



South Nation  
**Conservation**  
de la Nation Sud

## **Bear Brook Watershed Study | Étude du bassin versant de Bear Brook**

### **Public Information Center | Séance d'information publique**

Class Environmental Assessment – Flood Mitigation

Évaluation environnementale de portée générale – Mesures d'atténuation des risques d'inondation



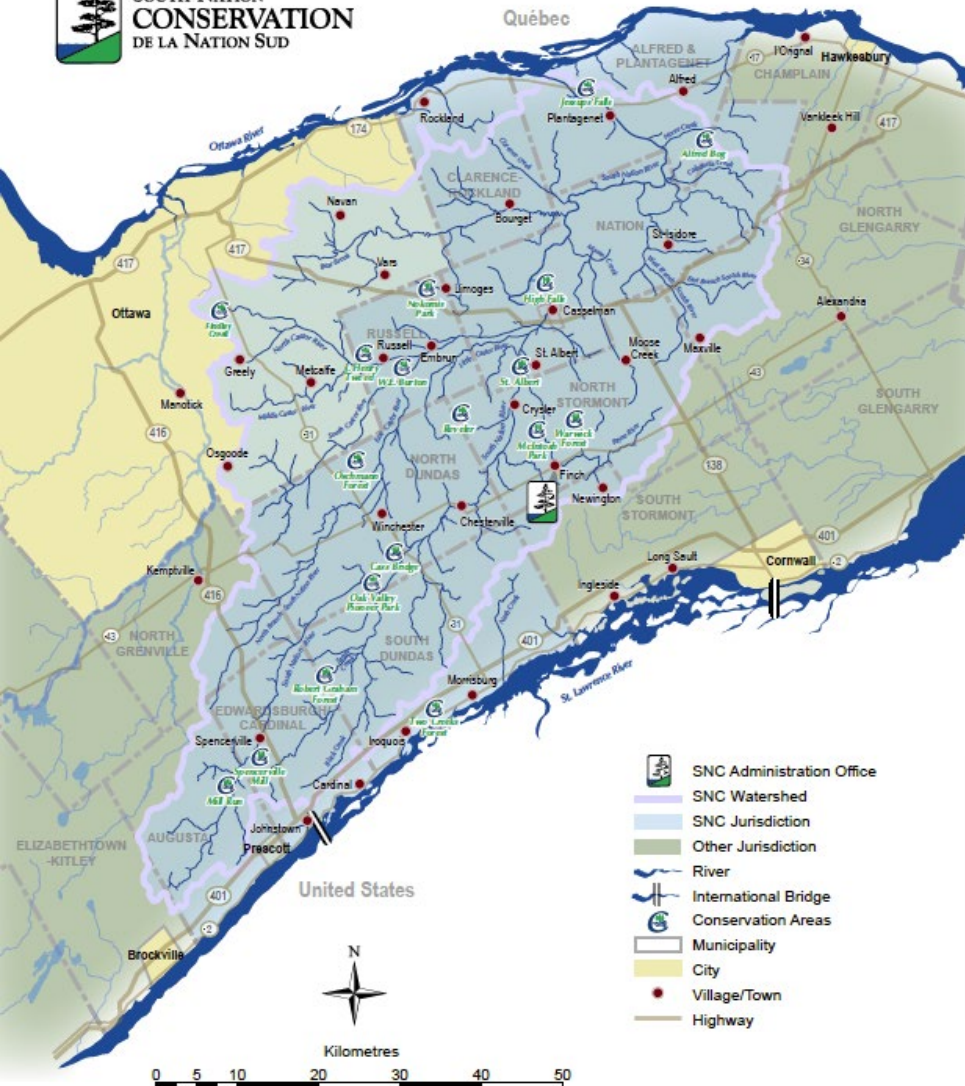


**LAND**  
**ACKNOWLEDGEMENT**  
**RECONNAISSANCE DU TERRITOIRE**





# South Nation Conservation



- One of Ontario's 36 Conservation Authorities
- Community-based watershed management
- 16 member municipalities including City of Ottawa
- 4,480 km<sup>2</sup> jurisdiction in Eastern Ontario

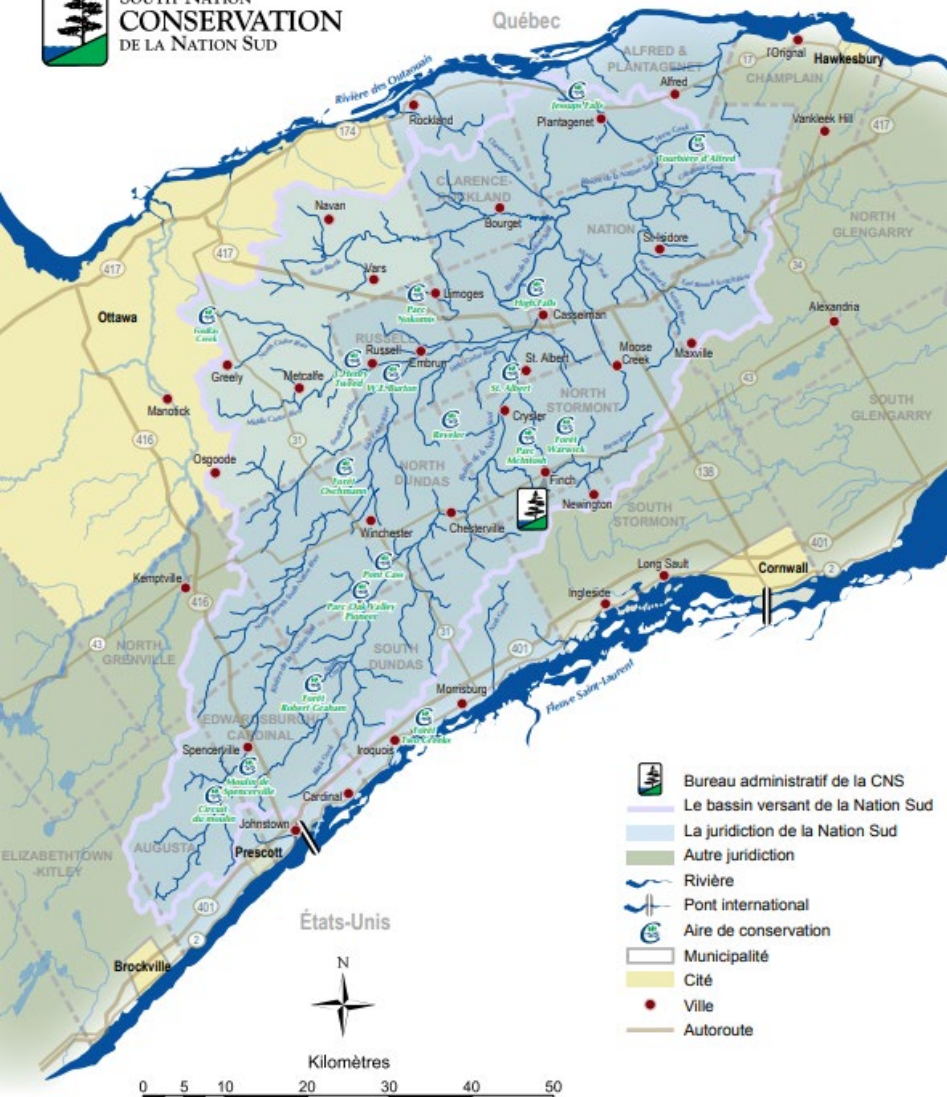




# Conservation de la Nation Sud



SOUTH NATION  
CONSERVATION  
DE LA NATION SUD



- L'un des 36 offices de protection de la nature de l'Ontario
- Gestion des bassins versants axée sur la collectivité
- 16 municipalités membres, dont la Ville d'Ottawa
- Territoire de compétence de 4 480 km<sup>2</sup> dans l'Est de l'Ontario





