMAT INFORMATION: FGDB	26
9.2.1	<i>Format Name.....</i>	26
9.2.2	<i>Version.....</i>	27
9.2.3	<i>Specification.....</i>	27

9.2.4	<i>Language</i>	27
9.3	DELIVERY FORMAT INFORMATION: KMZ.....	27
9.3.1	<i>Format Name</i>	27
9.3.2	<i>Version</i>	27
9.3.3	<i>Specification</i>	27
9.3.4	<i>Language</i>	27
9.4	INFORMATION ON ZIP DATA PRODUCT DELIVERY FORMAT OF SHP AND KMZ	27
9.4.1	<i>Unit of Delivery</i>	27
9.4.2	<i>Size</i>	27
9.4.3	<i>Medium Name</i>	27
9.4.4	<i>Additional delivery information</i>	28
9.5	INFORMATION ON DATABASE PRODUCT DELIVERY: FGDB.....	28
9.5.1	<i>Unit of Delivery</i>	28
9.5.2	<i>Size</i>	28
9.5.3	<i>Medium Name</i>	28
9.5.4	<i>Additional delivery information</i>	29
9.6	REFERENCE TO SPECIFICATION SCOPE	29
10	ADDITIONAL INFORMATION	29
10.1	LIMITATION OF LIABILITY.....	29
10.2	CREDIT	29
10.3	POINT OF CONTACT	29
11	METADATA	29

LIST OF TABLES

Table 1: Attributes contained in EGS_Flood_Product_Archive and EGS_Flood_Product_Current 13

Table 2: Attributes contained in EGS_Flood_Product_Current_Swath and EGS_Flood_Product_Archive_Swath..... 15

Table 3: Flood Classification Domain 15

Table 4: Confidence Level Domain 16

Table 5: Event Type Domain..... 16

Table 6: Sensor Name Domain..... 17

Table 7: Sensor Type Domain 21

1 OVERVIEW

1.1 TITLE

Floods in Canada / International Floods— Product Specification

1.2 REFERENCE DATE

Data product specifications creation date:

2020-03-19

1.3 RESPONSIBLE PARTY

Natural Resources Canada
Strategic Policy and Innovation Sector
Canada Centre for Mapping and Earth Observation
Client Services

Telephone: Toll free: 1-800-661-2638 (Canada and USA)

Fax: +01-819-564-5698

E-mail: egs-sgu@nrcan-mcan.gc.ca

URL: <https://open.canada.ca/en/open-maps>

1.4 LANGUAGE

eng – English

fra - French

1.5 ABBREVIATIONS AND ACRONYMS

CCMEO Canada Centre for Mapping and Earth Observation

CSRS Canadian Spatial Reference System

DEM Digital Elevation Model

ECCC Environment and Climate Change Canada EGS Emergency Geomatics Service

EGS Emergency Geomatic System

ESRI Environmental Systems Research Institute, Inc.

FGDB Esri File GeoDatabase

FTP File Transfer Protocol

GIS Geographic Information System

GOC Government Operations Centre (Public Safety Canada)

ISO International Organization for Standardization

KML	Keyhole Markup Language
KMZ	Keyhole Markup Language Zipped
NAD83	North American Datum of 1983
NASP	National Aerial Surveillance Program
NRCan	Natural Resources Canada
OGC	Open Geospatial Consortium
OGP	International Association of Oil and Gas Producers
RCM	Radar Constellation Mission
SAR	Synthetic Aperture Radar
SHP	Esri Shapefile
SPI	Strategic Policy and Innovation Sector
UTC	Coordinated Universal Time
WMS	Web Map Service
ZIP	File compression format

1.6 INFORMAL DESCRIPTION OF THE DATA PRODUCT

The Floods in Canada / International Floods product displays the extent of flooding over specific areas of interest. It is published to assist on-the-ground flood response activities and to facilitate decision-making in order to reduce the risk posed by flood events in Canada or internationally. Emergency Geomatics Service (EGS) generates and publishes this product when tasked by the Government Operations Centre (GOC).

The map product is produced from images acquired by synthetic aperture radar (SAR) satellites in near real time. The main sources are the Canadian RADARSAT-2 satellites, the Radarsat Constellation Mission (RCM), as well as satellites from international agencies who are signatory to [The International Charter Space and Major Disasters](#).

For a Canadian event, this collection of cartographic products regroups flood extent products and their associated footprints. Three visualization timeframes are available:

- Active Floods in Canada
- Floods in Canada – Current Year
- Floods in Canada – Archive

Only the monitoring products produced during the last 3 days (i.e. 72 hours from present) are visible in the 'Active Floods in Canada' web service. These can be found later in 'Floods in Canada - Current Year' service. At the beginning of each year (and sometimes on an irregular basis throughout the year), the products contained in the "Current Year" service are transferred to the archives. All the data produced since 2005 can therefore be found in "Floods in Canada – Archive".

2 SPECIFICATION SCOPE

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

2.1 DOMESTIC PRODUCTS

2.1.1 Scope identification

Main

2.1.2 Level

This scope refers to the following level according to the ISO 19115 standard:

006 - Series

2.1.3 Level name

Floods in Canada

2.1.4 Extent

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

2.1.4.1 Description

Canadian territory

2.1.4.2 Vertical extent

The Floods in Canada product does not have a vertical element. There is no elevation (z) associated with the data.

2.1.4.2.1 Minimum value

Not applicable

2.1.4.2.2 Maximum value

Not applicable

2.1.4.2.3 Unit of measure

Not applicable

2.1.4.2.4 Vertical datum

Not applicable

2.1.4.3 Horizontal extent

2.1.4.3.1 West bounding longitude

-141.0

2.1.4.3.2 East bounding longitude

-52.0

2.1.4.3.3 South bounding latitude

41.0

2.1.4.3.4 North bounding latitude

84.0

2.2 INTERNATIONAL PRODUCTS

2.2.1 Scope identification

Main

2.2.2 Level

This scope refers to the following level according to the ISO 19115 standard:

006 - Series

2.2.3 Level name

International Floods

2.2.4 Extent

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

2.2.4.1 Description

Regions outside of Canadian territory

2.2.4.2 Vertical extent

The International Floods product does not have a vertical element. There is no elevation (z) associated with the data.

2.2.4.2.1 Minimum value

Not applicable

2.2.4.2.2 Maximum value

Not applicable

2.2.4.2.3 Unit of measure

Not applicable

2.2.4.2.4 Vertical datum

Not applicable

2.2.4.3 Horizontal extent

2.2.4.3.1 West bounding longitude

-180.0

2.2.4.3.2 East bounding longitude

180.0

2.2.4.3.3 South bounding latitude

-80.0

2.2.4.3.4 North bounding latitude

+84.0

2.2.5 Temporal extent

The temporal extent is given by the following period of time:

2.2.5.1 Beginning date

2005-05

2.2.5.2 Ending date

Today

2.3 COVERAGE

Full extent

3 DATA PRODUCT IDENTIFICATION

3.1 TITLE

Floods in Canada [Domestic Products]

International Floods [International Products]

3.2 ABSTRACT

The products "Floods in Canada" and "International Floods" are geospatial collections of vector data representing the extent of major floods. The EGS flood extent products are produced using Synthetic Aperture Radar (SAR) and/or optical satellite imagery as well as any other additional information that may be available. The processing methods used to extract flood products from satellite imagery (SAR and optical) were developed by an in-house research team by the Canada Center for Remote Sensing (CCRS) at Natural Resources Canada (NRCan). These methods allow EGS to extract flood extents from optical and SAR images from Canadian satellites (e.g. Radarsat-2, RCM, see **Figure 1**) as well as satellites from international agencies who are signatory to [The International Charter Space and Major Disasters](#) (**Figure 2**).

