

Ross River flood hazard mapping

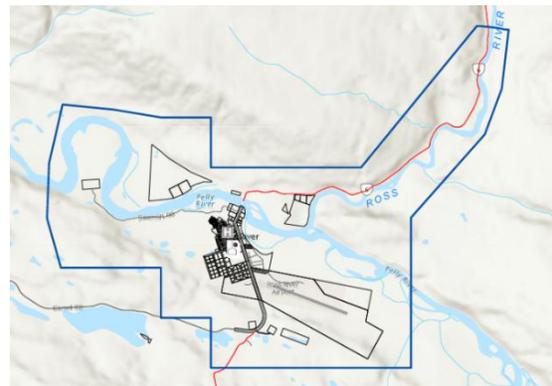
What are flood maps and why are they useful?

Flood maps are prepared by engineers and show an area that may be covered by water or where water reached during a past flood event. These maps describe the level of flood hazard in different areas of a community.

The information produced through flood mapping studies can be used in the design of mitigation measures, emergency preparation and community development planning. Final flood maps are publicly available for use by community members and all levels of government.

Mandate & funding

The Government of Yukon is developing flood maps for communities at risk to support resilience in the face of climate change. Natural Resources Canada is financially supporting this work through the Flood Hazard Identification and Mapping Program.



Mapped areas of interest (outlined in blue) – Identified with input from Government of Yukon departments and Ross River Dena Council staff.

Study timeline

Planning for flood mapping in Ross River began in spring 2024. The Government of Yukon hired a consultant, Stantec (supported by Dena Cho Environmental) to complete the study.

Here's how the work was completed:

- **Apr 2025:** start of consultant contract, engagement planning, review of previous work
- **Spring:** site visit, Knowledge Holder interviews, shoreline and river bottom surveying, high water mark surveying
- **Summer/fall:** data analysis, modelling and mapping
- **Early 2026:** open house and online engagement on draft maps, preparing final maps
- **2026:** final maps and report published

Community involvement

Community members and Ross River Dena Council (RRDC) staff were involved in the study at various stages:

- RRDC provided input into boundaries of areas to be mapped
- Knowledge holder engagement in May 2025 provided input for the analysis
- Dena Cho Environmental supported historical flood documentation, field surveys, and data analysis
- Draft maps are being shared online, and a public engagement meeting will be held (in-person and online) to gather input on the results

FOR MORE INFORMATION:

floodmapping@yukon.ca / floods.service.yukon.ca



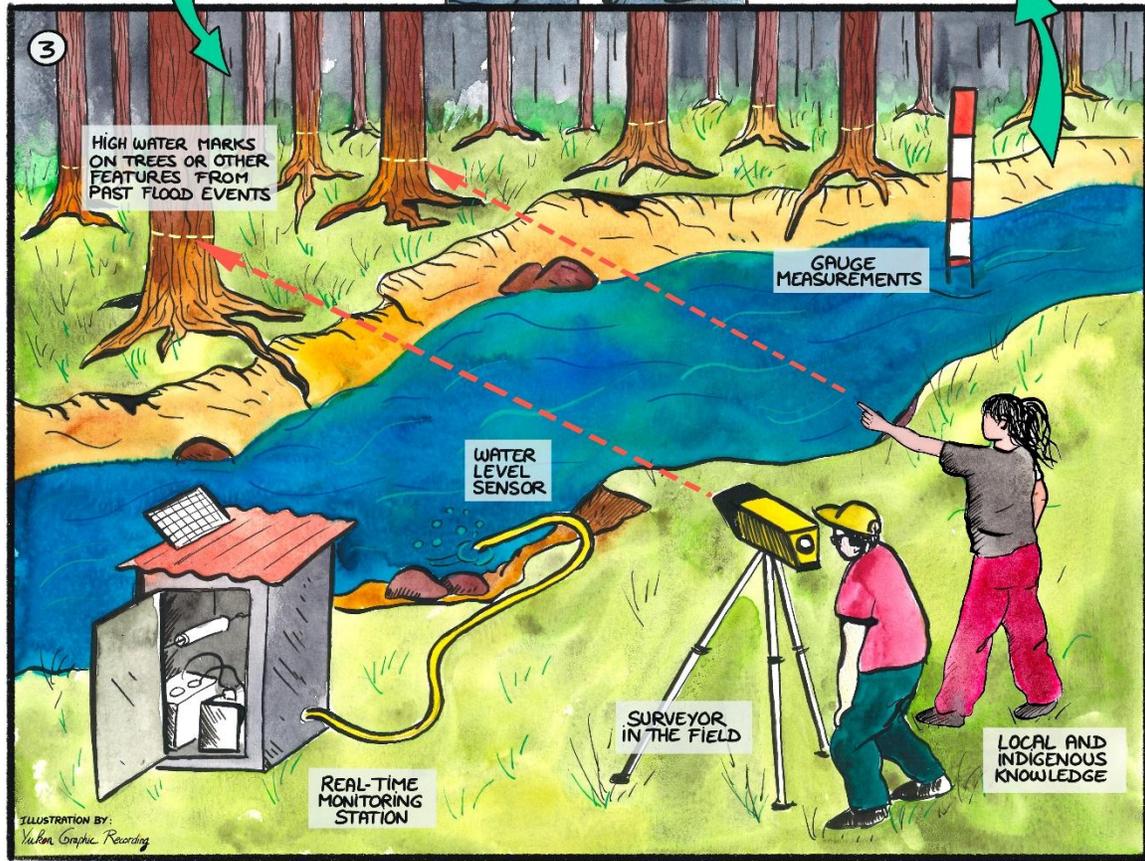
WHAT IS A FLOOD MAP?

