



# Floods in Canada - Causes, effects and regional patterns

## Subject/Topic

Natural disasters, geography, flood preparedness and response

## Time

150 minutes (can be adapted to be longer or shorter)

## Grade Levels

Secondary (grades 9-12)

## Learning Objectives

- Students will use critical thinking skills to assemble a map of Canada.
- Students will identify floods that have happened in Canada since 1900.
- Students will assess and discuss patterns that stand out on the FloodSmart Canada tiled map.
- Students will research floods in Canada using national databases and scientific sources.
- Students will consider the connection between climate change and flood frequency and intensity.

## Materials

- FloodSmart Canada tiled map
- Computers with internet access
- Pens, paper
- Presentation screen

## Overview

Students will use the FloodSmart Canada tiled map to visualize and interpret flood occurrences and patterns in Canada. Students will learn about the natural causes of floods and their implications for communities commonly affected by flooding.

## Focus questions

Where do floods typically happen in Canada? Why are these regions prone to flooding? What are some of the major flooding events that have happened in Canadian history? What data exists that describes these floods? How can maps help us understand flood patterns and make flood predictions? How can databases help us understand the causes and effects of floods?

## Lesson Description

**Minds on:** Students will discuss floods in Canada as they assemble the FloodSmart Canada tiled map. Students will think critically about the patterns they identify on the map.

**Action:** Students will work in groups and will use the geo-inquiry process to answer research questions related to flooding in Canada.

**Conclusion:** Students will share their research results with the class in the form of a group presentation.

## Lesson Implementation

**Minds on:** Prior to the lesson, print out one (or several) copies of the FloodSmart Canada tiled map, depending on the size of the class.

Inform students that the lesson will focus on floods (the most common natural disaster in Canada), and that they will be using the FloodSmart Canada tiled map to learn about the locations and timing of flood events since 1900, and to research specific areas prone to flooding.

Distribute pieces of the FloodSmart Canada tiled map to students and challenge the class to assemble the map. Have the students sit around the map once it is complete and divide the class into small groups. Ask each group to visually dissect the elements on the map, including the legend, the data and the overall patterns they notice. Encourage students to take notes about what they see as these will help them with their research later in the lesson. The following types of questions may help students to think critically about the map:

- What do you notice first?
- What do you notice upon further investigation?
- What on the map looks odd or unusual?
- Have you ever seen a map like this before? How does it compare to other maps?
- What place and/or phenomenon does the map show?
- If there is text on the map, what is it describing?
- How do you think the information for this map was gathered?
- If this map were made 200 years ago, would it show the same patterns? Would there be more or less data?





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- Do you see any changes over time when looking at this map?
- How does the geography of Canada play a role in the patterns you identified?
- What can you conclude based on this map?

Invite students to share their analyses and to raise any questions they have about the map.

**Action:** Explain to students that they will be using the geo-inquiry process to research flood patterns in Canada, using the FloodSmart Canada tiled map as a starting point. The geo-inquiry process involves the following steps:

1. Ask geographic questions
2. Acquire geographic resources
3. Interpret and analyze
4. Evaluate and draw conclusions
5. Communicate
6. Reflect and respond

Assign a different region in Canada that is prone to flooding to each of the groups. Have students identify different floods that have occurred in those regions using the FloodSmart Canada tiled map. Using the following set of guidelines, assist students with an in-depth analysis of the causes, effects and implications for humans of flooding in their assigned region. Feel free to provide students with a geographic question to help start them off. Students will work together to create a presentation that they will then share with the rest of the class.

## 1. Ask geographic questions

- a. Student groups will each come up with two research questions that revolve around a geographical issue. For example:
  - i. What geographical features make this area prone to flooding and are these features natural or man-made?
  - ii. What climatological features contribute to flooding in this area and are these features evolving over time as climate change continues?
  - iii. Are there any current public awareness programs or flood reduction efforts in place, and can more be done to reduce the risk of flooding?
  - iv. What data exists to study trends in regional precipitation and the movement of water on land, and can that data help predict future flood scenarios?

## 2. Acquire geographic resources

- a. Students will divide research responsibilities among the members of their group, and use physical or digital information sources to answer their research questions. For example:
  - i. One group member can use an atlas to learn about the history of the region.
  - ii. One group member can use pictures/photographs to learn about the culture and characteristics of the region.
  - iii. One group member can research government websites to assess the demographics and economy of the region.