3.2.1 Product and Methodology Description

The flood extents product is developed using a methodology that incorporates machine learning, region growing and leverages historical inundation frequency products to classify open water and flooded vegetation from satellite imagery. An example of a flood extent product is presented in **Figure 1** which displays 'open water' and 'flooded vegetation' from all other land cover classes extracted from a Radarsat-2 image.

Open water is mapped by using a process that makes use of multiple radar polarizations when available to perform multi-channel supervised machine learning classification. This process uses inundation frequency from historical data to sample scene-specific signatures with added information obtained from land and water classes. Land signatures are extracted where inundation has never occurred based on historical data, while water signatures are extracted where water is permanent (frequency = 100%). Machine learning is then used to automatically classify the open water extent.

Once open water is mapped, flooded vegetation is mapped by iteratively region growing from open water into adjacent bright intensity areas using a bright threshold value criterion. This is possible because flooded vegetation results in high intensity return to the sensor caused by double-bounce of the incident beam first off of horizontal water surfaces beneath the canopy, and second off of vertical trunks and stems acting as corner reflectors before returning to the sensor (**Figure 4** for explanation).

The presence of corner reflectors other than flooded vegetation may produce commission error, a second limitation of the methodology is related to the local topography of the riverbanks. Steep riverbanks oriented perpendicular to the radar look direction will appear bright and will be incorrectly classified as flooded vegetation. If confidence in the flooded vegetation product is not high enough, EGS may simply publish the 'open water' extent extracted by this method or, if necessary, by use of a legacy open water threshold extraction method.

Notes:

- Editing of flood maps is still required to remove either false detections or those that are not of interest for public safety. When possible, ancillary data (e.g. aerial survey, crowdsourced information, field surveys, unmanned aerial vehicle) is used in the editing process.
- The methodology is sensor-independent and can extract flood extents from single polarization (e.g. TerraSAR-X), dual-polarization (e.g. Sentinel-1) and quad-polarization (e.g. RADARSAT-2).
- The severity of the flood is best interpreted as a time series and/or in conjunction with ground validation. The flood status can be very dynamic throughout the spring melt season and products reflect the conditions at the date/time of satellite image acquisition (information available in distributed flood product metadata).
- Currently the presence of river ice within the flood zone is established using photo interpretation for anomalous areas that are not clearly classified by the flood algorithms.

The methods developed and/or used by EGS to produce the "Floods in Canada" product is further detailed in the following literature:

Olthof, I., Tolszczuk-Leclerc, S., Lehrbass, B., Shelat, Y., Neufeld, V., & Decker, V. (2018) New flood mapping methods implemented during the 2017 spring flood activation in southern Quebec. *Open file (Geomatics Canada)*, Natural Resources Canada. <http://publications.gc.ca/pub?id=9.853128&sl=1>

EGS will apply the same methods to produce the "International Floods" product when they are found to be appropriate for local conditions.

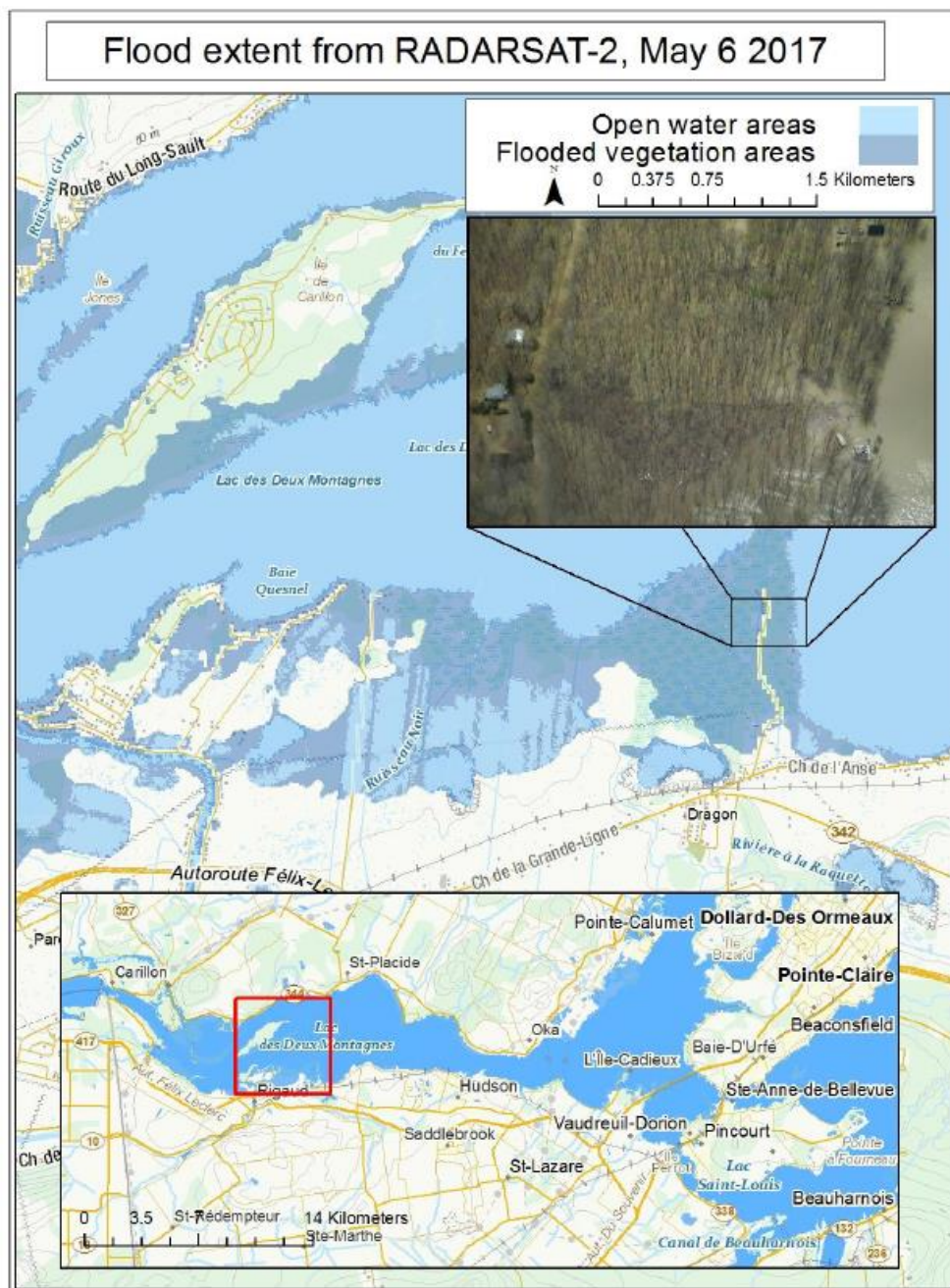


Figure 1 Open water and flooded vegetation mapped from RADARSAT-2 near Rigaud, Quebec, confirmed by oblique airphotos.