1
A FLOOD MAP SHOWS AN AREA AROUND A BODY OF WATER THAT WOULD BE COVERED BY WATER, BASED ON A CERTAIN RIVER FLOW OR LAKE SURFACE LEVEL.



2
PAST WATER LEVELS ARE MEASURED USING:

4
THESE DATA ARE ANALYZED TO ESTIMATE THE WATER LEVEL THAT HAS A 5%, 1%, 0.5%, ETC. CHANCE OF BEING REACHED IN ANY YEAR. THIS ESTIMATED WATER LEVEL IS THEN SHOWN ON THE MAP.



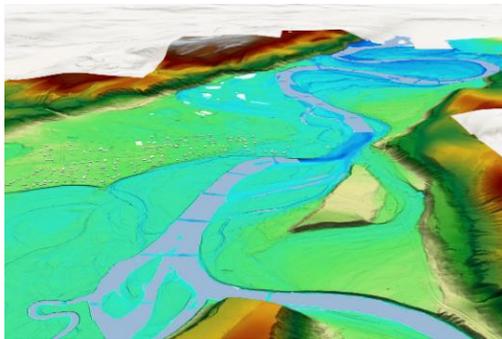
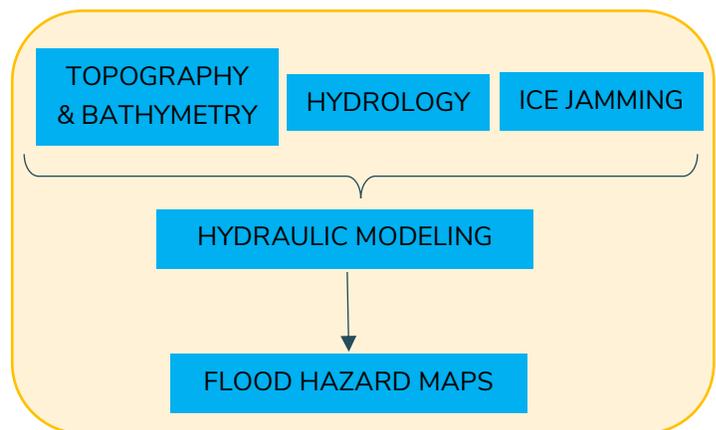
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Making a flood map

To make a flood map, topographic and bathymetric data (describing the shape of the land and riverbed) are combined with hydrology data (flows in the river) and ice jam details (where applicable) in a process called hydraulic modelling. The hydraulic model estimates how high the water could rise and how far flooding could spread for different river flows. These water levels and flood areas are then presented on the flood maps.



Integrated bathymetry & topography

Topography and bathymetry

What is the shape of the land around and under the rivers?

LiDAR data for the topography (areas above water) was surveyed by a contractor in 2019 and 2025.

Bathymetry (areas below water) were surveyed in summer 2025. The surveyed bathymetry and cross-sections were integrated with the LiDAR data from 2019 and 2025, providing the terrain input for the hydraulic modelling.

Hydrology

What are the flood flows of the rivers?