# South Nation Conservation / Conservation de la Nation Sud



**Our Local Environment.  
We're in it Together.**

**Notre environnement local,  
protégeons-le ensemble.**





# Bear Brook Watershed Study – Open Houses

## Open House Format

- 30-minute project presentation
- Poster board viewing with key project information
- Opportunities for 1-on-1 discussions with staff
- Feedback form to inform next steps
- Results to be presented at a future public meeting

*Last Open House focused on Phase 1 of the Watershed Study: Characterization Report held on November 13, 2025 at the Bear Brook Community Centre*





# Étude sur le bassin versant de Bear Brook – Séances d'information publique

## Format de la séance d'information

- Présentation du projet (30 minutes)
- Consultation des panneaux d'information présentant les principaux éléments du projet
- Possibilités de discussions individuelles avec le personnel
- Formulaire de rétroaction pour orienter les prochaines étapes
- Présentation des résultats lors d'une future réunion publique

*La dernière séance d'information portait sur la phase 1 de l'étude sur le bassin versant : le rapport de caractérisation, présenté le 13 novembre 2025 au Centre communautaire Bear Brook.*





# Bear Brook Flood Mitigation: Class EA

Mesures d'atténuation des risques d'inondation à Bear Brook : ÉE de portée générale



*Bear Brook flooding at Frank Kenny Road in the City of Ottawa*

*Inondation du ruisseau Bear Brook au chemin Frank Kenny dans la Ville d'Ottawa*

- Bear Brook Watershed Study Overview  
Aperçu de l'étude sur le bassin versant de Bear Brook
- Class Environmental Assessment:  
Flood Mitigation – AECOM  
Évaluation environnementale de portée générale :  
Mesures d'atténuation des risques d'inondation
  - **Cost of flooding**  
Coûts associés aux inondations
  - **Long list of mitigation options**  
Liste des options potentielles d'atténuation
  - **Evaluation criteria**  
Critères d'évaluation
- How to Be Involved  
Comment vous impliquer



# Bear Brook Watershed

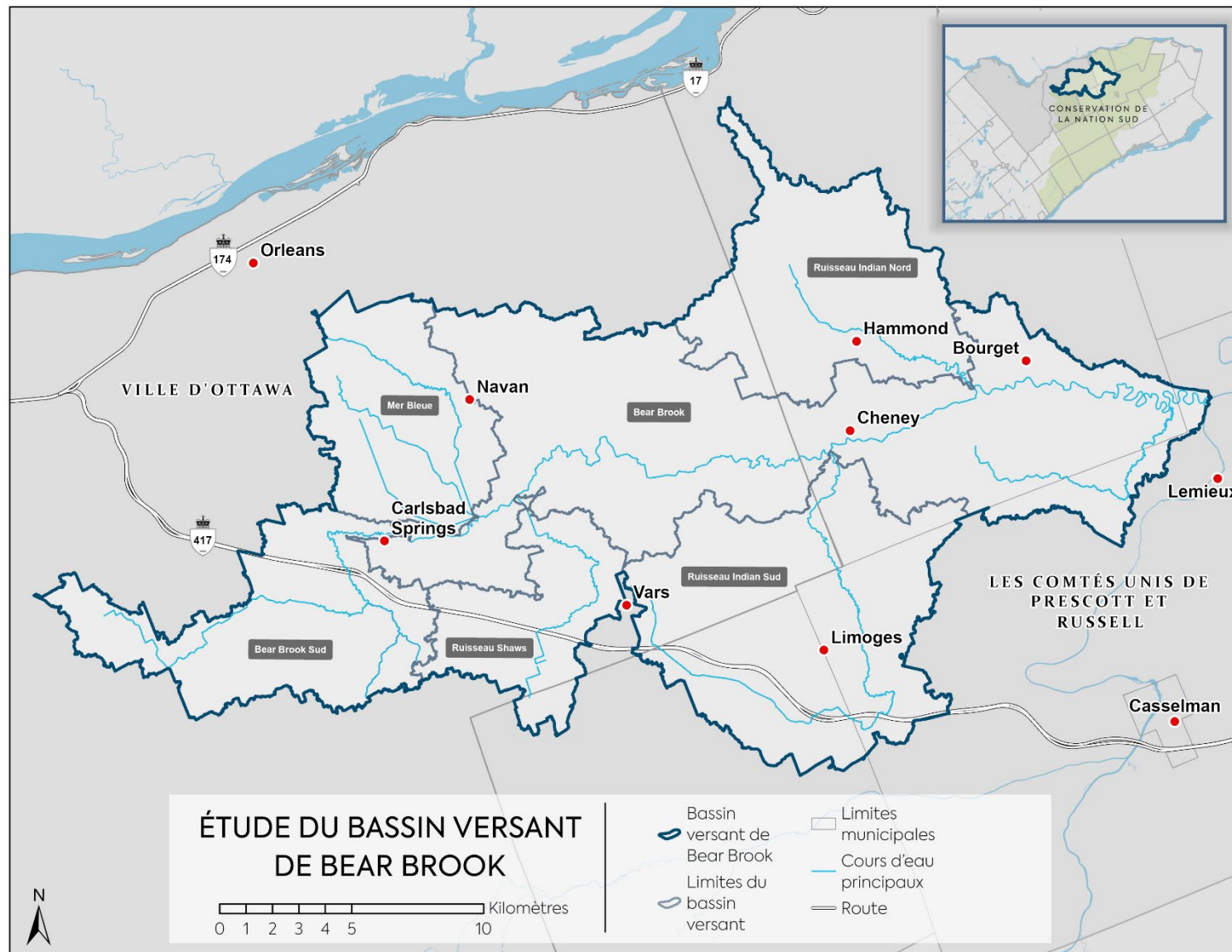


The Bear Brook Watershed is the area of land that drains all snow melt and rain to a common outlet – Bear Brook.

- The watershed boundary is determined by the landscape and elevations surrounding the watershed.
- Bear Brook outlets to the South Nation River.



# Bassin versant de Bear Brook



Le bassin versant de Bear Brook est le territoire où l'ensemble des eaux de pluie et de fonte des neiges s'écoulent vers un exutoire commun : le ruisseau Bear Brook.