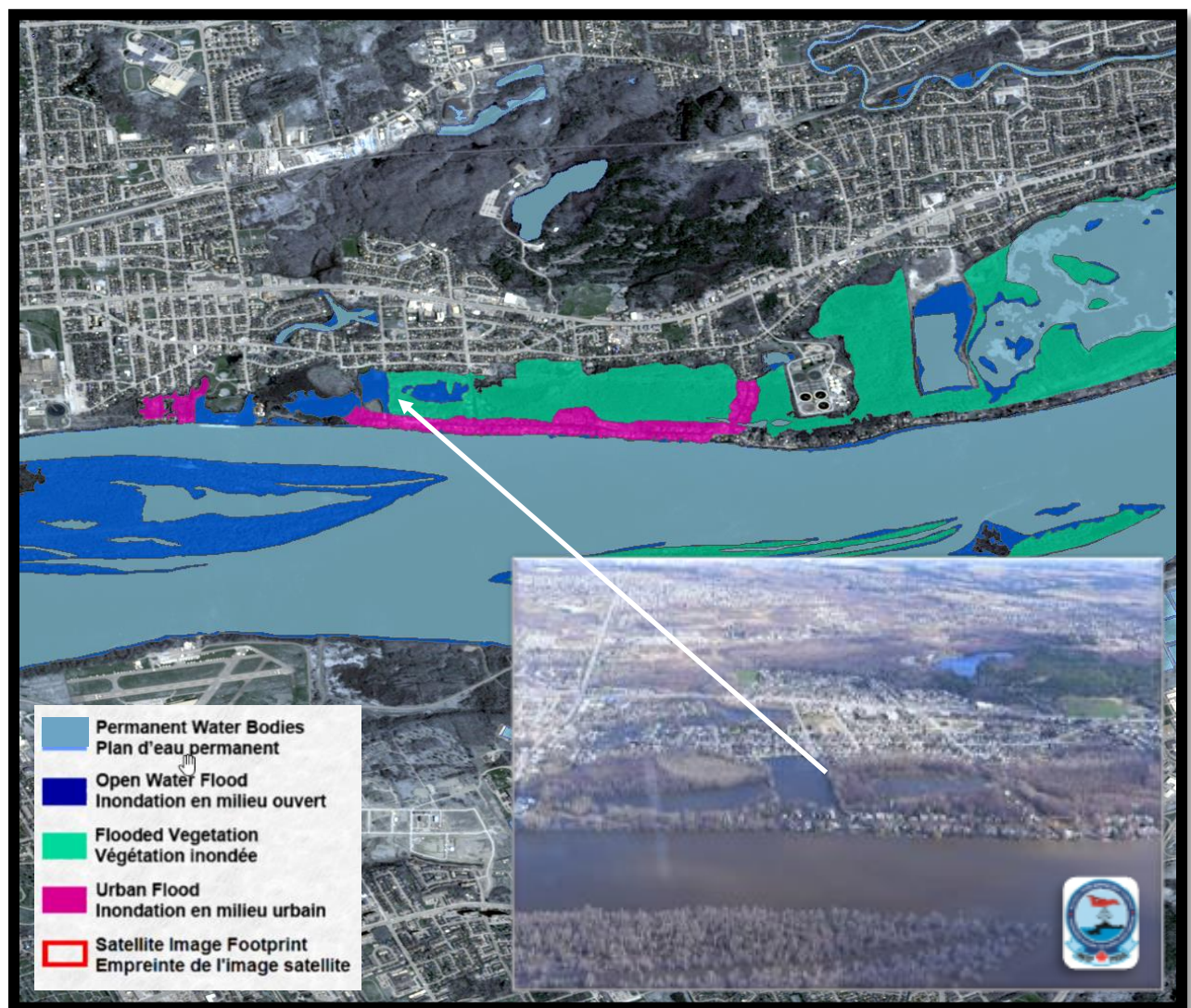


Figure 2 Flooding on the Ottawa River (Quebec / Ontario): from a PlanetScope image of May 8, 2019, at 2:25 p.m. UTC. The flood is represented by land use category: pale blue for permanent water, dark blue for open water flooding, green for vegetated flooding and pink for urban environment. Coincident field validation photo provided by Transport Canada's National Aerial Surveillance Program (NASP).



Figure 3 a) An example of flooding in Red River, Manitoba. The water is calm and therefore has specular reflection. b) Specular reflection: A smooth surface acts like a mirror for the incident radar pulse. Most of the incident radar energy is reflected away, and very little energy is scattered back to the radar sensor.

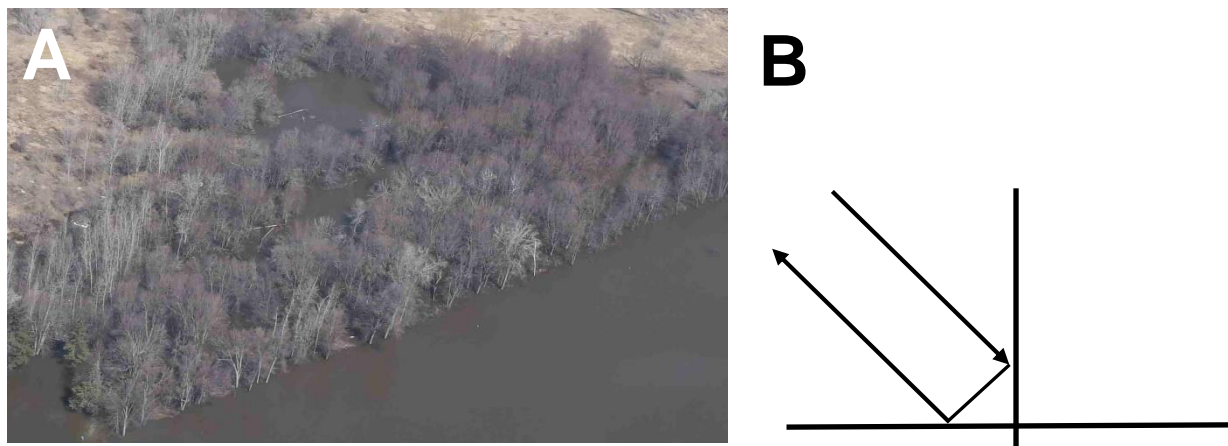


Figure 4 a) An example of flooded vegetation on the Ottawa River in Gatineau, Quebec (photo provided by Transport Canada's National Aerial Surveillance Program (NASP)). The water is calm and the vertical trees cause a double bounce resulting in a high intensity return. b) Schematic figure showing the effect of double-bounce backscattering of flooded vegetation where water and vegetation reflect back a high proportion of the radar energy back to the sensor.

