Application of FHIMP Climate Change Guidelines on Water Survey of Canada gauge design

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Flood Hazard Identification and Mapping Program (FHIMP)

Environment and Climate Change Canada
Environnement et Changement climatique Canada

Canada

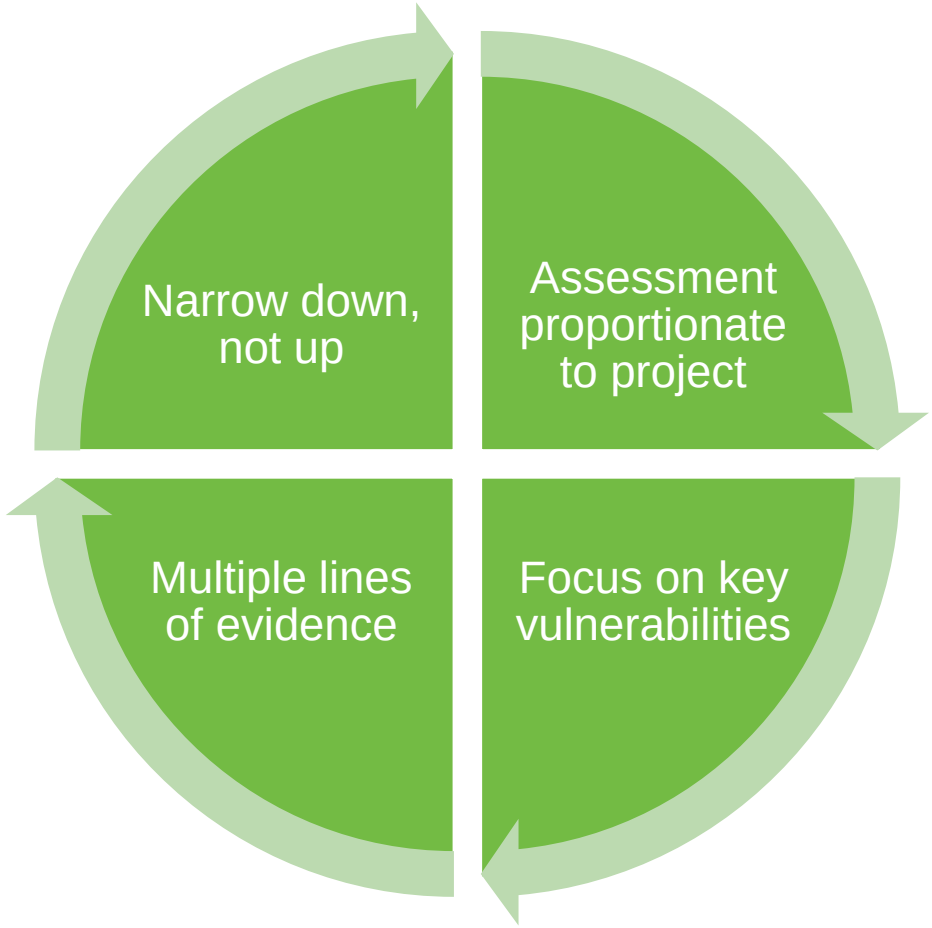
Introduction

FHIMP

- Aid Provinces and Territories with flood mapping
- Strategic projects to advance the science of flood mapping
- Create guidelines
  - Integrate climate change impacts into flood hazard mapping

Proposed ECCC Protocol

1. **Project and Watershed Description**: Purpose of project, causes of flooding & watershed scale
2. **Background Review**: Existing climate data, models and analysis, other future changes (land use, etc.)
3. **Conceptual Model**: What causes floods? How might climate change modify this?
4. **Analysis**: Review observations, data & models; proportionate assessment
5. **Recommendations**: Synthesize all steps; narrow down and combine multiple lines of evidence



