Public Safety Canada | Sécurité publique Canada

BUILDING A **SAFE** AND **RESILIENT CANADA**

Federal Flood Risk Identification

Infrastructure and Buildings Working Group

October 1, 2024

Canada

Issues

- Flooding is Canada's **costliest** natural disaster, and climate change is projected to increase the frequency, severity and variability of all types of flooding.
- Total residential flood risk in Canada is estimated at **$2.3 billion** per year of Average Annual Loss.
- Canada's exposure to flooding is **growing** as a result of increasing housing, infrastructure development, and asset concentration in flood-prone areas.
- In addition, research has shown that a significant number of Canadians located in high-risk flood areas **are not aware of their home or property being at risk**, and therefore exposed to possible flooding events with potentially devastating consequences.

Current Federal Action

- The Government of Canada is working to make key contributions to **adaptation and risk reduction** action through leadership, supporting foundational science and information, building knowledge and capacity, and investing in climate solutions.
- The federal government is working to **improve coordination and program alignment** across all its disaster resiliency programs.
- Both the **Emergency Management Strategy** and **National Adaptation Action Plan** outlined the need to improve understanding of disaster risks in all sectors of society to help develop climate resilient communities.

Natural Hazard Risk Management – Federal Level

- Flood risk reduction is a joint responsibility of all levels of government. Public Safety Canada (PS) holds a leadership role in emergency management, and keeping Canadians safe and protected, including from disasters and risks.

- The Government of Canada is advancing several flood risk reduction initiatives, to increase flood resilience across Canada. Four main hazard risk management initiatives were funded as components of integrated flood risk management in Budget 2023 and 2024:

    1. Implement a **modernized DFAA Program**, which would incentivize mitigation efforts
    2. Stand-up a low-cost **Flood Insurance Program** aimed at protecting high-risk households
    3. Identify **Federally Identified Flood Risk Areas (FIFRA)** for federal government purposes
    4. Create a publicly accessible online Flood Risk Awareness **Digital Resource** for Canadians

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Overview

Flood Mapping at the Canada-wide Scale

- Innovations
- Use-cases

Federally Identified Flood Risk Areas (FIFRA)

- Data Layer
- Program

Communicating and Using the FIFRA

Flood Mapping

- Flood mapping **improves** the overall understanding of flood risk and flood management response.

- The current flood mapping landscape in Canada includes two main types of flood mapping:

Engineering flood maps are the typical flood map in Canada. They:

- Use high resolution input data
- Consider regional hydrology and local hydraulic features
- Produce maps of (relatively) high accuracy and precision.

Global modelling and mapping are becoming more accessible. They:

- Are lower resolution (~30m)
- Estimate pluvial, fluvial, and coastal flooding
- Provide depth and extents for a variety of return period
- Are relatively low accuracy and precision

Canada-wide Flood Hazard Model - Iterations

0 Public Safety Canada (PS) purchased several limited distribution Canada-wide models in 2020 and has been using them for flood risk assessments and analysis

1 In 2024, PS closed a competitive bid process which procured a Canada-wide model with limited sharing capabilities

2 In the coming years, PS will start building a Canada-wide model with academic partners that will be open-source

Canada-wide Flood Hazard Model

Use Cases

- ✓ Pluvial flood risk in Canada.
- ✓ Distribution of flood risk across the country including:
  - Portion of Canadian homes at risk.
  - Trends in geographic location; rural and urban situations; social vulnerability correlation.
- ✓ Impact of climate change and development across the country.
- ✓ Consistent scenarios across the country
- ✓ Create an aggregation of the flood hazard data that allows for flood hazard ratings to be provided for the whole country.

FIFRA Initiative

The FIFRA Initiative seeks to identify high-risk areas across Canada that ultimately would require additional risk assessments and minimum mitigation levels to secure federal funding contributions. It has a two-step process:

1. The **FIFRA Data Layer** will identify a flood hazard rating ranging from Low to Extreme and will be publicly communicated through a Flood Risk Awareness Digital Resource.

2. Based on the identified flood risk rating, the **FIFRA Program** will provide a decision-support tool, including a new mitigation guideline, to guide potential federal infrastructure investments and identify the appropriate mitigation conditions.