- Les limites du bassin versant sont déterminées par le relief et les élévations du terrain environnant.
- Le ruisseau Bear Brook se déverse dans la rivière Nation Sud.



# Bear Brook Watershed Study



## Phase 1: Watershed Characterization (2023–2025)

Describes the current state and recent trends of water, natural heritage, and natural hazards (flooding, erosion, unstable soils).



## Phase 2: Scenario Planning & Risk Assessment (2024–2026)

Examines future land use and climate change scenarios to better understand risks and opportunities. Includes a Class Environmental Assessment for flood mitigation options.



## Phase 3: Implementation Planning–Watershed Plan (2026–2027)

Develops recommendations, policies, and monitoring frameworks to guide sustainable watershed management.



# Étude sur le bassin versant de Bear Brook



## Phase 1 : Caractérisation du bassin versant (2023–2025)

Décrit l'état actuel et les tendances récentes en matière d'eau, de patrimoine naturel et de risques naturels (inondations, érosion, sols instables).



## Phase 2 : Planification de scénarios et évaluation des risques (2024–2026)

Examine les scénarios futurs d'utilisation des sols et de changement climatique afin de mieux comprendre les risques et les opportunités. Comprend une évaluation environnementale de portée générale pour les options d'atténuation des inondations.



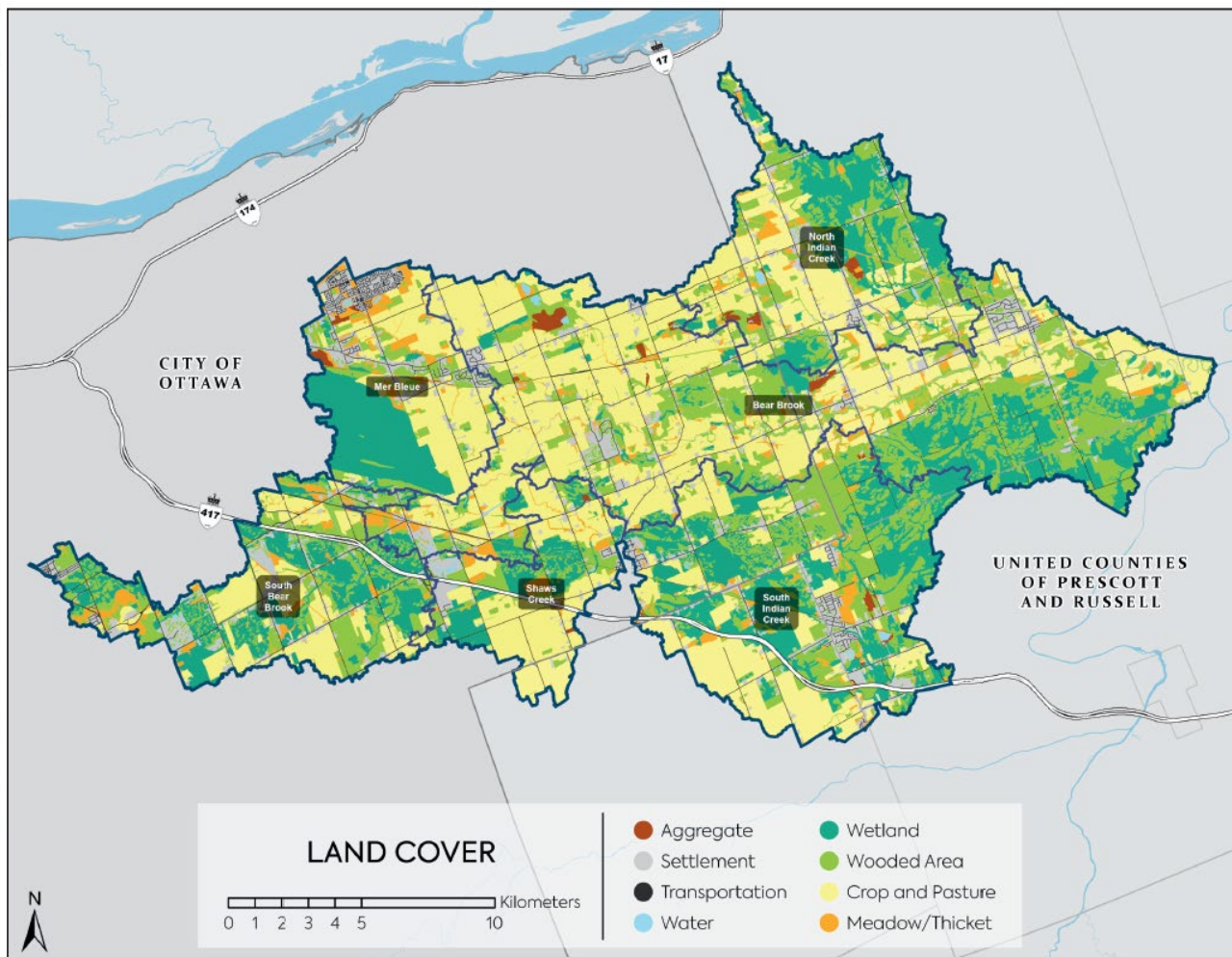
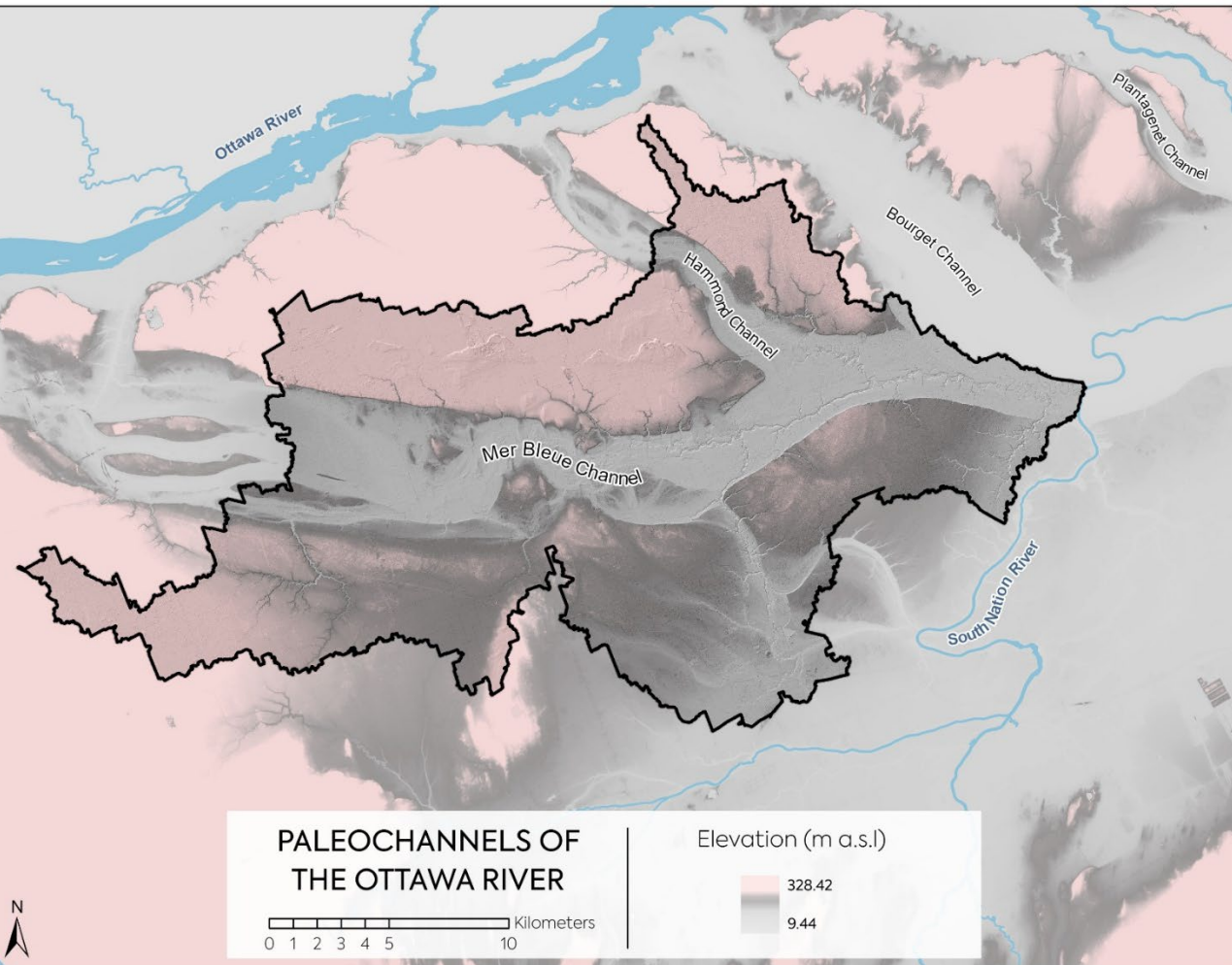
## Phase 3 : Planification de la mise en œuvre – Plan pour le bassin versant (2026–2027)