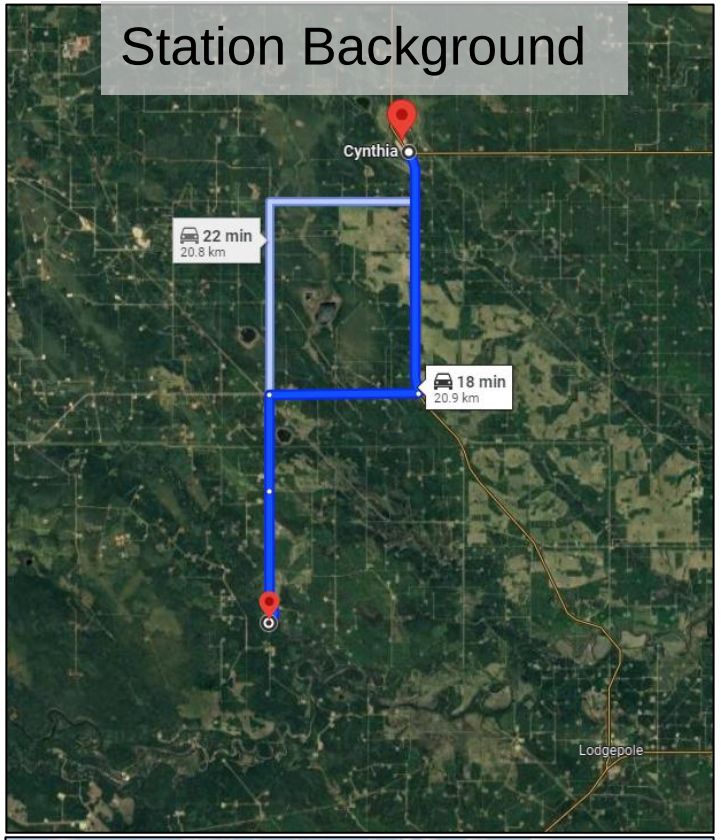
Protocol for Considering Climate Change

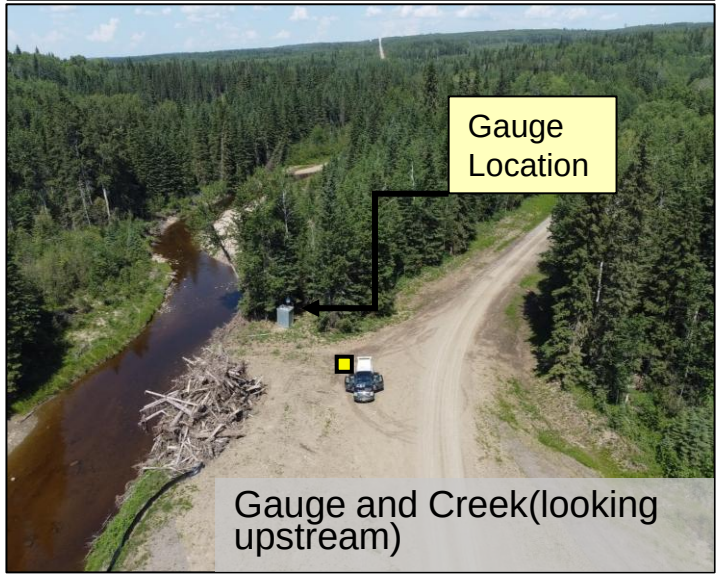
- **Important Takeaways:**

  - **Steps 1 – 3 stay the same** no matter the project:
    - Project description
    - Background review
    - Conceptual model

  - **Step 4 (analysis)** is what **changes**:
    - Location
    - Data availability
    - Size of project or its implications ($$)
    - Risks