FIFRA Data Layer Underlying Principles

Canada-wide Coverage	Federal identification of flood hazard must be at the Canada-wide scale
Consistent Scenarios	Data must incorporate and include a full range of flood scenarios and return periods
Consistent Assessment	Flood scenarios, generating mechanisms and boundaries are created consistently and available across the country
Public Communication	Data is presented in a fashion that is appropriate for public dissemination.
Appropriate Level of Detail	Data is aggregated into ratings to account for possible uncertainty and allows use for appropriate purposes (such as screening federal investments in high and extreme risk areas)

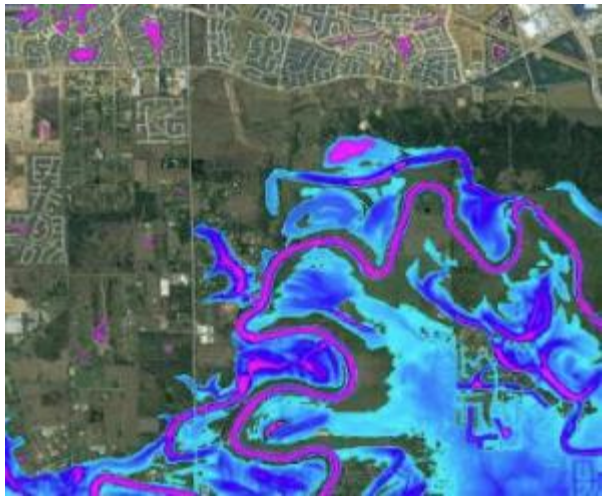
FIFRA Data Layer– Process Overview

Canada-wide Flood Hazard Model – QAQC

Methodology Research

Matrix Approach

Data Analyses



Low	Moderate
High	Extreme

FIFRA Data Layer Methodology Research – Final Approach

- The FIFRA will use a **matrix approach** to combine depth and probability to create a risk rating.

Advantages of a Matrix Approach

- Considers the intensities from multiple return periods.
- Used internationally for other hazards such as landslides, and increasingly, avalanches.
- Great tool for screening purposes to reduce risk of unmitigated federal investments in high and extreme risk areas.
- Does not reduce the data to an 'in or out' and is probabilistic.

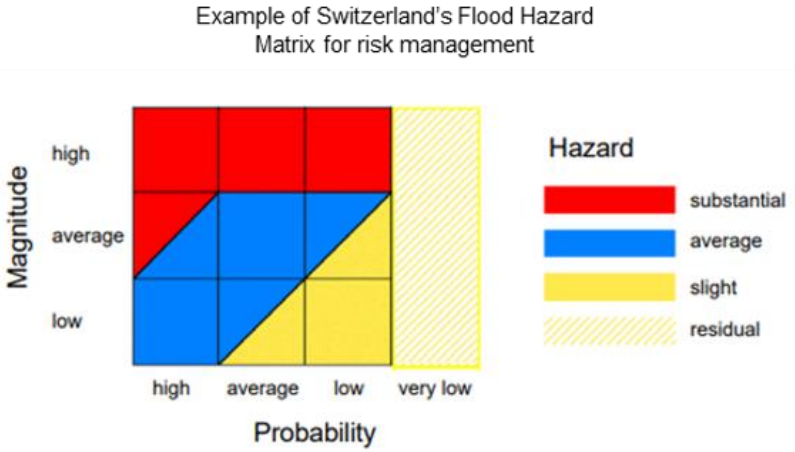
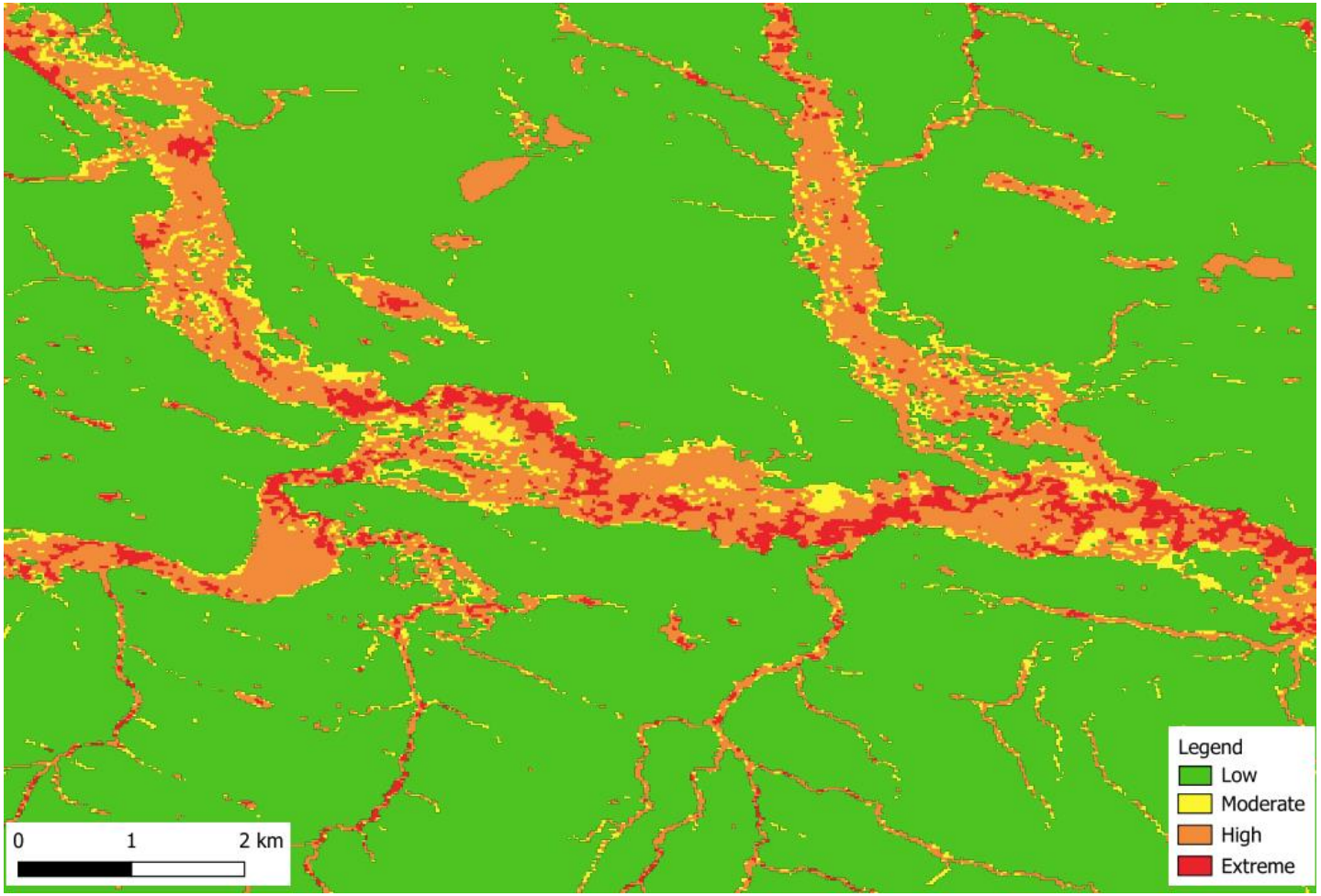