Élabore des recommandations, des politiques et des cadres de surveillance pour orienter la gestion durable du bassin versant.



# Bear Brook Watershed Study

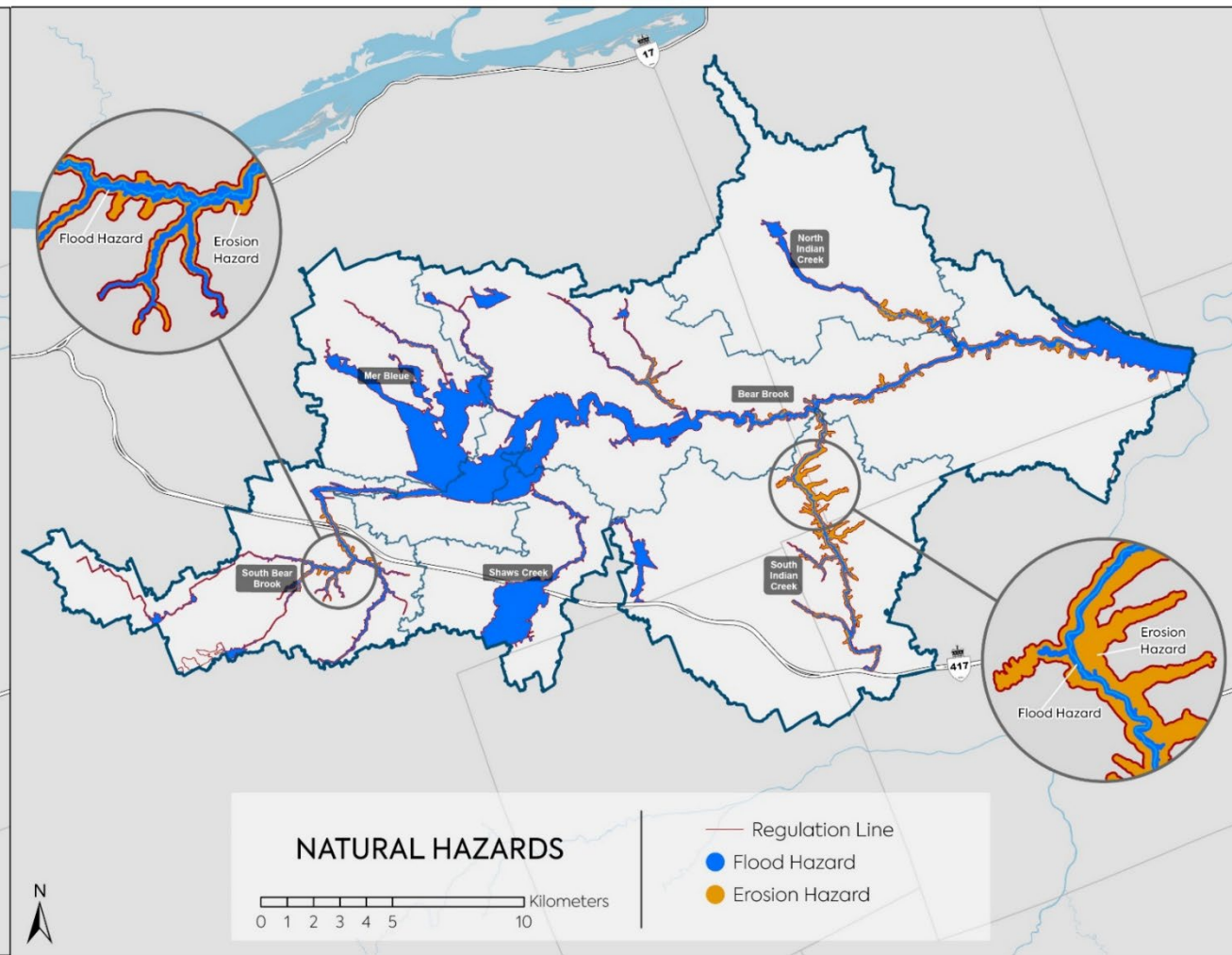
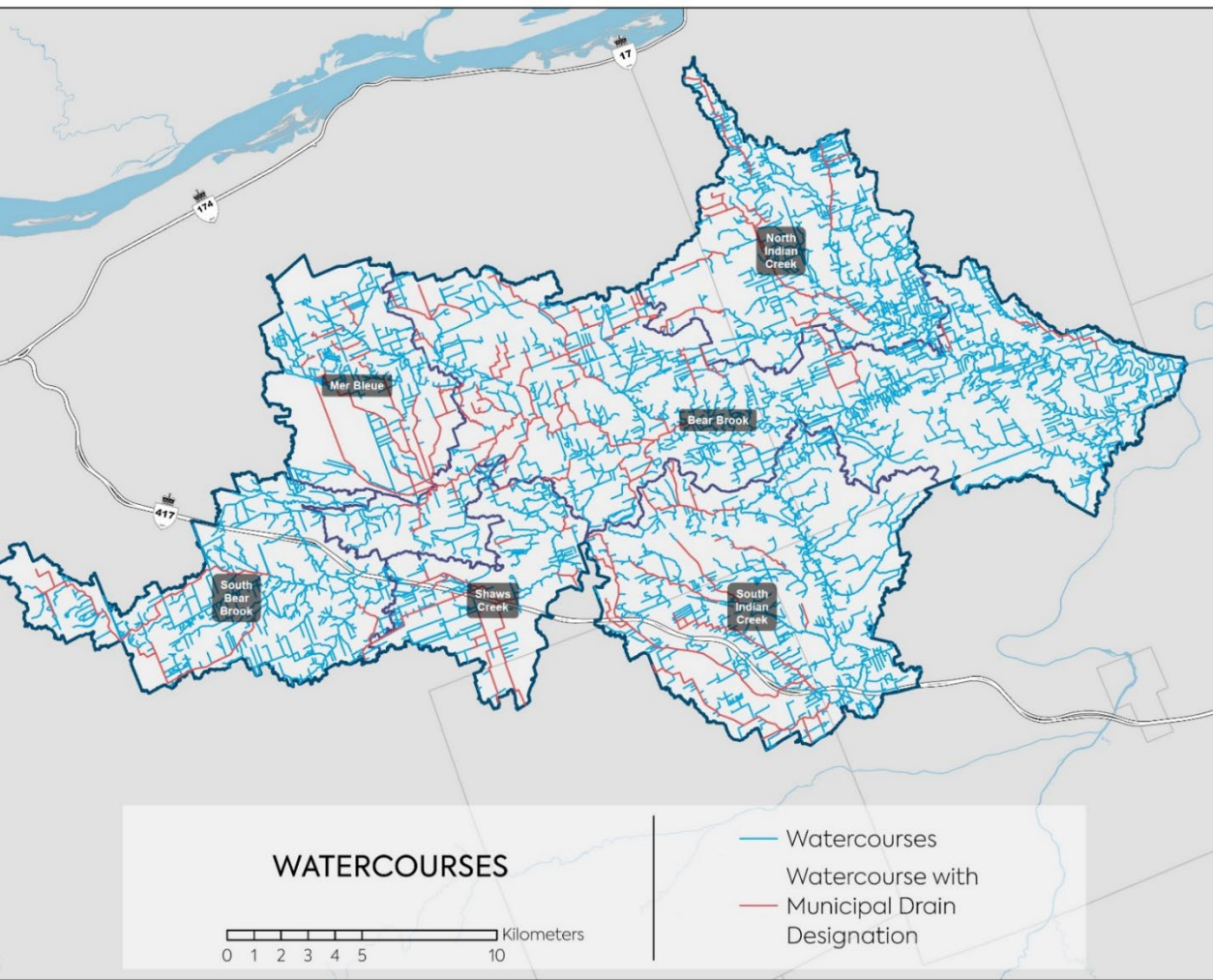
## Étude sur le bassin versant de Bear Brook