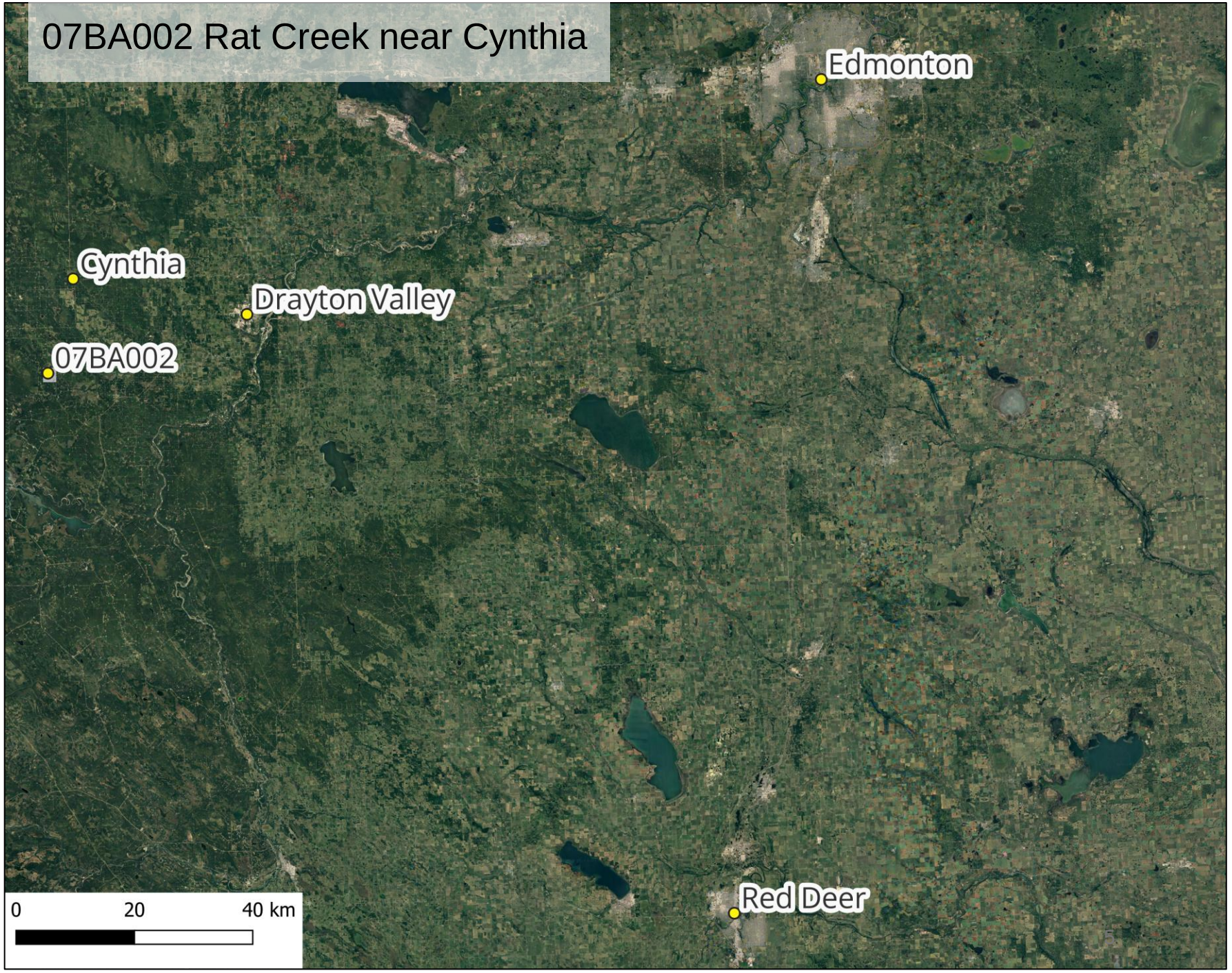
Station Background





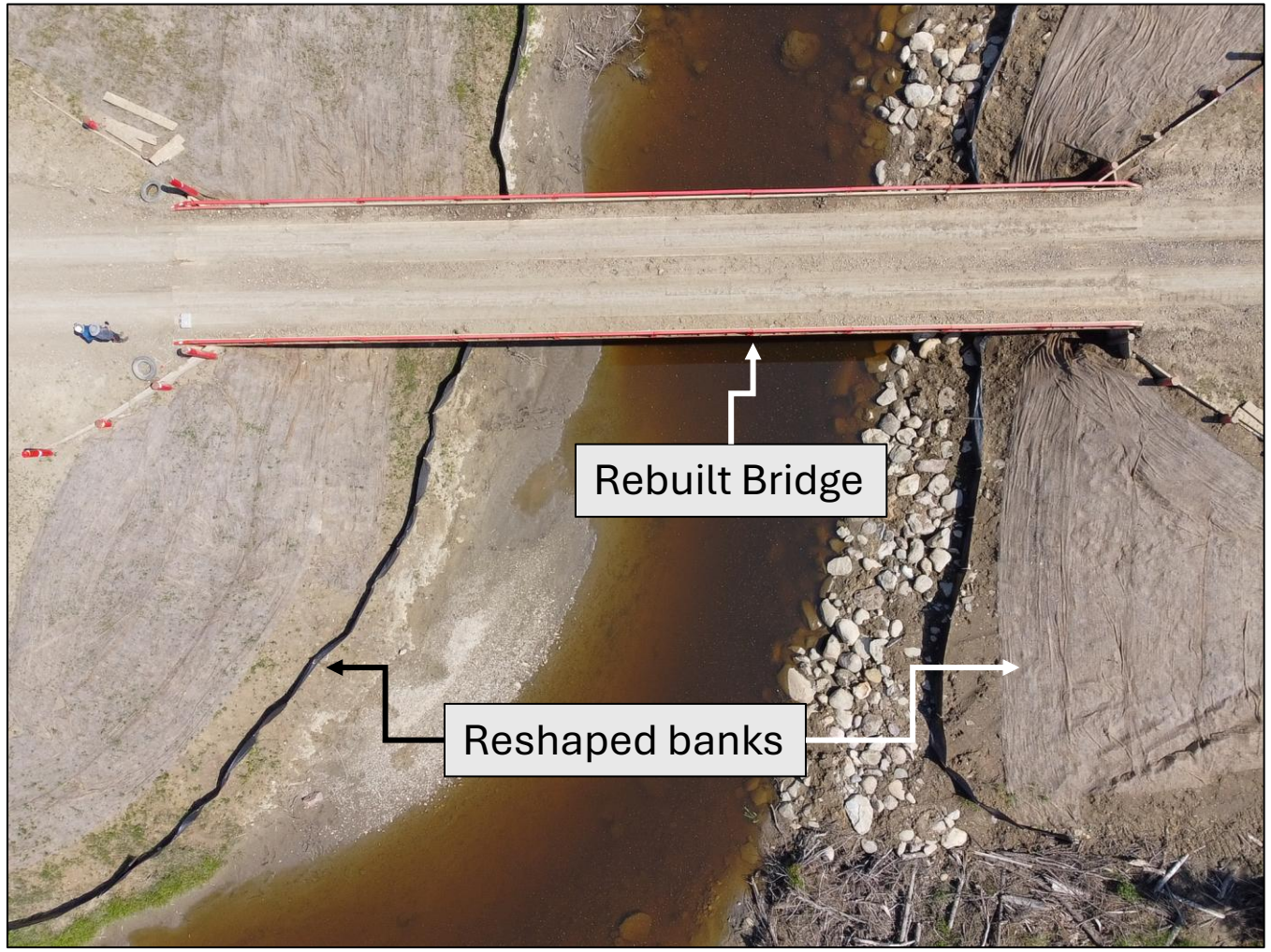
Gauge and Creek(looking upstream)