3.3 OBJECTIVE

Flooding can have devastating impacts on human life, infrastructure, wildlife, agriculture, and economy. Flooding can result from a variety of factors including spring snowmelt, ice jams, extreme rainfall, hurricanes, tsunamis, and coastal flooding. Canada typically experiences spring flooding on a yearly basis, it is expected with changes in climate that there will be an increase in flood events frequency and intensity.

Access to near-real time flood maps and information detailing the extent, severity and progression of a flood event greatly improves on the ground situational awareness and facilitates decision making and flood forecasting. Other methods of collecting flood extent information include aerial survey, field surveys and UAV's (Unmanned Aerial Vehicle). While these methods have many advantages including excellent flexibility in terms of observation timing and frequency, some of the disadvantages are they can be expensive and provide limited spatial coverage. Satellite remote sensing systems provide a very good alternative due to their routine, systematic, synoptic and repetitive imaging capability. While optical satellite imagery is subject to weather conditions, Synthetic Aperture Radar (SAR) satellites such as Canada's RADARSAT-2 and RCM are particularly well suited to the task because they can image independent of daylight and weather conditions. However, SAR satellites operate in certain orbits that limit their imaging capabilities in terms of time and frequency of acquisition. As such, SAR satellite and optical observation must be considered as complementary rather than conflicting sources of information.

3.4 TOPIC CATEGORY

Main topics for the product, as defined by the ISO 19115-1:2014 standard:

007 - environment

008 - geoscientificInformation

012 - inlandWater

3.5 SPATIAL REPRESENTATION TYPE

001 - vector

3.6 SPATIAL RESOLUTION

Spatial resolution varies depending on the source imagery.

3.7 GEOGRAPHIC DESCRIPTION

3.7.1 Authority

International Organization for Standardization (ISO)

3.7.1.1 Title

ISO 3166-1 and ISO 3166-2: 2013 Codes for the representation of names of countries and their subdivisions, respectively – Part 1 Country codes, Part 2 Subdivision codes

3.7.1.2 Date

Reference date of the ISO 3166-1, ISO 3166-2:2013 standard: 2013-11-01

3.7.1.3 Date type

002 - Publication

3.7.2 Code

Code of the geographical region covered by the domestic products according to the ISO 3166-1 country code standard:

CAN – Canada (Alpha-3 representation)
CA – Canada (Alpha-2 representation)

and the ISO 3166-2 subdivision code standard:

AB – Alberta
BC – British Columbia
MB – Manitoba
NB – New Brunswick
NL – Newfoundland and Labrador
NS – Nova Scotia
NT – Northwest Territories
NU – Nunavut
ON – Ontario
PE – Prince Edward Island
QC – Quebec
SK – Saskatchewan
YT – Yukon

EGS may also create international flood products when activated through The International Charter Space and Major Disasters and it is felt that the methods developed for its domestic products will be appropriate for local conditions. The subject countries and subdivisions will also be identified by their ISO 3166-1 Alpha-3 and ISO 3166-2 Alpha-2 codes, respectively.

3.8 REFERENCE TO SPECIFICATION SCOPE

Main

4 DATA CONTENT AND STRUCTURE

4.1 DESCRIPTION

This vector product is composed of a water layer classified according to land use and a layer containing the image footprint. The flood extent product files can be subdivided into two to six categories depending on the area's physical characteristics, meteorological conditions, sensor type, image resolution, and quality of the image. The 'Permanent Water' and 'Open Water' classifications are in all contemporary products. The classifications "Flooded Vegetation", "Urban Flooding", "River Ice" and "Unknown State" are included when their determination is possible and appropriate. The "Unknown State" classification is used in cases where an area could not be updated with the last available image, but where flooding may persist.

Each satellite image processed is analyzed individually to produce a new flood extent product.

4.2 DATA MODELLING SCHEMA

4.2.1 Application schema

Not applicable

4.2.2 Feature catalogue

The layers contained in the downloadable FGDB files have the following structures.

4.2.2.1 EGS_Flood_Product_Current and EGS_Flood_Product_Archive

Polygon feature class of original flood extents. The attributes contained in feature class are presented in Table 1.

Table 1: Attributes contained in EGS_Flood_Product_Archive and EGS_Flood_Product_Current

Attribute	Type	Definition
product_file_name	Text (255)	Filename of published product associated to feature.
version	Float (3)	Version of product
confidence_level	confidenceLevelDomain (10)	Confidence level of product (Low, Moderate, High)
swath_file_name	Text (255)	Name of assembled sensor image file from which product file was extracted. May consist of several mosaicked scenes.
swath_id	Text (100)	Unique identifier assigned to swath that ties product to upstream database tables.
event_type	eventTypeDomain (30)	Type of event that resulted in product (values relevant to flood products are: Flood, Earthquake, Mass Movement, River Ice Breakup, Storm)
country_code	Text (3)	ISO 3166-1 Alpha-3 country code.
subdivision_code_client	Text (2)	ISO3166-2 country subdivision code of the political entity for whom the product was prepared. If a flood occurs in a waterbody lying along a boundary shared by more than one subdivision, only of those will be deemed the client.
aoi_type	Text (20)	Type of AOI that aoi_code represents. ('watershed-3' or 'watershed-4' for flood products)

aoi_code	Text (128)	River basin name at level 3 or 4 of ECCC or area of interest code
target_name	Text (128)	Specific target that the product is associated with. For example, may be the name of a river tributary or municipality that has flooded.
datetime_utc	Date (8)	Date and time UTC of image acquisition 'CCYY-MM-DDThh:mm:ss.uuu'
date_utc	Date (8)	Date of image acquisition "CCYY-MM-DD"
datetime_utc_str	Text(19)	Date and time UTC of image acquisition 'CCYY-MM-DD hh:mm:ss' in text
sensor_type	sensorTypeDomain (10)	Sensor type
sensor_name	sensorNameDomain (25)	Imagery sensor name
product_notes	Text (1000)	Important notes about product (bilingual)
datetime_publication_utc	Text (19)	Date and time UTC of product publication
package_url	Text (255)	FTP download url of published product
is_active	Short Integer (2)	Available or not
class	classDomain (255)	Type of flooded area (0 = Unclassified, 1 = Permanent Water, 2 = Open Water, 3 = Flooded Vegetation, 4 = Urban Flood, 5 = River Ice, 6 = Unknown State)
Shape	Geometry	Type of geometry (Polygon)
Shape_Length	Double	Length of geometry in spatial reference units
Shape_Area	Double	Area of geometry in spatial reference units

4.2.2.2 EGS_Flood_Product_Current_L1 and EGS_Flood_Product_Archive_L1

Polygon feature class of Level 1 flood extents. These feature classes contain flood extent polygons from the original (4.2.2.1) feature classes that are greater than 1 000m². The attributes contained in feature class are presented in Table 1.