# Bear Brook Watershed Study

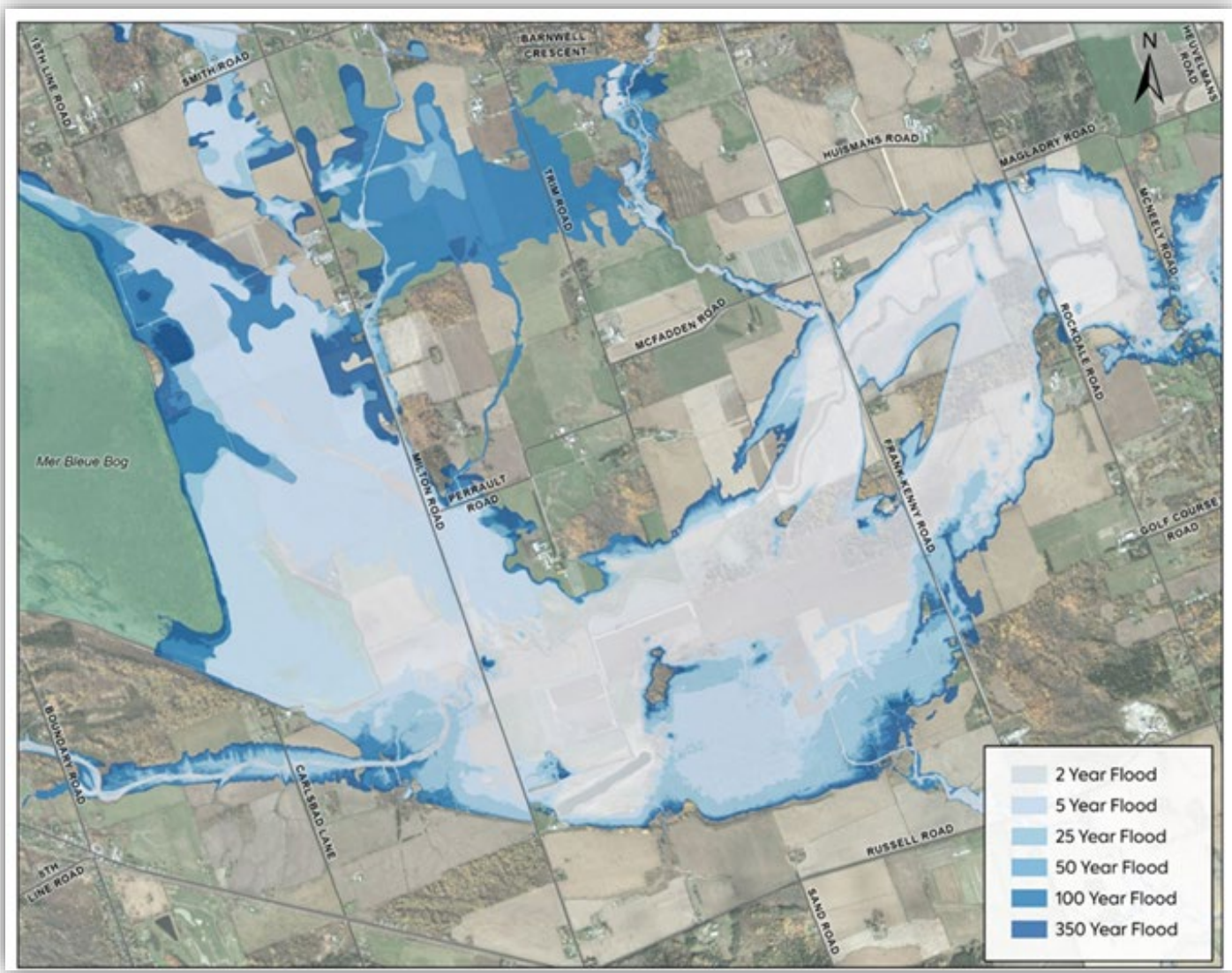
## Étude sur le bassin versant de Bear Brook