Statistical analysis was completed to estimate the magnitude of flood events on both the Pelly River and the Ross River using river flow and level data from Water Survey of Canada stations in the area. Flooding can happen from both breakup ice jams and open water (ice-free) conditions in the study area. Using this information, we calculated how likely certain river flow levels are to happen each year during two times of the year: the breakup period (late April to early May) and the open water period (late May to October). These are called “annual exceedance probability” (AEP) flows. An AEP tells us the chance that a certain flow or water level will be reached or passed in any given year.

What about land & climate changes?

Historical records may not reflect the full potential for future flood events. The project considered potential changes to land cover (forest fire, permafrost, vegetation) and climate (temperature and precipitation patterns and extremes) between now and 2100. Land cover change was determined to have a potential for increasing flood flows. Climate change effects are anticipated to increase flood flows between now and 2100.

Additional flood scenarios were modelled to reflect potential changes to flows under future climate and land cover conditions. These scenarios considered a 30% increase to the Ross River and Pelly River flows.

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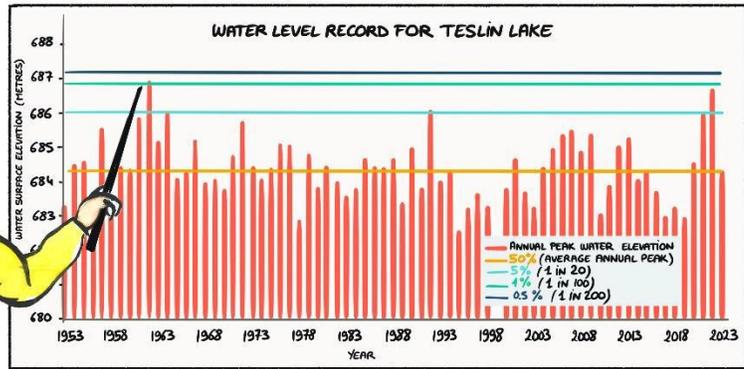


UNDERSTANDING FLOOD PROBABILITIES

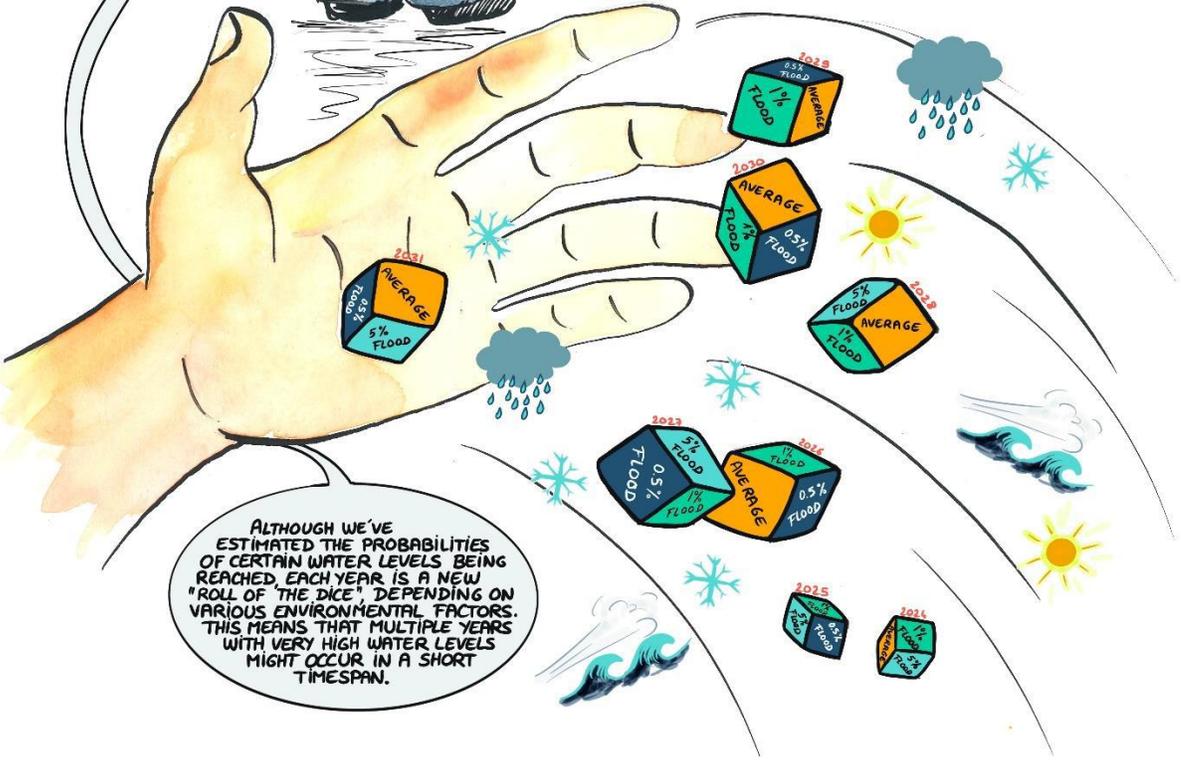
THE LIKELIHOOD OF THE WATER REACHING OR EXCEEDING A CERTAIN LEVEL IN ANY YEAR CAN BE DESCRIBED AS A PERCENT PROBABILITY. THESE PROBABILITIES ARE CALCULATED BASED ON RECORDS OF THE PEAK LEVEL REACHED IN PAST YEARS. LEARN MORE ABOUT FLOOD PROBABILITIES BELOW THROUGH THE EXAMPLE OF PAST FLOODING IN TESLIN.

