10 March 2025

English

United Nations Group of Experts on Geographical Names 2025 session New York, 28 April – 2 May 2025 Item 5 (b) of the provisional agenda * Technical expertise: Geographical names data management

Geographical names for providing weather forecast information in Canada

Submitted by Canada**

Summary:

In 2019, the Meteorological Service of Canada (MSC), which provides Canadians with authoritative information on weather, water quality, climate, ice and air quality, launched the WeatherCAN Mobile Application to provide accessible weather information. The MSC is managed by Environment and Climate Change Canada (ECCC), a department of the Government of Canada.

One of the requirements of this application is the ability to provide accurate, standardized and authoritative place name information so users can locate themselves and receive weather forecasts and alerts. ECCC has partnered with Natural Resources Canada (NRCan), another department of the Government of Canada, to ensure accurate place names are represented in the application by using a subset of the Canadian Geographical Names Database (CGNDB), Canada's official national geographical names database.

The full report provides further information and lessons learned regarding the use of geographical names data for providing weather forecast information in Canada.

^{*} GEGN.2/2025/1.

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Geographical names for providing weather forecast information in Canada

The Meteorological Service of Canada (MSC)

The Meteorological Service of Canada (MSC) is Canada's authoritative source for weather forecasting and alerts, as well as water, ice and climate data. The MSC is a branch of Environment and Climate Change Canada (ECCC), a department of the Government of Canada. It has a broad mandate, including: protecting and conserving Canada's natural heritage; predicting weather and environmental conditions; preventing and managing pollution; and, promoting clean growth and a sustainable environment for present and future generations.

WeatherCAN Mobile Application

In 2019, the MSC launched the WeatherCAN Mobile Application, a free smartphone-based application ('app') to provide accessible weather information to Canadians. This application provides weather forecast and alert information to approximately 750 000 users monthly.



Weather forecast information, Ottawa, Ontario, WeatherCAN, February 6, 2025

An operational requirement of the WeatherCAN app is the ability to provide a search capability by geographical place name to locate users, as well as to provide a list of locations that users may select for their personalized weather forecasts and alerts.

The MSC explored several potential solutions for geographical names data, including third party data providers, and decided to use a subset of the Canadian Geographical Names Database (CGNDB), the national database for official place names maintained by Natural Resources Canada (NRCan). The CGNDB is the repository for geographical names approved by the federal, provincial and territorial naming authorities of the Geographical Names Board of Canada (GNBC), and provides an authoritative, updated, and open source for geographical names data. In addition, the CGNDB provides geographical names in the two official languages of Canada (French and English) where required, as well as robust support for official names in Indigenous languages.

Authoritative Geographical Names Data

To respond to MSC's requirements for the WeatherCAN app, NRCan developed a custom dataset formatted as a comma-separated value (CSV) file that contains data for approximately 12 600 geographical points across Canada.



Geographical distribution of sites from the CGNDB subset used by the MSC

Since there was no existing product that fully met MSC's requirements, an initial list of official geographical sites and names to be included in the WeatherCAN dataset was selected by NRCan's toponymy team by visually inspecting and selecting appropriate geographical names within each of the 1300 pre-determined polygons covering Canada. Once the initial list of geographical names was determined, the software Feature Manipulation Engine (FME) by Safe Software was used to 1) extract a point geometry and all required attributes for those official geographical names from the CGNDB, 2) format all the extracted information into the schema defined by MSC, and 3) export the results into a dataset in the CSV format.

The following lists the attributes included for each of the geographical locations in the WeatherCAN dataset:

- A five character <u>unique identifier</u>, used in the CGNDB for the geographical name for each site;
- The <u>official geographical name(s)</u> for each site, which may include versions in English, French and/or an Indigenous language, where appropriate (for example, 'Lake Winnipeg' in English, 'Lac Winnipeg' in French and 'Weenipagamiksaguygun' in the Anishinaabemowin language);
- For geographical names that have origins in an Indigenous language, the name's <u>Indigenous language</u> is recorded using an ISO 639-3 language code;
- <u>District</u>, an attribute used in cases where there are multiple locations in the CGNDB with the same geographical name which are located in the same province or territory and not within close proximity to one another. The name's DISTRICT attribute is included in the MSC dataset to avoid confusion, and so that MSC can append that DISTRICT in brackets to the site's official name when displayed in the application (for example, 'Sainte-Anne-du-Lac (Antoine-Labelle)' and 'Sainte-Anne-du-Lac (Les Appalaches)' in Québec);
- The <u>province or territory</u> in which the site is located. If a site lies in more than one province/territory, then a separate entry must be included in the dataset for each province/territory;
- Latitude and Longitude coordinates;
- The <u>generic term</u> describing the type of feature for the site (here is a <u>controlled</u> <u>list</u> of generic codes defined by the GNBC);
- The site's <u>concise code</u>, which is a short alphanumeric code used to classify or regroup names based on the nature of the related toponymic feature (e.g. PROV, MUN1, RIV, etc. Concise Gazetteer of Canada – 1997. See the <u>complete list</u>.);
- The site's relevance at <u>scale</u>; and,
- A <u>unique feature ID</u> for each geographical name, which utilizes a unique identifier (32-character string) of the geospatial data representation of the geographical location. The same feature identifier is used for each unique geographical feature, even if the official geographical name changes.