# Bear Brook Flood Mitigation: Class EA

Mesures d'atténuation des risques d'inondation à Bear Brook : ÉE de portée générale



## Class Environmental Assessment (EA): Flood Mitigation – AECOM

- Cost of flooding  
Coûts associés aux inondations
- Long list of mitigation options  
Liste des options potentielles d'atténuation
- Evaluation criteria  
Critères d'évaluation



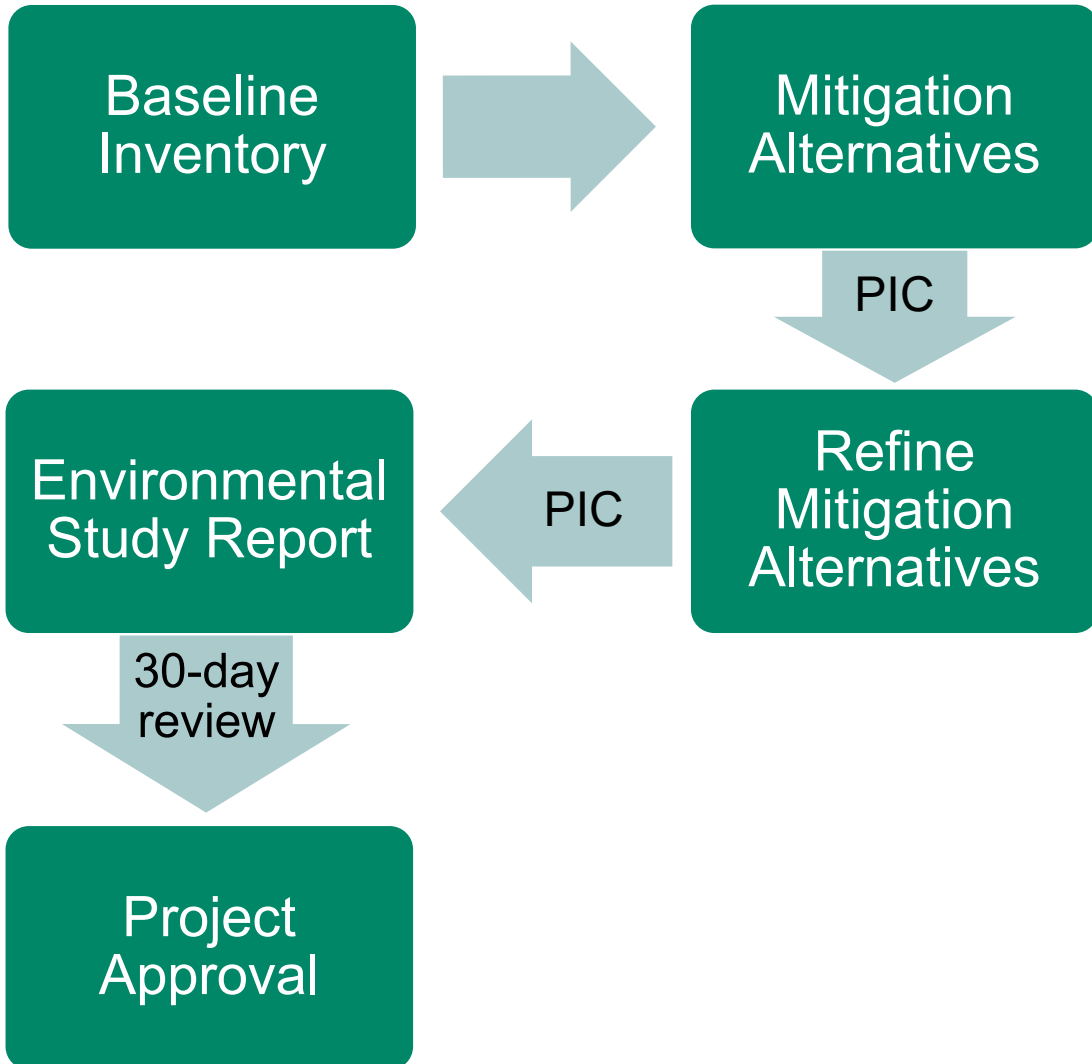
**Bear Brook Flood Mitigation  
Class Environmental Assessment  
Public Information Centre**

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# Project Background

- Bear Brook watershed has experienced recurring flooding, particularly impacting agricultural lands.
- Recent events (e.g., active hurricane season in summer 2024) highlighted ongoing flood risks and crop losses.
- The City of Ottawa, in partnership with SNC, initiated a multi-year Bear Brook Watershed Study to guide future water management.
- AECOM completed a flood damage assessment to better understand impacts.
- Based on these findings, a Class EA process was initiated to evaluate mitigation options.

# Class Environmental Assessment



- Following the Conservation Ontario Class Environmental Assessment for Remedial Flood and Erosion Control Projects.
- Objective is to identify the best solution to provide long-term flood protection.
- The Class EA process provides opportunities for public participation throughout the planning of the project.

# Bear Brook Watershed Key Characteristics

## ➤ **Watershed characteristics:**

- ❖ Area of ~490 km<sup>2</sup>
- ❖ Elevation range of 43 m – 119 m
- ❖ Channel elevation range of 45 m – 99 m