SINCE 1953 (THE START OF OUR RECORD), TESLIN LAKE HAS ALREADY HAD TWO FLOOD EVENTS AROUND THE 1% (1 IN 100) LEVEL.

THE ANNUAL PEAK WATER LEVEL IN TESLIN LAKE VARIES A LOT. THE PEAK IN 1962 WAS ALMOST 4.5 METRES ABOVE THE PEAK IN 1992. SOME LAKES HAVE A SMALLER RANGE.



IN ANY FUTURE YEAR ANY ONE OF THESE PEAK LEVELS (OR ONE OUTSIDE OF THE OBSERVED RANGE) COULD OCCUR. HOWEVER, THE 5% (1 IN 20) EVENT IS MORE LIKELY TO OCCUR THAN THE 1% (1 IN 100) OR THE 0.5% (1 IN 200) EVENTS.



ALTHOUGH WE'VE ESTIMATED THE PROBABILITIES OF CERTAIN WATER LEVELS BEING REACHED, EACH YEAR IS A NEW "ROLL OF THE DICE" DEPENDING ON VARIOUS ENVIRONMENTAL FACTORS. THIS MEANS THAT MULTIPLE YEARS WITH VERY HIGH WATER LEVELS MIGHT OCCUR IN A SHORT TIMESPAN.



Ice Jamming

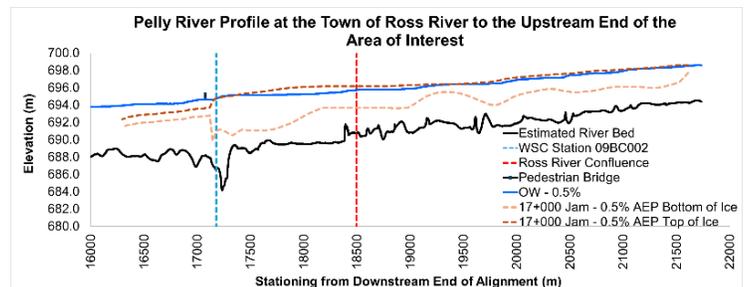
Where do ice jams start and over what length of the river do they occur?

Flooding in the Ross River area from ice jamming has primarily been documented on the Pelly River – most recently in 2013. This study reviewed ice jamming locations that have a) consistently occurred in the past and b) resulted in flooding, identifying five ice jam locations for flood mapping purposes: These ice jams were simulated in the hydraulic modelling software, with the AEP breakup period flows.

Hydraulic modelling

How high is the water in the river when flooding occurs?

Hydraulic modelling software was used to simulate water levels during various flood events. The foundation of the model was the terrain (topography and bathymetry). The open water AEP flows were used to estimate open water flood extents. Breakup AEP flows were used in combination with the simulated ice jams to estimate breakup jam flood extents. Hydraulic modelling was completed for the 5% AEP, 1% AEP, 0.5% AEP, and 0.5% AEP + climate change scenarios.



Profile (side view) of Pelly River showing open water model results (in blue) compared to ice jamming (in orange)



Composite flood map for a land cover / climate change scenario at the community of Ross River

Flood hazard maps

For each flood event modelled, a “composite flood map” was produced by combining the extents of the breakup jam and open water flooding extents.

This approach means that each flood map shows the overall inundation extent associated with a given flood probability, whether that flooding is caused by ice jamming or open water floods.

The public can access the full set of flood maps for review and comment at the following link:

<https://floods.service.yukon.ca/pages/draft-flood-maps>

FOR MORE INFORMATION:

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