07BA002 Rat Creek near Cynthia



June 2023 Flood – Infrastructure Damage

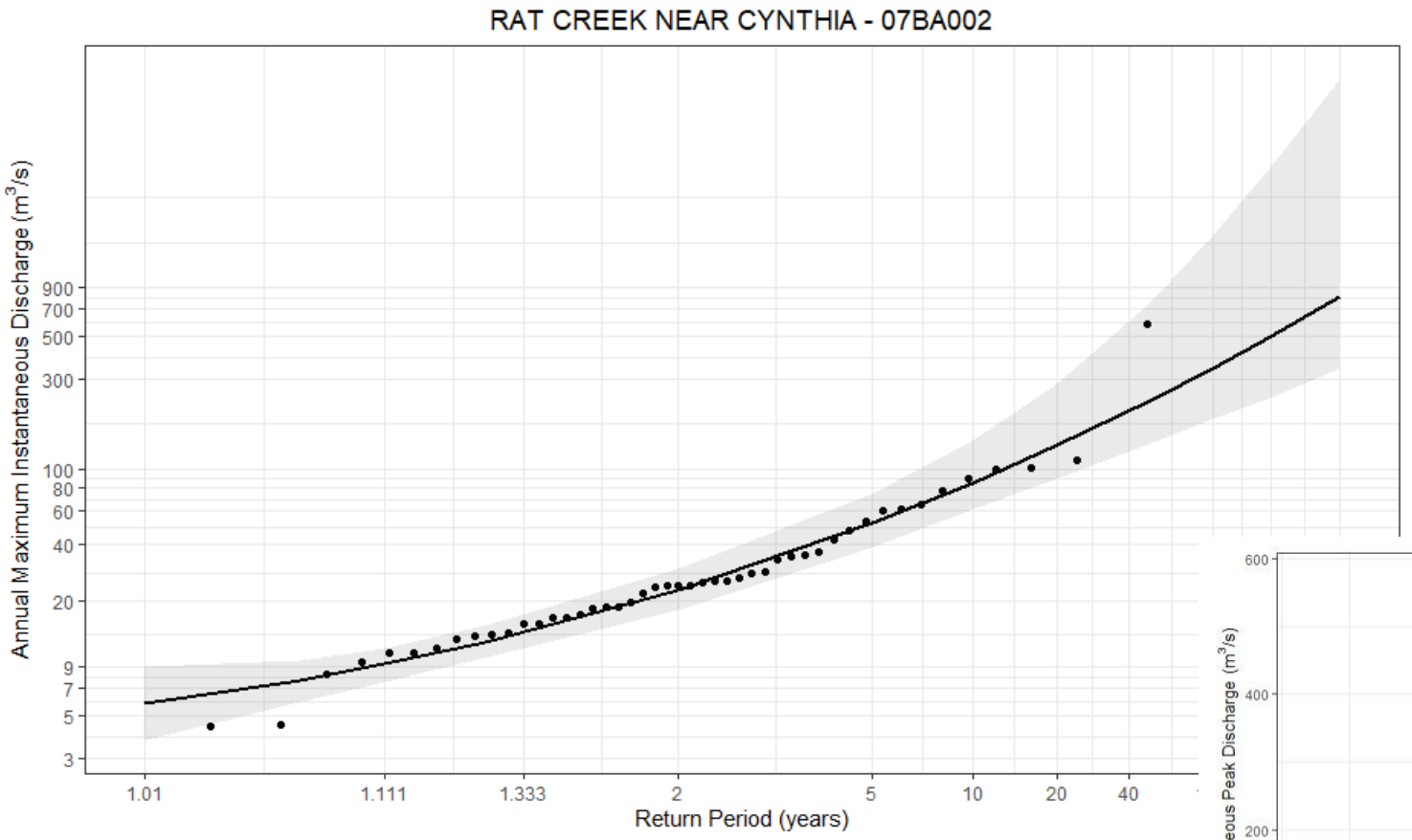
Post Flood – Rebuilt Bridge and Banks

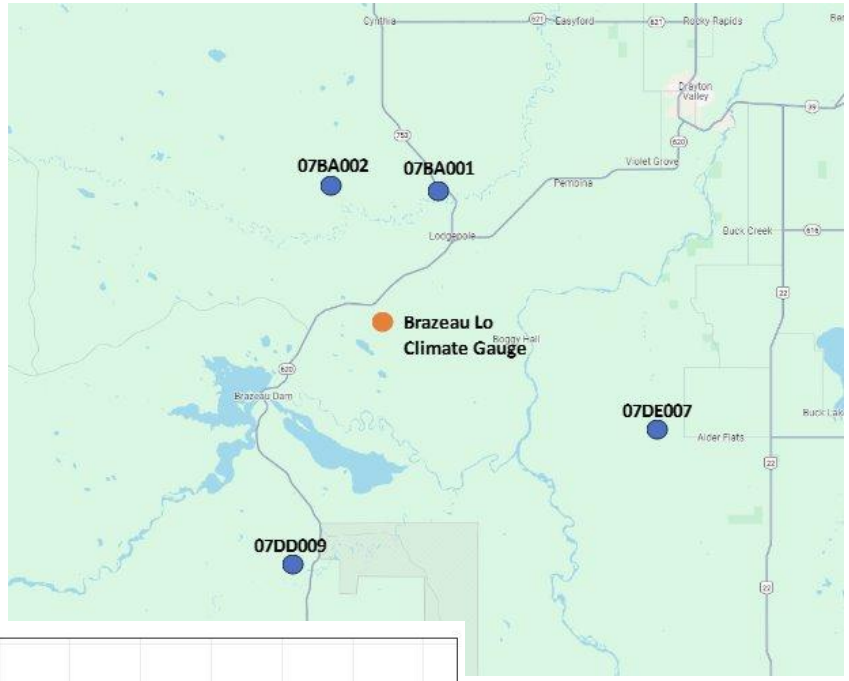


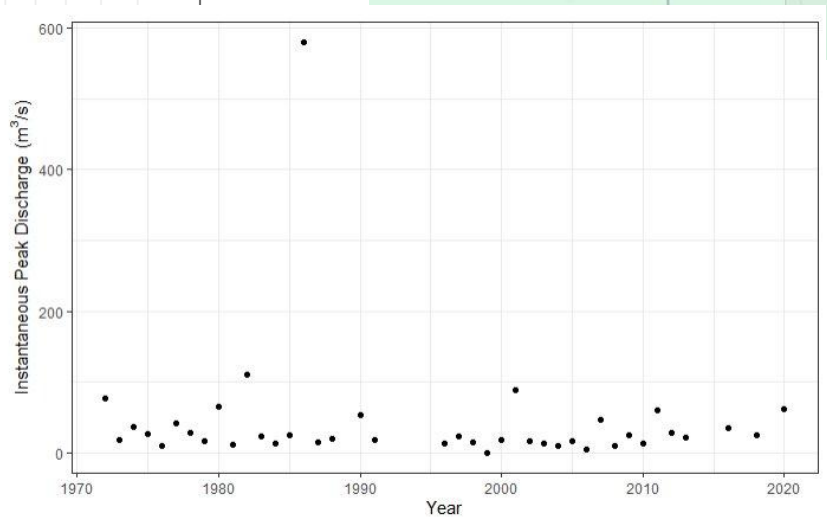
Step 1: Project and Watershed Description

- Drainage area 606 km^2, within Athabasca River Watershed
- Nival hydrologic regime
- High flow during freshet (May-June) and summer rainfall (June-August)