4.2.2.3 EGS_Flood_Product_Current_L2, and EGS_Flood_Product_Archive_L2

Polygon feature class of Level 2 flood extents. These feature classes contain flood extent polygons from the original (4.2.2.1) feature classes that are greater than 600m². The attributes contained in these feature classes are presented in Table 1.

4.2.2.4 EGS_Flood_Product_Current_L3 and EGS_Flood_Product_Archive_L3

Polygon feature class of Level 3 flood extents. These feature classes contain flood extent polygons from the original (4.2.2.1) feature classes that are greater than 300m². The attributes contained in these feature classes are presented in Table 1.

4.2.2.5 EGS_Flood_Product_Current_L4, and EGS_Flood_Product_Archive_L4

Polygon feature class of Level 4 flood extents. These feature classes contain flood extent polygons from the original (4.2.2.1) feature classes that are greater than 100m². The attributes contained in these feature classes are presented in Table 1.

4.2.2.6 EGS_Flood_Product_Current_FP and EGS_Flood_Product_Archive_FP

Polygon feature class of image footprints for the Flood in Canada products. The attributes contained in these feature classes are presented in Table 1.

4.2.2.7 EGS_Flood_Product_Current_Swath and EGS_Flood_Product_Archive_Swath

Polygon feature class of image swathes used to generate Flood in Canada products. The attributes contained in feature class are presented in Table 1 with the addition of the attribute presented in Table 2.

Table 2: Attributes contained in EGS_Flood_Product_Current_Swath and EGS_Flood_Product_Archive_Swath

Attribute	Type	Definition
swath_file_name	Text (255)	Satellite swath path name

4.2.3 Attribute Domain Definitions

4.2.3.1 classDomain

Flood classification according to land use.

Table 3: Flood Classification Domain

Attribute	Type	Definition
Unclassified	Integer 0	Generally applied to older products, shows gross flood extent with no separation of permanent water from flooded areas, and no distinction between differing land uses in the flood zones.
Permanent Water	Integer 1	Permanent water bodies.
Open Water Flood	Integer 2	Flood extent that can be directly observed by satellite observation.
Flooded Vegetation	Integer 3	Any flood which happens in flooded forest environment, this type of flood is interpreted according to three criteria: a brilliant radar feedback, the known presence of tree

		vegetation obtained from a land use map, then the proximity of a watercourse.
Urban Flood	Integer 4	Flood in a denser built environment observed by high resolution optical satellite imagery or by a combination of indirect observations (Field photographs, airborne photography, drone imagery, etc.) Radar does not allow mapping of floods in urban areas due to the shadow cast by the buildings as well as other factors. This class is therefore only present in the product when a secondary source is used to validate the flooded urban / built area.
River Ice	Integer 5	Ice coverage observed by SAR imagery, high-resolution optical satellite imagery or by a combination of indirect observations (Field photographs, airborne photography, drone imagery, etc.)
Unknown State	Integer 6	Current flood state could not be established for the area using the most recent image, but flooding may still persist. The image may not overlay the area, or obstructions like cloud cover in an optical image may prevent such determination.

4.2.3.2 confidenceLevelDomain

Confidence level assigned to the product after quality control

Table 4: Confidence Level Domain

Attribute	Type	Definition
low	Text Low	Low confidence level
moderate	Text Moderate	Moderate confidence level
high	Text High	High level of confidence

4.2.3.3 eventTypeDomain

Definition: Event that was the catalyst for the product being created.

Table 5: Event Type Domain

Attribute	Type	Definition
Drought	Text Drought	Activation caused by drought.
Epidemic	Text Epidemic	Activation caused by biological epidemic.
Earthquake	Text Earthquake	Activation caused by earthquake which in turn could result in infrastructure collapse or tsunami-driven flooding.
Extreme Temperature	Text	Activation caused by extreme temperatures.

	Extreme Temperature	
Flood	Text Flood	Activation caused by flooding triggered by spring thaw or heavy rainfall.
Humanitarian	Text Humanitarian	Activation caused by humanitarian crisis.
Industrial Accident	Text Industrial Accident	Activation caused by an industrial accident such as explosion, pipeline rupture, release of toxic material into the environment, reactor meltdown.
Infestation	Text Infestation	Activation caused by an infestation of insects, vermin or other animal life.
Mass Movement	Text Mass Movement	Activation caused by mass movement such as a landslide or avalanche.
River Ice Breakup	Text River Ice Breakup	Activation caused by river ice breakup and associated ice jams.
Storm	Text Storm	Activation caused by normal rain or snow storm.
Transportation Accident	Text Transportation Accident	Activation caused by a transportation accident such as train derailment, multi-vehicle pile up.
Volcanic Activity	Volcanic Activity	Activation caused by volcanic eruption.
Wildfire	Text Wildfire	Activation caused by forest or grassland wildfire.
Wind Storm	Text Wind Storm	Activation caused by tornado, hurricane, typhoon or other wind storm.
Other	Text Other	Activation caused by other event that does not fit into the above event definitions.

4.2.3.4 sensorNameDomain

Sensor used to capture imagery from which final product was derived. This is a living list that may be expanded as new sensors come online.

Table 6: Sensor Name Domain

Attribute	Type	Definition
ALOS	Text ALOS	ALOS (Advanced Land Observation Satellite) – provides both optical and SAR capability.
ALOS-2	Text ALOS-2	ALOS-2 (Advanced Land Observing Satellite-2; SAR mission)
CBERS-4	Text CBERS-4	CBERS-4 (China-Brazil Earth Resources Satellite) – 4th Generation Satellite Series - optical
COSMOS-SkyMed	Text COSMOS-SkyMed	European Space Agency constellation of 4 SAR satellites
Gaofen-3	Text Gaofen-3	Gaofen-3 (GF-3) SAR Satellite C-band polarimetric SAR satellite of CNSA (China National Space Administration)