Figure 6: Diagram of hazard levels ("dangers") as a function of probability and intensity.

FIFRA Data Layer - Risk Ratings



FIFRA Program - Resilience Guidance

The FIFRA Resilience Guidance is expected to identify the appropriate mitigation conditions and risk tolerances that **federal** investments at a risk of flooding are required to adhere to receive federal funding.

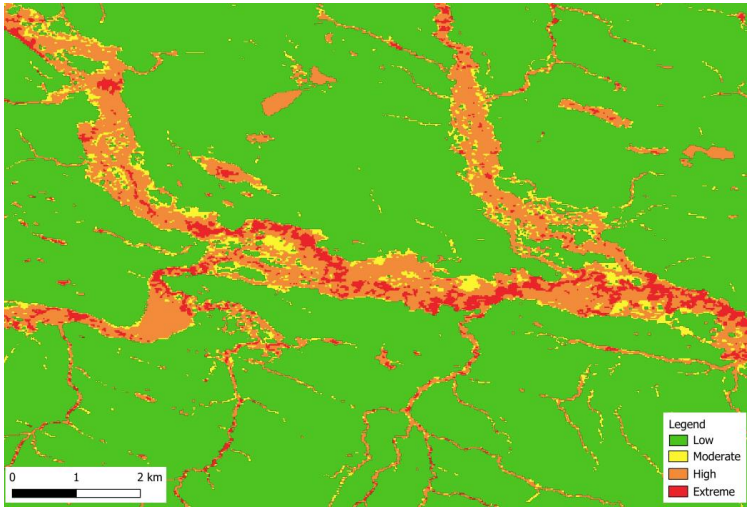
The FIFRA Guideline will:

- ✓ Provide a federal minimum standard level of protection for any new federal development in high-risk areas, as this is inconsistent or unavailable throughout Canada.
- ✓ Provide comprehensive and consistent information on risk tolerances to identify the appropriate mitigation conditions and risk tolerances.
- ✓ Consider Provincial/Territorial/Indigenous/Local context where applicable.
- ✓ Account for mitigation concepts, such as design life, reasonability, ROI, performance-based design, and/or criticality.
- ✓ Include relevant aspects of federal guidelines, building codes and standards.
- ✓ Consider how this will be applied on the ground and consider how to streamline, simplify, and avoid adding substantial administration that will disproportionately hurt the lowest capacity jurisdictions

FIFRA – Examples of Use Cases

- Flood Risk Awareness Digital Resource: The Resource will display the FIFRA ratings to publicly communicate the FIFRA.
- Climate Toolkit for Infrastructure (CT4I): The FIFRA will support the CT4I to help establish climate resilience and mitigation requirements across new infrastructure funding programs and enhance climate informed guidance, standards, and codes.
- Disaster Financial Assistance Arrangements (DFAA): The DFAA will be updating the existing provision of limiting the eligibility of unmitigated structures in flood risk areas (as designated and/or identified by municipal, provincial/territorial, and/or federal authorities).
- Federal Real Property: Public Services and Procurement Canada could integrate the FIFRA within their Building Management plans or Asset Management Plan to promote understanding of flood risk and encourage mitigation actions.