## ➤ **Hydrologic Features:**

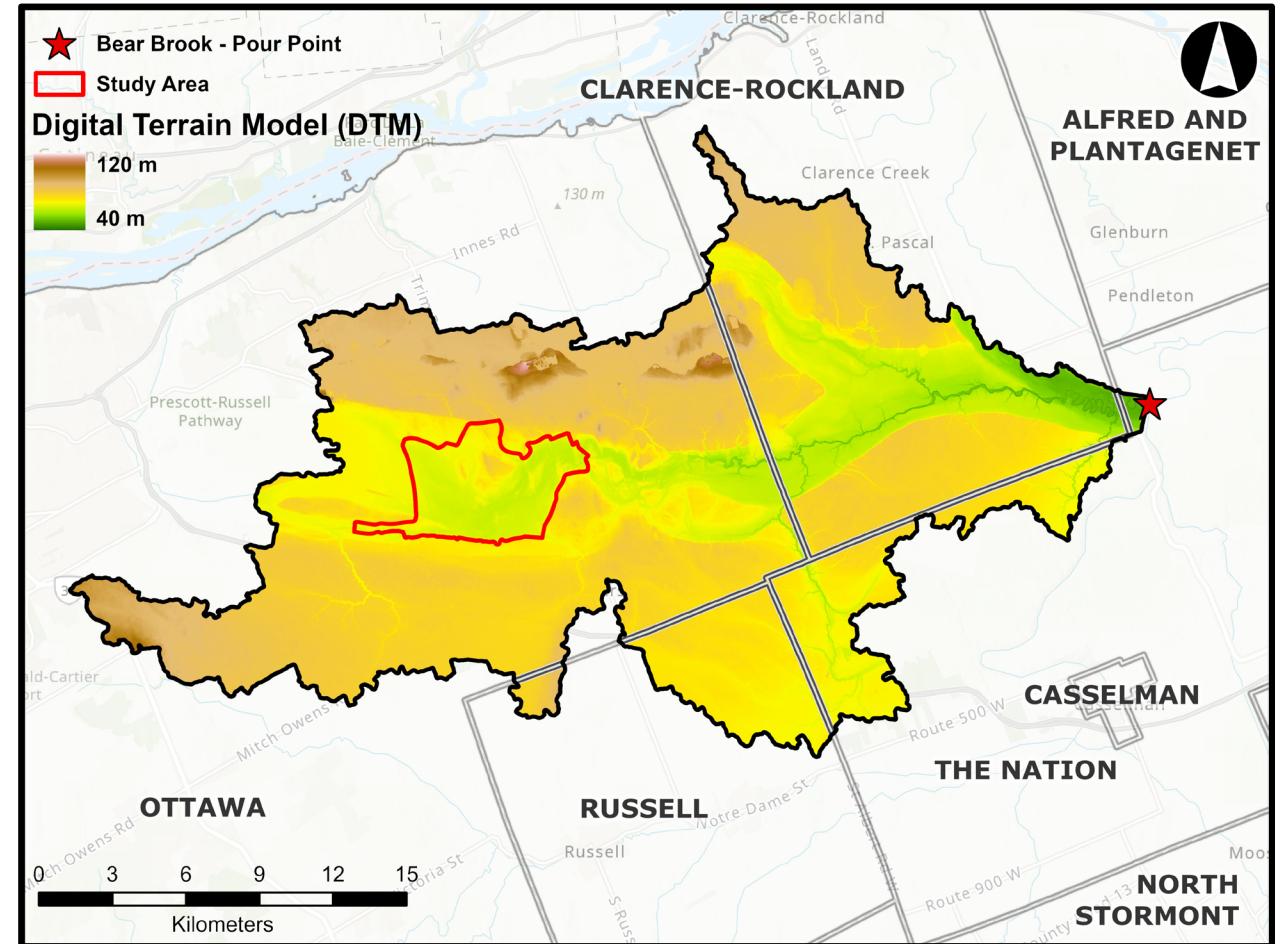
- ❖ Wetlands, clay plains, and low-lying areas
- ❖ Slow drainage response
- ❖ Extensive watercourse/tile drain networks

## ➤ **Source Water Protection:**

- ❖ Portions of the watershed fall within Source Water Protection areas
- ❖ Sensitive to changes in drainage and land use

## ➤ **Key Features:**

- ❖ Vars-Winchester Esker
- ❖ Mer Bleue Bog



# Problem Statement

- Bear Brook watershed experiences frequent flooding due to very flat topography and limited drainage capacity.
- The system is storage-dominated, meaning water is not efficiently conveyed out of the watershed.

**FLAT AREA**

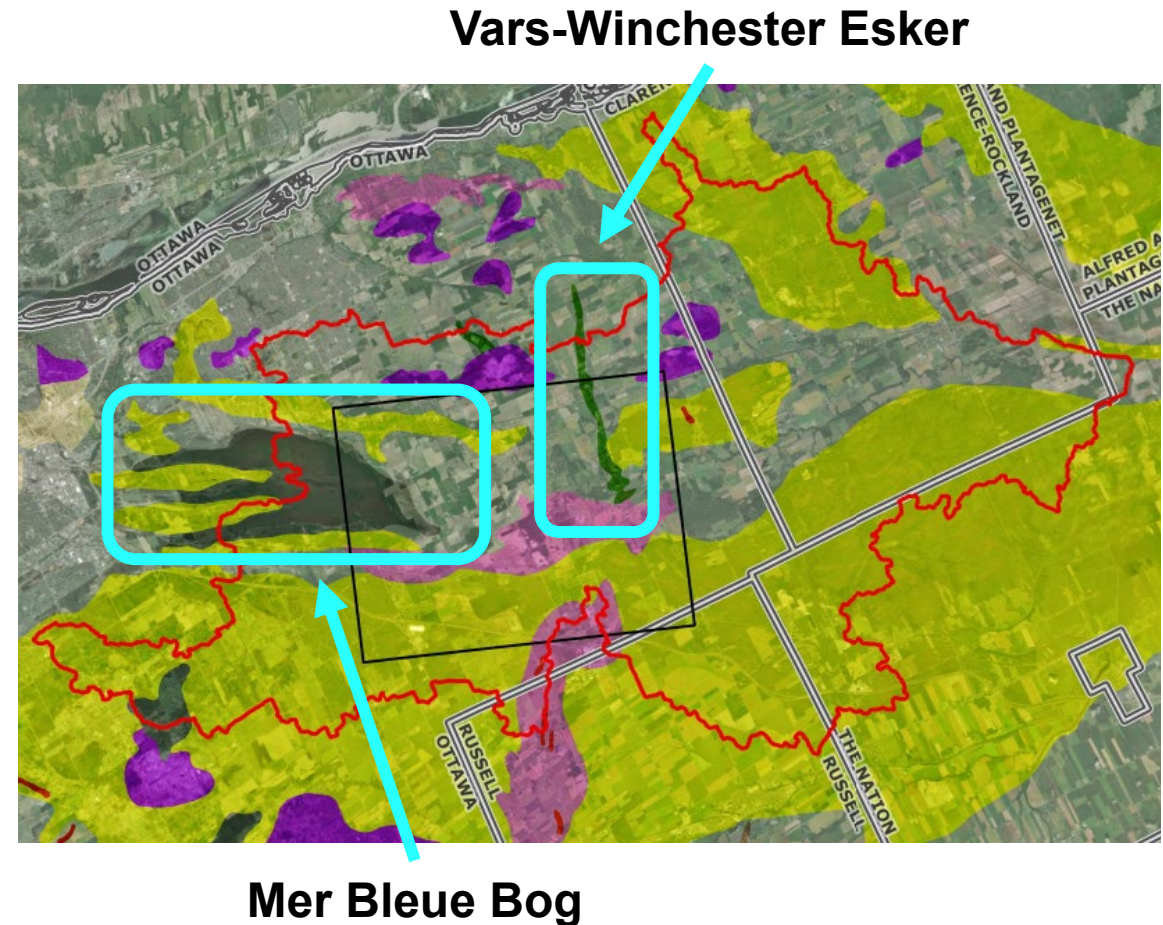


**SLOPED AREA**



# Project Constraints

- The Vars-Winchester Esker is downstream of the study area.
  - ❖ Provides municipal water for seven villages in the Bear Brook watershed
- The Mer Bleue Bog is upstream of the study area.
  - ❖ Low drainage capacity
  - ❖ Significant natural feature