GeoEye-1	Text GeoEye-1	GeoEye-1 is an Earth-imaging optical satellite operated by Maxar of the United States as part of ESA's Third Party Missions Programme
GeoEye-2	Text GeoEye-2	Earth observation optical satellite designed and built by Lockheed Martin Space Systems.
Kanopus-V	Text Kanopus-V	Kanopus-V 1 (Kanopus-Vulkan N1, Environmental Satellite) is an Earth observation optical minisatellite mission of the Russian Space Agency, Roskosmos and ROSHYDROMET/Planeta.
Kanopus-V-IK	Text Kanopus-V-IK	Kanopus-V-IK 1 (Kanopus-Vulkan-Infra-Krasny-1) is a small Russian (Roscosmos) optical satellite for Earth-observation purposes.
KOMPSAT-2	Text KOMPSAT-2	KOMPSAT-2 (also known as Arirang-2) is an Earth-imaging/environmental Korean optical satellite.
KOMPSAT-3A	Text KOMPSAT-3A	KOMPSAT-3A (Korea Multi-Purpose Satellite-3A / Arirang-3A) earth observation optical/infrared satellite with two imaging systems on board.
KOMPSAT-5	Text KOMPSAT-5	KOMPSAT-5 (Korea Multi-Purpose Satellite-5 / Arirang-5) is an Earth observation SAR satellite system
KOMPSAT-6	Text KOMPSAT-6	KOMPSAT-6 (Korea Multi-Purpose Satellite-6 / Arirang-6) is the second SAR satellite of KARI (Korea Aerospace Research Institute) as a follow-on from KOMPSAT-5.
KOMPSAT-7	Text KOMPSAT-7	KOMPSAT-7 (Korea Multi-Purpose Satellite-7 / Arirang-7) is the follow-up model of KOMPSAT-3A to provide high-resolution optical imagery.
Landsat 7	Text Landsat 7	Landsat 7 is a collaboration between NASA, NOAA and USGS to provide optical satellite imagery.
Landsat 8	Text Landsat 8	Landsat 8 it is a collaboration between NASA and the USGS to provide optical satellite imagery.
Landsat 9	Text Landsat 9	Landsat 9 it is a collaboration between NASA and the USGS to provide optical satellite imagery.
MODIS	Text MODIS	MODIS (or Moderate Resolution Imaging Spectroradiometer) is a key instrument aboard the Terra (originally known as EOS AM-1) and Aqua (originally known as EOS PM-1) satellites to provide optical imagery.
PALSAR	Text PALSAR	Phased Array L-band Synthetic Aperture Radar (PALSAR) aboard ALOS-1 satellite.
PALSAR-2	Text PALSAR-2	The PALSAR-2 aboard the ALOS-2 is an L-band Synthetic Aperture Radar (SAR).
PlanetScope	Text PlanetScope	The PlanetScope constellation consists of 130+ DOVE satellites is able to provide optical imagery every day that covers nearly all of Earth's landmass.
Pleiades-HR 1A	Text Pleiades-HR 1A	AIRBUS Defence & Space Pleiades-1A optical sensor provides high resolution stereo imagery as part of a constellation of 2 satellites.
Pleiades-HR 1B	Text Pleiades-HR 1B	AIRBUS Defence & Space Pleiades-1B optical sensor provides high resolution stereo imagery as part of a constellation of 2 satellites.

RADARSAT-1	Text RADARSAT-1	RADARSAT-1 is the first Canadian developed and commercially operated Earth observation SAR satellite with the objective to monitor environmental change and the planet's natural resources.
RADARSAT-2	Text RADARSAT-2	RADARSAT-2 is a jointly-funded SAR satellite mission of CSA (Canadian Space Agency) and MDA (MacDonald Dettwiler Associates Ltd. of Richmond, BC), representing a Canadian government/industry partnership (Public Private Partnership).
RapidEye	Text RapidEye	RapidEye is a constellation of five identical optical satellites owned and operated by Planet.
RCM-1	Text RCM-1	RCM-1 is the first of 3 satellites in the RADARSAT Constellation Mission that provides C-band SAR data with daily revisit capability.
RCM-2	Text RCM-2	RCM-2 is the second of 3 satellites in the RADARSAT Constellation Mission that provides C-band SAR data with daily revisit capability.
RCM-3	Text RCM-3	RCM-3 is the third of 3 satellites in the RADARSAT Constellation Mission that provides C-band SAR data with daily revisit capability.
RESOURCESAT-2	Text RESOURCESAT-2	ResourceSat-2 is a data continuity mission of ISRO (Indian Space Research Organization) that captures optical imagery.
Resurs-P	Text Resurs-P	Resurs-P (Resurs-Prospective) Remote Sensing Mission Constellation consisting of 2 spacecraft that collect optical imagery.
RISAT	Text RISAT	RISAT-1 (Radar Imaging Satellite-1) is the first indigenous satellite imaging mission of ISRO (Indian Space Research Organization) that collects C-band SAR imagery.
SAC-C	Text SAC-C	SAC-C (Satélite de Aplicaciones Científicas-C) is an international cooperative Earth observation mission of Argentina, USA, Denmark, Brazil, Italy and France with CONAE (Comisión Nacional de Actividades Espaciales) of Buenos Aires (CONAE is the Space Agency of Argentina) and NASA as the main partners, that collects optical imagery.
SAOCOM-1A	Text SAOCOM-1A	SAOCOM (SAR Observation & Communications Satellite) Constellation of 2 spacecraft collecting polarimetric L-band SAR imagery.
Sentinel-1A	Text Sentinel-1A	Sentinel-1A is the first of two polar-orbiting satellites collecting C-band SAR imagery.
Sentinel-1B	Text Sentinel-1B	Sentinel-1B is the second of two polar-orbiting satellites collecting C-band SAR imagery.
Sentinel-2A	Text Sentinel-2A	Sentinel-2A is the first of two polar-orbiting satellites placed in the same sun-synchronous orbit, phased at 180° to each other, collecting optical imagery.
Sentinel-2B	Text Sentinel-2B	Sentinel-2B is the second of two polar-orbiting satellites placed in the same sun-synchronous orbit, phased at 180° to each other, collecting optical imagery.

Sentinel-3A	Text Sentinel-3A	Sentinel-3A is the first of two satellites in a constellation that collect both optical and SAR imagery.
Sentinel-3B	Text Sentinel-3B	Sentinel-3B is the second of two satellites in a constellation that collect both optical and SAR imagery.
SkySat	Text SkySat	SkySat is a constellation of 21 high-resolution Earth imaging satellites owned and operated by the commercial company Planet that collect optical imagery.
SPOT-6	Text SPOT-6	SPOT 6 (Satellite pour l'Observation de la Terre) is the first of two identical satellites that form a constellation collecting optical imagery, the second being SPOT-7.
SPOT-7	Text SPOT-7	SPOT 7 (Satellite pour l'Observation de la Terre) is the first of two identical satellites that form a constellation collecting optical imagery, the second being SPOT-6.
TanDEM-X	Text TanDEM-X	TDX (TanDEM-X: TerraSAR-X add-on for Digital Elevation Measurement) is a high-resolution interferometric SAR mission of DLR (German Aerospace Center), together with the partners EADS Astrium GmbH and Infoterra GmbH in a PPP (Public Private Partnership) consortium.
TerraSAR-X	Text TerraSAR-X	TerraSAR-X1 (also referred to as TSX or TSX-1) is a German SAR satellite mission for scientific and commercial applications.
UK-DMC2	Text UK-DMC2	UK-DMC-2 (United Kingdom - Disaster Monitoring Constellation-2) is satellite that collects optical imagery.
Undefined	Text Undefined	Sensor is not identified by other members of this domain. For example, imagery may have been captured by a drone or may be a hybrid created from multiple sources.
WorldView-1	Text WorldView-1	WorldView-1 is an environment-monitoring satellite from Maxar of the United States that collects optical imagery.
WorldView-2	Text WorldView-2	WorldView-2 is an environment-monitoring satellite from Maxar of the United States that collects optical imagery.
WorldView-3	Text WorldView-3	WorldView-3 is an environment-monitoring satellite from Maxar of the United States that collects optical imagery. It is very similar to WorldView-2 but positioned in a lower orbit.
WorldView-4	Text WorldView-4	WorldView-4 is an environment-monitoring satellite from Maxar of the United States that collects optical imagery.