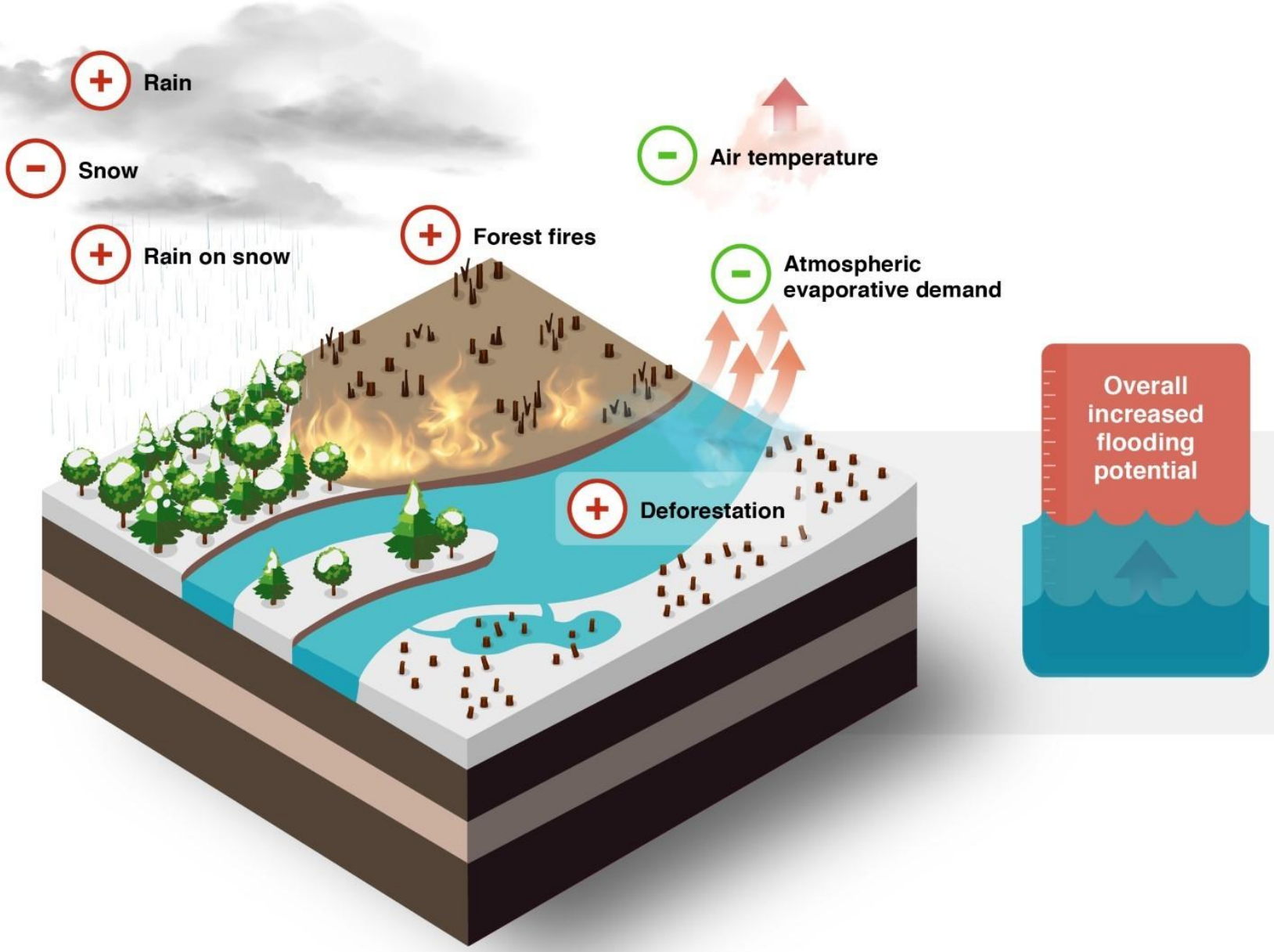
Step 2: Background Review







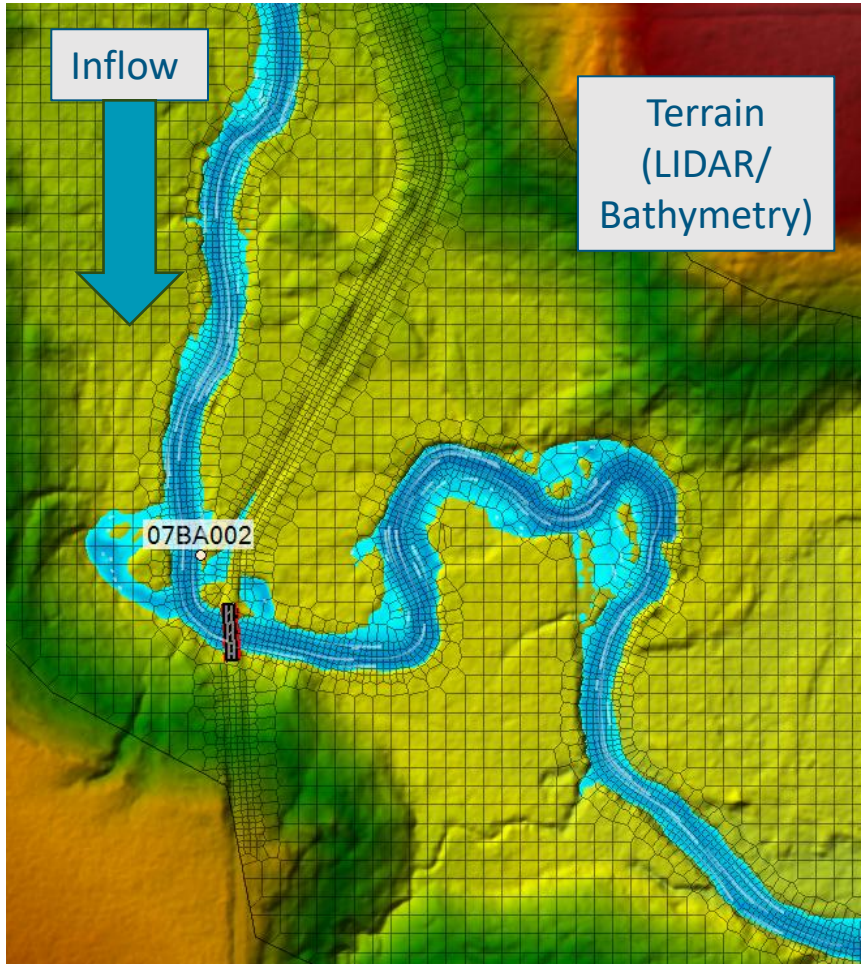
Step 3: Conceptual Model



Step 4: Analysis

- Athabasca River Watershed: projected change in a 100 year flood return period is 4-12% (low end)
- Small, rain event driven watershed: projected change in 100 year rainfall intensity is 20% (high end)
- Next steps: model a range of climate change impacted flows to see impacts on the gauge area