FIFRA Communication



- Transparency
- Meets the needs of the audience
- Clear and concise messages
- Scalable
- Invoke behavioural change

FIFRA Communication - Flood Risk Awareness Digital Resource

- The Flood Risk Awareness Digital Resource will provide **centralized flood hazard information** to help individuals and communities be better informed and prepared for flooding.
- In addition to publicly communicating the FIFRA, the Resource will also include knowledge, guidance, tools and resources to make informed decisions about flood risk.
- The Resource will link to **Canada's Flood Mapping Inventory** to identify areas in Canada where a flood hazard map has been collected by NRCan.

Your Flood Risk is **MODERATE**

This property is in an "X Zone" according to the Federal Emergency Management Agency's flood insurance rate map. It is located in a low-lying area in a rainy climate and is protected by a levee.

Your risk is lowered if your building is elevated 3ft above the ground.
This number represents three feet above the highest adjacent curb. Read more about the City of New Orleans minimum elevation requirements.

There are other things you can do to lower your risk:

- Clean in front of your catch basins - $
- Elevate your utilities - $
- Install green infrastructure - $ - $$
- Elevate your home - $$$

Reduce your risks inside your home

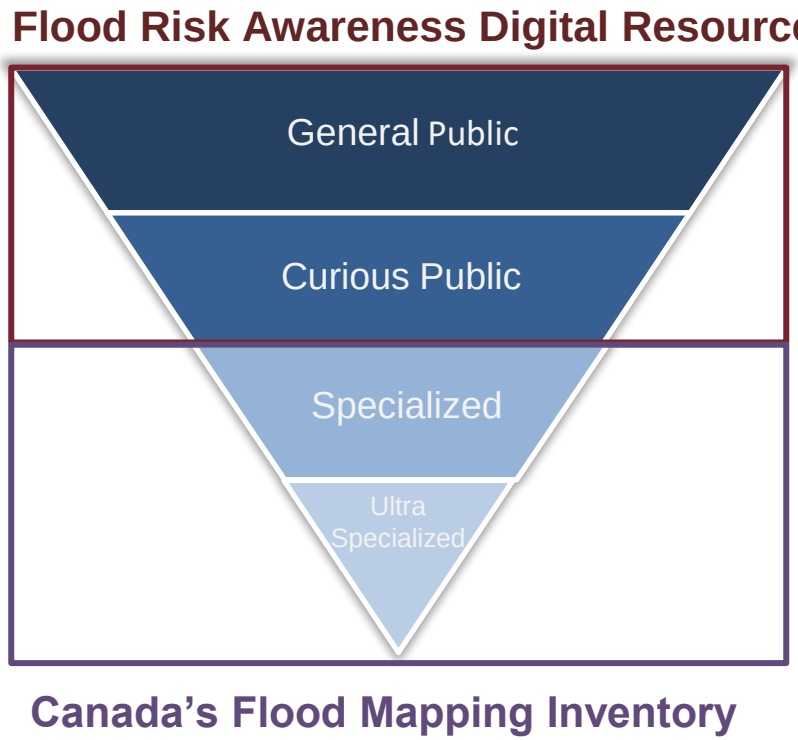
Manage water around your home

Protect your investment from flooding

Get prepared for extreme weather events

The above images are used for example purposes only.

Flood Risk Awareness Digital Resource – Web Presence



Flood Risk Awareness Digital Resource

- Designed to provide comprehensive and accessible flood hazard and risk information that can be used and understood by all Canadians.

Canada's Flood Mapping Inventory

- Purpose-built as a centralized repository for standardized, high-quality flood hazard data, informing technical analyses, land-use regulations, and engineering applications.

Timelines

Procured Canada-wide Flood Hazard Model QA/QC **(Spring 2024-Fall 2024)**

Base FIFRA Data Layer Review **(Spring 2024-Winter 2025)**

Establish the policy aspects of the decision support tool for the FIFRA **(Summer 2024 - Spring 2025)**

Base FIFRA Data Layer Established **(Spring 2025)**

FIFRA Mitigation Guidance created – (**Spring 2025)**

Resource Launch & FIFRA Implementation **(2025)**