4.2.3.5 sensorTypeDomain

Definition: Type of sensor from which the product was derived

Table 7: Sensor Type Domain

Attribute	Type	Definition
SAR	Text SAR	Synthetic Aperature Radar
Optical	Text Optical	Multi-band optical
Undefined	Text Undefined	Undefined/unknown

4.3 REFERENCE TO SPECIFICATION SCOPE

Main

5 REFERENCE SYSTEMS

5.1 SPATIAL REFERENCE SYSTEM

Product files are offered in the World Geodetic System spatial reference system (WGS84 – EPSG:4326) while the corresponding web services use the Web Mercator projection (WGS 84 / Pseudo-Mercator - EPSG:3857).

5.1.1 Authority

5.1.1.1 Title

EPSG Geodetic Parameter Registry:

URL: <http://www.epsg-registry.org>

5.1.1.2 Date

Reference date:

2011-08-17

5.1.1.3 Date type code

Date type according to ISO 19115 standard:

002 - Publication

5.1.1.4 Responsible party

OGP - International Association of Oil and Gas Producers

URL : <http://www.epsg.org> (en anglais seulement)

5.1.2 Code

Coordinate reference system identifier (CRSID):
EPSG:3857 and 4326

5.1.3 Code space

EPSG - European Petroleum Survey Group

5.2 REFERENCE TO SPECIFICATION SCOPE

Main

6 DATA QUALITY

Disclaimer:

Emergency response authorities are the primary users of these satellite-derived open water flood extent map products. These products are generated to provide analysis and emergency response situational awareness and to facilitate decision-making during major flood events. The open water flood extent products are generated rapidly and limited time is available for editing and validation. The flood products reflect the open water flood conditions at the date/time of acquisition. While efforts are made to produce high quality products, near-real time products may contain errors due to the limited time available for vector editing and validation. Please note that current algorithms do not map flooded areas under the forest canopy and are not optimized for urban flood mapping.

6.1 COMPLETENESS

The datasets contain a classification of flooded areas. The completeness depends on the area's physical characteristics and meteorological conditions, the processing time available, sensor type, image resolution, and quality of the image. The footprints define the area available for processing for the image. The flood products are visually inspected for content against the source images used to generate the classifications and independent source when available. Manual editions are undertaken until quality is deemed high enough for publication.

6.1.1 Commission

Information products derived from satellite images, in general, have limitations imposed by sensor parameters and environmental conditions at the time of acquisition. For example:

- SAR images are sensitive to moisture; large amounts of wet snow can be expected to be misclassified as water.
- Other natural or manmade targets which exhibit a specular reflection can be misclassified as water. Examples: Smooth wet ice, asphalt highway/parking lot, desert sand, airport landing strips. SAR images acquired in mountainous areas can have significant relief displacement (foreshortening, layover and radar shadow) due to SAR side looking geometry. Thus in presence of steep terrain can render the extraction of flood extent difficult.

- Corner reflectors other than flooded vegetation adjacent to open water may result in commission errors in the flooded vegetation class.
- Where riverbanks are steep and roughly parallel with the SAR orbit, flooded vegetation commission error will also occur. These errors are caused by the proximity of the riverbanks to the main channels satisfying the region growing criterion with steep local incidence angles that increase backscatter values to the point where confusion with flooded vegetation occurs. Hence, steep riverbanks oriented perpendicular to the radar look direction will appear bright and will be incorrectly classified as flooded vegetation. Using ancillary datasets such as slope and aspect based on look direction help solve this problem by preventing region growing on slopes above a certain grade. Every efforts to remove this type of error are deployed to remove this type of error from the final products during the quality control process.

A number of editing tools are used to edit out over mapping of the flood extent, but there may be some over mapped areas left over.

6.1.2 Omission

Information products derived from satellite images, in general, have limitations imposed by sensor parameters and environmental conditions at the time of acquisition. For example:

- SAR images are sensitive to surface roughness. The presence of high winds that generate waves, current/rapids, and the presence of ice on water increases the roughness of the water surface and complicate the discrimination of open water.
- To minimize editing, a fixed spatial extent processing mask is often used to delimit the extraction of open water polygons to areas of interest. Areas outside of this mask are not processed. The footprint of the area processed is available for download on our FTP site with open flood extent products.

A minimum polygon size is set in hectares and varies by regions, end user needs and ground conditions. Some small flooded areas might be missing from the final product for this reason.

6.2 CONSISTENCY

6.2.1 Conceptual Consistency

Not applicable

6.2.2 Domain Consistency

The domain of values included in the feature catalogue is validated in the source database containing the product. This approach ensures the domain consistency between the feature catalogue and the product.

6.2.3 Format Consistency

The use of well-established commercial software to generate distribution formats ensures format consistency for product distribution.

6.2.4 Topological Consistency

Not applicable

6.3 POSITIONAL ACCURACY

6.3.1 Absolute or external accuracy

The positional accuracy varies according to two major factors:

1. The resolution of the source image.
2. The precision of the DEM which is used to orthorectify the image.

The resolution of the image used in the flood extent extraction process is provided in the metadata.

The precision is not calculated.

6.3.2 Relative or internal accuracy

Unknown

6.4 TEMPORAL ACCURACY

6.4.1 Accuracy of a Time Measurement

Not applicable

6.4.2 Temporal Consistency

Not applicable

6.4.3 Temporal Validity

The product represents the river ice conditions at the time of image acquisition.

6.5 THEMATIC ACCURACY

6.5.1 Classification Correctness

Products extracted from SAR or optical satellite images have limitations imposed by sensor parameters and environmental conditions at the time of image acquisition. The use of a 'Confidence Level' attribute makes it possible to qualify the quality of the product classification of low, moderate or high. A low confidence level often means that the source is of low resolution and that the limits of the flood extent are more or less reliable. A high confidence level means that the source comes from a high-resolution image and that the product has probably been verified by additional data such as aerial photographs.

6.5.2 Non Quantitative Attribute Correctness

Not applicable

6.5.3 Quantitative Attribute Accuracy

Not applicable

6.5.4 Reference to specification scope

Main

7 DATA CAPTURE

7.1 DESCRIPTION

The flood extent product is generated by from SAR and optical satellite imagery following the following procedure:

1. **Data acquisition:** Satellite image is acquired.
2. **Pre processing:** import image, orthorectification, mosaicking, scaling, and filtering.
3. **Flood extraction algorithm:** EGS tools are used to extract open water and, if possible, flooded vegetation from source imagery.
4. **Post-processing:** classification, filtering, convert to vector, and filter out small polygons.
5. **Quality assurance and product validation:** Manual editing is done to validate the content. If possible ancillary data (e.g. aerial survey, crowdsourced information, field surveys, UAV's (Unmanned Aerial Vehicle)) is used.
6. **Packaging and publishing:** The product is then packaged for distribution with the supporting documents (e.g. metadata, documentation)

7.2 REFERENCE TO SPECIFICATION SCOPE

Main

8 DATA MAINTENANCE

8.1 DESCRIPTION

The flood extent product represents a snapshot of the flood conditions when the image was taken. Most of the time, no updates are made to the flood extent product; however, in rare exceptions, modifications can be made to the product if additional information provides a more accurate representation of conditions.