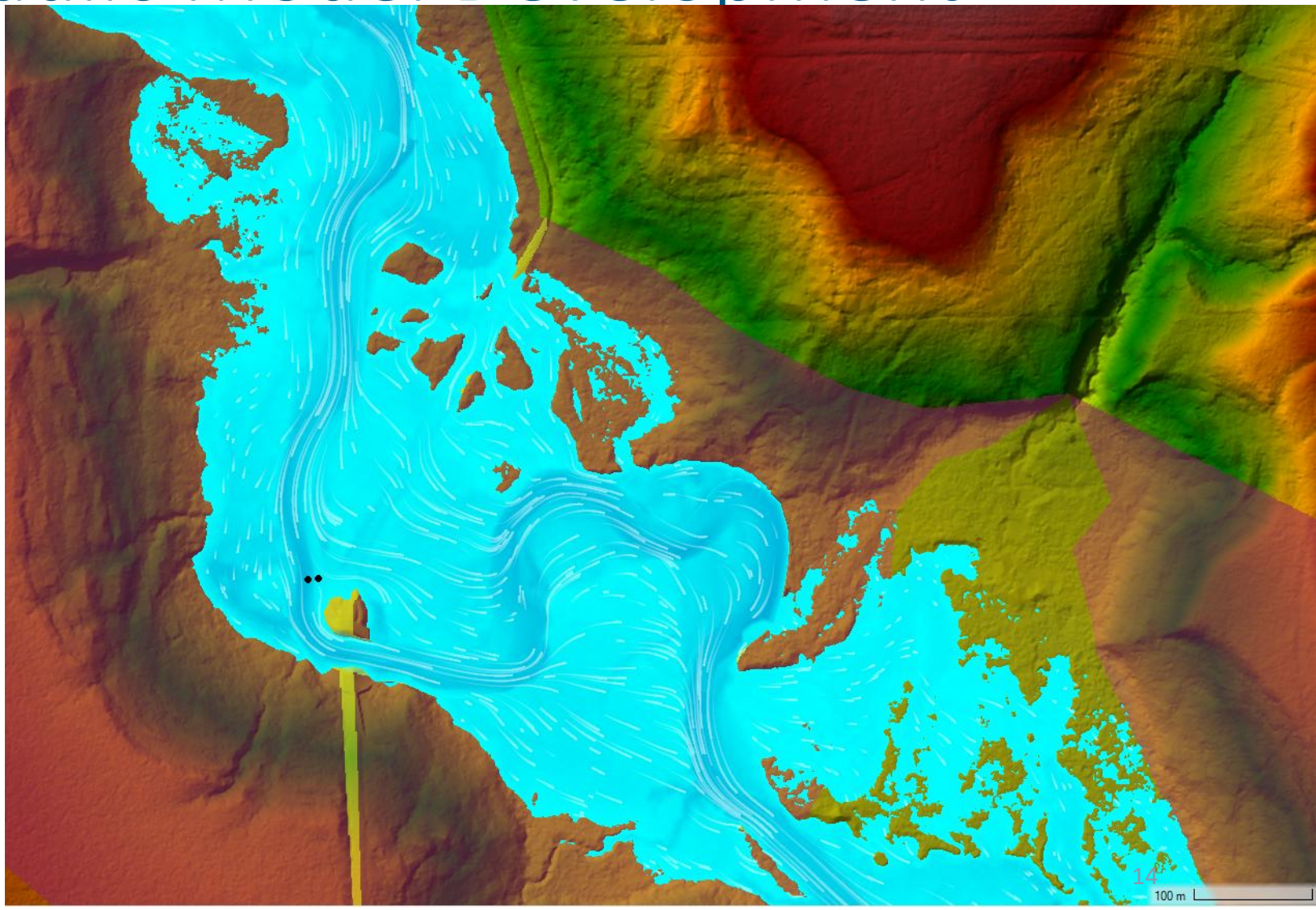
Hydraulic Modelling



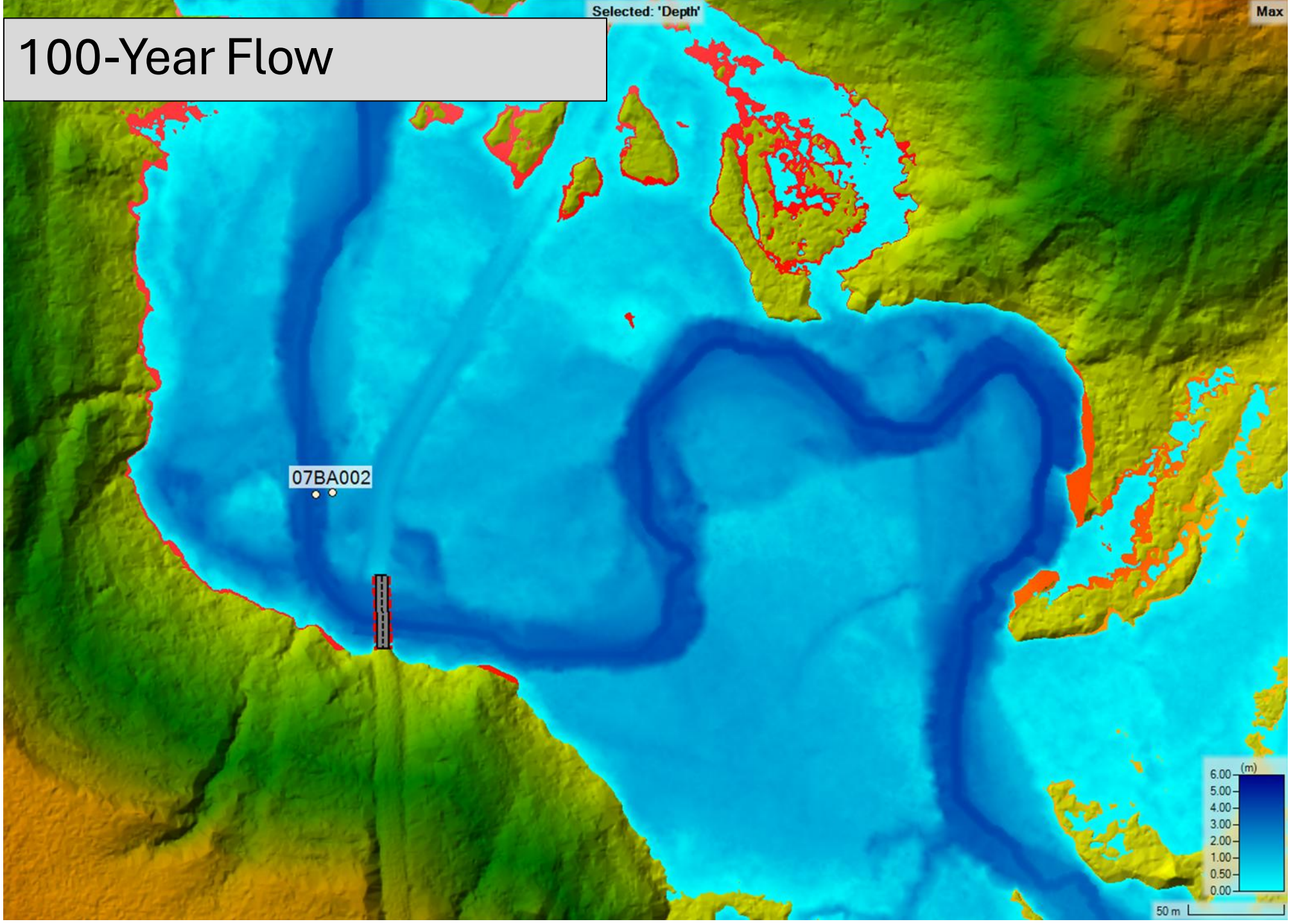
- Mapping river flow scenarios
- 2D Hydraulic Model
- Program: HEC-RAS, version 6.5