GNDB_ID_EN	CGNDB_ID_FR	CGNDB_ID_IN	GEONAME_EN	GEONAME_FR	GEONAME_IN	IN_LANGUAGE	DISTRICT	PROV_TERR	LATITUDE	LONGITUDE	GENERIC	CONCISE	REL_SCALE	FEATURE_ID
AJCS		ACVMB	Gull Island Rapids		Tshiashku-paushtik ^u	moe		NL	52.9714586	-61.4452308	Rapids	RAP	250000	0c114137849c20c3acf70901608c74bd
BEIS	GBFJV	GBXYL	Lake Winnipeg	Lac Winnipeg	Weenipagamiksaguygun	mis		MB	52.131944	-97.261111	Lake	LAKE	5000000	3a3b4c5fba3411d892e2080020a0f4c9
		IBAPF			Mînî Thnî	sto		AB	51.1677778	-114.8533333	Townsite	UNP	1000000	0cffbdb1849c20c3d18c0b821630b659

Sample of geographical names extracted from WeatherCAN dataset

The CGNDB is periodically updated due to ongoing activities by Canada's federal, provincial, and territorial naming authorities. Processes were developed using FME to keep the MSC dataset up-to-date. The FME process periodically compares the names in MSC's custom dataset to the current names in the CGNDB to check for any changes that need to be reflected in the WeatherCAN dataset. Another similar process extracts the necessary information from the CGNDB when MSC requests new names be added to the dataset. If any changes are detected or when MSC requests new names be added, the required updates are made and a new version of the CSV file is provided to the MSC. A new dataset is extracted and provided for the WeatherCAN dataset every 2-3 months, on average, to ensure the geographical names used are always current.

Geographical names within the WeatherCAN App

The application locates users and returns weather forecasts and alerts based on an algorithm that considers weather alerts/forecasts and census polygons. Users can also save multiple locations.

Other uses

In September 2024, the MSC started to use the same CGNDB subset used by the WeatherCAN mobile app to provide location-based weather information on its website. Before this update, the website was providing forecast and alert information for around 800 localities. The website now provides that information for around 11 000 localities. The website has around 8 million users monthly.



MSC Weather information, screenshot for Ottawa, Ontario, February 5, 2025

The MSC currently disseminates their weather alerts and forecasts to Canadians using a system based on pre-defined polygons with names. Moving forward, the MSC is looking to replace those pre-defined polygons for their extreme weather alert system. Starting in 2026, MSC forecasters will create free-form polygons to define the threat areas affected by severe thunderstorm and tornado warnings. The goal is to disseminate those weather alerts to a more geotargeted audience using MSC's dissemination platforms. By doing so, the description of the threat area will also be improved in the public text-based bulletins by using the CGNDB sites. Since these extreme weather hazards can cover small areas, the MSC requested to add around 2000 sites to MSC's CGNDB subset to improve the national coverage and to be able to characterize properly the location of those threat areas across the country.

In summary, the CGNDB subset improves the weather forecast and alert information that the MSC provides to Canadians by offering that information for around 11 000 localities. The city of Calgary in Alberta is a good example of that improvement. In the past, the MSC was only providing this information for Calgary. The MSC will now provide this information for 8 different sites that are within the city's boundaries. The following is an image representing the polygon for the city of Calgary with the 8 CGNDB sites that are within that polygon and that are now used to disseminate weather alerts and forecasts:



Sites from MSC's CGNDB subset that are located within the city of Calgary, Alberta

Lessons learned and looking ahead

In the future, additional place names may be added to the dataset for the WeatherCAN application and the website, allowing more personalized weather information. MSC and NRCan will continue to work together to improve the dataset and meet user needs with regards to weather information and alerts across Canada.

Application users pay close attention to the geographical names used in the search tools for the app. This results in periodic requests from users to add additional sites, or to question some aspect of the names in the app. Naming authorities periodically change the place name, or some attribute of the name, such as improving the precision of the Latitude-Longitude coordinate.

Currently, NRCan provides updated datasets of the CGNDB for weather forecast use every few months to ensure the geographical names reflected are

always current. The MSC continues to provide feedback to NRCan to ensure application and website user comments are addressed as needed.

In conclusion, MSC's utilization of the CGNDB to create a custom dataset for use within the WeatherCAN app and online is an example of how authoritative, open-source geographical names data may be utilized for widespread public use. Utilizing this custom dataset for weather information has improved the ability of users to find weather information for their precise geographic locations, including providing additional sites within municipalities. Moving forward, the MSC will be looking to transform the dataset from pre-defined polygons to free-form polygons for extreme weather alerts to ensure that these alerts are reflecting the correct geographical areas which are affected. NRCan and ECCC will continue to collaborate to ensure that the custom geographical names dataset will meet user needs, and that ongoing place name updates to the CGNDB are reflected in MSC's public applications.

Points for discussion

The Group of Experts is invited to:

- (1) Take note of the efforts made to integrate authoritative geographical names data in the provision of key public digital services, notably weather forecast information.
- (2) Express its views on the report and discuss other potential applications for geographical names data.