## Connection to the Canadian Geography Framework

### Concepts of Geographic Thinking

- Spatial significance
- Patterns and trends
- Interrelationships
- Geographic perspective

### Inquiry Process

- Ask geographic questions
- Interpret and analyze
- Evaluate and draw conclusions
- Reflect and respond

### Geospatial Skills

- Location
- Direction
- Scale
- Maps
- Perspectives





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- iv. One group member can use meteorological and climatological websites to study graphs and maps of the region.
- v. One group member can search online databases to identify patterns and trends throughout time and space.
- vi. One group member can use the media to track the impacts of floods on local communities and if the frequency or severity of floods is changing over time.
- vii. One group member can research the way in which the perception about flood events or the gathering of data has changed with new technologies and the advent of social media.

### 3. Interpret and analyze

- a. Students will work together in their groups to make sense of the information they collect. For example:
  - i. Students can create charts, graphs or maps to organize qualitative or quantitative data.
  - ii. Students can collect quotes from citizens affected by flooding.
  - iii. Students can create word clouds or photo essays to show their classmates particular scenarios.

### 4. Evaluate and draw conclusions

- a. Students will come to a decision about the best possible answers to their original research questions. For example,
  - i. Students may identify an increase in the frequency and severity of rainfall events in their entire region, or a part of their region, and may be able to hypothesize why this is happening based on the data they collected.
  - ii. Students may realize that their region is understudied and the data available is insufficient to come to any direct conclusions, in which case they could make recommendations about where further research and development is needed.

### 5. Communicate

- a. Students will divide communication and presentation responsibilities among the members of their group, and will use a presentation method of their choice to describe their research and tell an informative story about the causes, effects and implications of flooding in their region. For example,
  - i. Some group members can work on creating aesthetically pleasing graphics.
  - ii. Some group members can work on adding text to the slides.
  - iii. Some group members can work on speaking notes.
  - iv. Some group members can work on adding audio or visual assets to their presentation.

### 6. Reflect and respond

- a. Each group should be given the chance to reflect on and respond to the following questions at the end of their presentation:
  - i. What did you learn about this region that you did not know before this exercise?
  - ii. Can you identify what the cartographer knew and didn't know about your region when making this map?
  - iii. What would you add to the FloodSmart Canada tiled map if you could?





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**Conclusion:** Gather the pieces of the FloodSmart Canada map. Consider hanging the map on the wall as a reference or for use in future activities.

Allow each group sufficient time to present their research and main conclusions. Consider leaving a few minutes at the end of every presentation for your own questions or for questions from the class.

Encourage an open discussion with the entire class after all the presentations have been given. How has the students' perception of flooding in Canada changed?

## Extend Your Geographical Thinking

Task students with staying up-to-date on flood events in Canada and the world using websites like FloodList, The Weather Network and Canadian Red Cross. Dedicate a few minutes at the beginning of class to discuss these events as a class. Encourage students to think globally and long-term—with ongoing climate change, do you suspect that more and more people will be affected by floods in the future?

Keep a copy of the FloodSmart Canada tiled map hanging in your class or school and add data to the map as new events happen that are covered in the media.

Have students extend their research by conducting a follow-up study that explores the cascading effects of significant floods. For example, is food supply, biodiversity, access to clean water, energy systems, or air quality affected by an increase in floods?

## Modifications

Instead of delivering presentations, students can submit a written project where each student is responsible for writing a portion of the project.

Instead of creating a formal presentation or project, students can create a digital or hard-copy timeline that tells the history of their region and makes projections into the future.

Instead of creating a formal presentation or project, students can attach figures, images or quotes to the FloodSmart Canada tiled map to create a nation-wide story map.

## Assessment Opportunities

Teachers can assess the level of students' questions and responses during group discussions.

Teachers can assess the spatial awareness skills of students as they complete the tiled map.

Teachers can evaluate students' skills (e.g., research, collaboration, organization) as they progress through their research projects.

Teachers can evaluate the final presentations or reports.

Students can provide constructive feedback after the presentations.



A map of Canada showing various flood-related data points. Colored circles and squares of different sizes are scattered across the map, representing different flood events or data points. The map includes labels for provinces and territories such as 'COLOMBIE BRITANNIQUE', 'ALBERTA', 'ONTARIO', and 'QUEBEC'. Major water bodies like 'HUDSON BAY' and 'LAKE HUDSON' are also labeled. The title 'Floods in Canada - Causes, effects and regional patterns' is overlaid on the top left of the map.

# Floods in Canada - Causes, effects and regional patterns

## Sources and Additional resources

- [Flooding in Canada](#)
- [FloodSmart Canada](#)
- [Partners for Action](#)
- [Canadian Disaster Database](#)
- [FloodList](#)
- [The Weather Network](#)
- [Canadian Red Cross](#)
- [Floods in Canada](#)
- [Active floods in Canada](#)
- [Water level and flow](#)
- [EarthData](#)
- [Climate Atlas of Canada](#)