Hydraulic Model Development

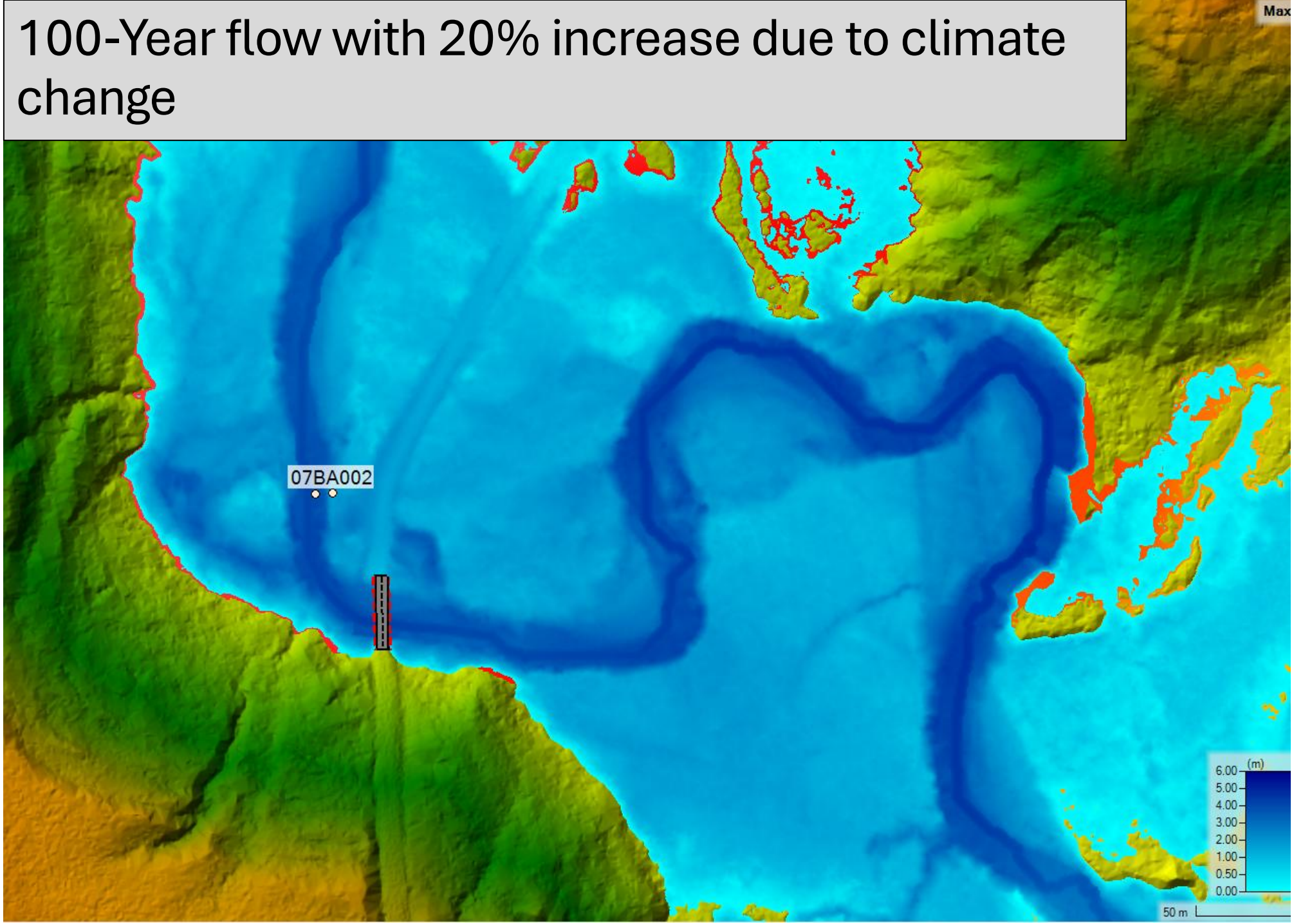
- Objectives:
  1. Map 100-yr event to area around gauge
  2. Map range of projected increases from climate change adjustment
  3. Aid in developing a gauge relocation plan



100-Year Flow



100-Year flow with 20% increase due to climate change



Summary

- Case study showed that uncertainty in design flows was overwhelmed by site characteristics; not worthwhile to focus on climate change shifts
- Climate change guidelines are meant to guide practitioner to incorporate predicted shifts in peak flow due to climate change
- Provinces and Territories to review draft guidelines in coming months

Thank you!
Questions?

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