Flood extent products published in the current year are added to 'Floods in Canada – Current Year'. At the end of each year (and potentially on an intermittent basis throughout the year), that year's products are transferred to 'Floods in Canada – Archive'. They are available for download on the Canada Open Maps website (<https://open.canada.ca/en/open-maps>).

8.2 REFERENCE TO SPECIFICATION SCOPE

Main

9 DATA PRODUCT DELIVERY

The product can be accessed in different formats.

- **Prepacked files (.zip):** These prepackaged files are published for each flood extent product extracted for a satellite image and are accessible via an FTP site. They contain the flood extent product in SHP and KMZ format. A Shapefile in ESRI format of the footprints of the images may also be included, as well as the related documentation, maps in PDF format and metadata.
- **WMS and ESRI Rest Web Service:** Allows you to display products dynamically according to the date and area of interest. There are three flood services. The first displays flooding that has been active during the last 72 hours, the second displays the current year flood extent, and the third displays archived (past years') flood extent products.
- **Geographic database files (ESRI File Geodatabase):** These files contain either all of the data for the current year or archived data since 2011. They are accessible via an FTP site.

9.1 DELIVERY FORMAT INFORMATION: SHP

9.1.1 Format Name

SHP Shapefile - ESRI™

9.1.2 Version

1998-07-01

9.1.3 Specification

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

9.1.4 Language

eng - English

fra – French

9.2 DELIVERY FORMAT INFORMATION: FGDB

9.2.1 Format Name

File Geodatabase - ESRI™

9.2.2 Version

Unknown (Outside the public domain)

9.2.3 Specification

Not available. This format was launched with the ArcGIS (ESRI™) software, version 9.2.

9.2.4 Language

eng - English

fra – French

9.3 DELIVERY FORMAT INFORMATION: KMZ

9.3.1 Format Name

KMZ - Extensible Markup Language

9.3.2 Version

2.3 (August 2015)

9.3.3 Specification

OGC KML 2.3 (<http://docs.opengeospatial.org/is/12-007r2/12-007r2.html>)

9.3.4 Language

eng - English

fra – French

9.4 INFORMATION ON ZIP DATA PRODUCT DELIVERY FORMAT OF SHP AND KMZ

9.4.1 Unit of Delivery

A ZIP file is available with the flood extent in SHP and KMZ format with associated documentation and metadata for each published flood extent product.

9.4.2 Size

The product size varies for 2MB to 15MB.

9.4.3 Medium Name

The flood extent products packaged in ZIP can be downloaded from the anonymous EGS FTP server at <ftp://data.eodms-sgdot.nrcan-rncan.gc.ca/EGS/> or its HTTPS equivalent <https://data.eodms-sgdot.nrcan-rncan.gc.ca/public/EGS/>.

9.4.4 Additional delivery information

- The ZIP file name contains information on the product type, country code, subdivision code, area of interest, and date+time with the following format:

PRODUCTTYPE_COUNTRYCODE_SUBDIVISIONCODE_AREAOFINTEREST_DATE_TIME.zip

ex : FloodExtentPolygon_CAN_NB_LowerSaintJohn_20190423_103028.zip

- On the EGS FTP server, the flood extent products are found in folders located below the root directory, organized by year, 'Flood_Products', country code, and subdivision code. For example:

ftp://data.eodms-sgdot.nrcan-mcan.gc.ca/EGS/2011/Flood_Products/CAN/MB/ or
https://data.eodms-sgdot.nrcan-mcan.gc.ca/public/EGS/2011/Flood_Products/CAN/MB/

- For the characteristics (time, mode, beam) of the satellite images used to generate the cartographic flood products, consult the metadata file associated with each product.

- Information on the use of data is detailed in the Open Government License – Canada

(<https://open.canada.ca/en/open-government-licence-canada>).

9.5 INFORMATION ON DATABASE PRODUCT DELIVERY: FGDB

9.5.1 Unit of Delivery

On the Open Government of Canada website, there are three databases containing information on flood extent products published:

1. Active Floods in Canada (previous 72 hours)
2. Floods in Canada – Current Year (current year)
3. Floods in Canada – Archive (previous years)

9.5.2 Size

The smallest FGDB can be under 50MB, with the other two changing in size as more products are published. The archive currently exceeds 500MB and continues to grow.

9.5.3 Medium Name

The Floods in Canada product is available on the Open Government of Canada website: (<https://open.canada.ca/en/open-maps>) or from the anonymous EGS FTP server at ftp://data.eodms-sgdot.nrcan-mcan.gc.ca/EGS/EGS_FGP_Geodatabases/Flood_Inondation/ or its HTTPS equivalent :

https://data.eodms-sgdot.nrcan-mcan.gc.ca/public/EGS/EGS_FGP_Geodatabases/Flood_Inondation/.

9.5.4 Additional delivery information

Each database contains:

1. feature class(es) of flood extent products,
2. feature class of net product extent footprints, and
3. sensor image swath feature classes.

Information on the use of data is detailed in the Open Government License – Canada (<https://open.canada.ca/en/open-government-licence-canada>).

9.6 REFERENCE TO SPECIFICATION SCOPE

Main

10 ADDITIONAL INFORMATION

10.1 LIMITATION OF LIABILITY

Accordingly, the information contained on this website is provided on an “as is” basis and Natural Resources Canada makes no representations or warranties respecting the information, either expressed or implied, arising by law or otherwise, including but not limited to, effectiveness, completeness, accuracy or fitness for a particular purpose. Natural Resources Canada does not assume any liability in respect of any damage or loss based on the use of this website. In no event shall Natural Resources Canada be liable in any way for any direct, indirect, special, incidental, consequential, or other damages based on any use of this website or any other website to which this site is linked, including, without limitation, any lost profits or revenue or business interruption.

10.2 CREDIT

Use of this data for publications, posters, or presentations is encouraged. All use must include the following standard acknowledgement paragraph: "The flood extent products are derived from satellite images and ancillary data with a system developed and operated by the Strategic Policy and Innovation Sector of Natural Resources Canada © Department of Natural Resources Canada. All rights reserved".

10.3 POINT OF CONTACT

For questions and feedback please contact the Emergency Geomatics Service (egs-squ@nrcan-rncan.gc.ca). Users are also encouraged to send ground reference (e.g. georeferenced photographs), this information will be used for to validate/refine the algorithms and improve the map products.

11 METADATA

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

Metadata for each Flood in Canada product contains the following information:

1. Unique identification information
2. Date information
3. Series information
4. Brief description
5. Detailed description
6. Spatial reference information
7. Geographic extent information
8. Distribution information
9. Information on distribution constraints