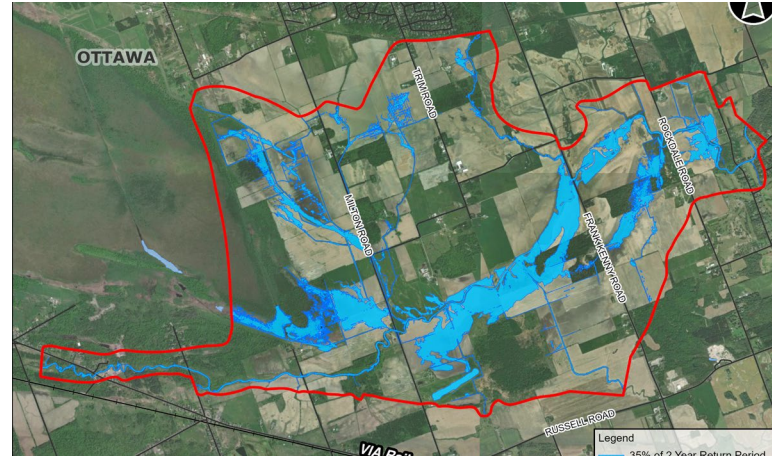
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# Opportunity Statement

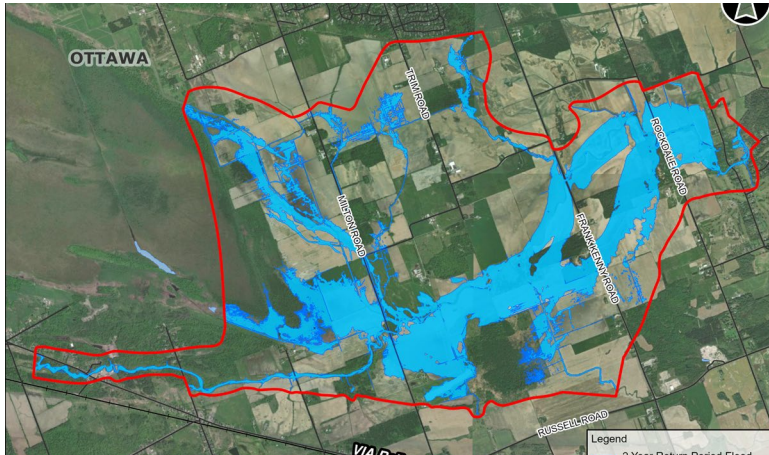
- There may be opportunities to reduce flooding through a range of measures. This would in turn:
  - ❖ Reduce economic losses (primarily agricultural)
  - ❖ Improve flood resilience under both spring and summer conditions
  - ❖ Provide implementable solutions within a very flat system

# Typical Summer vs Spring Flooding

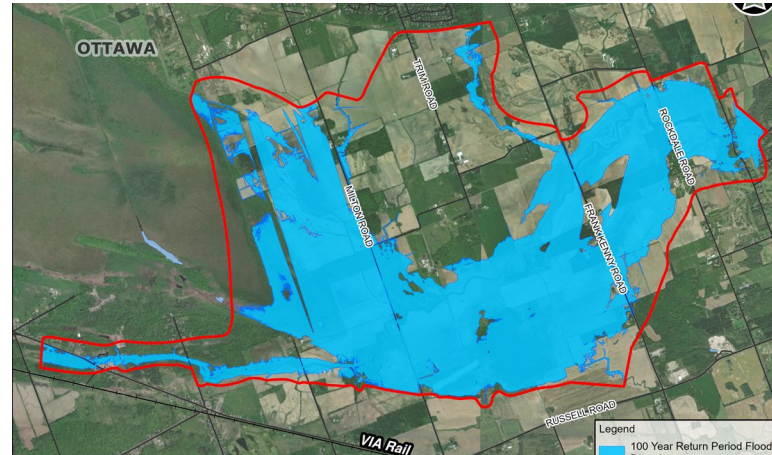
35% of 2-year Floodplain



2-year Floodplain



100-year Floodplain



Summer flooding

Smaller magnitude flows

Occurs during the growing season

Directly impacts active crops

Crop Losses

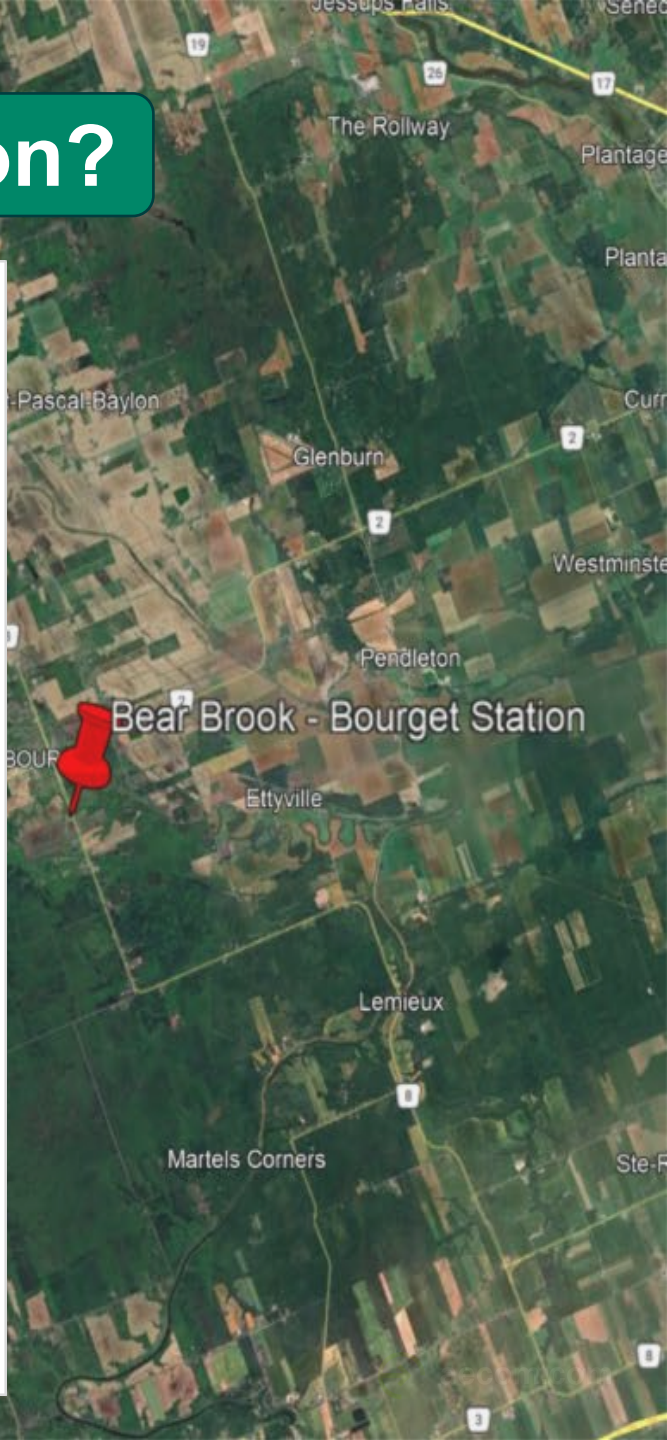
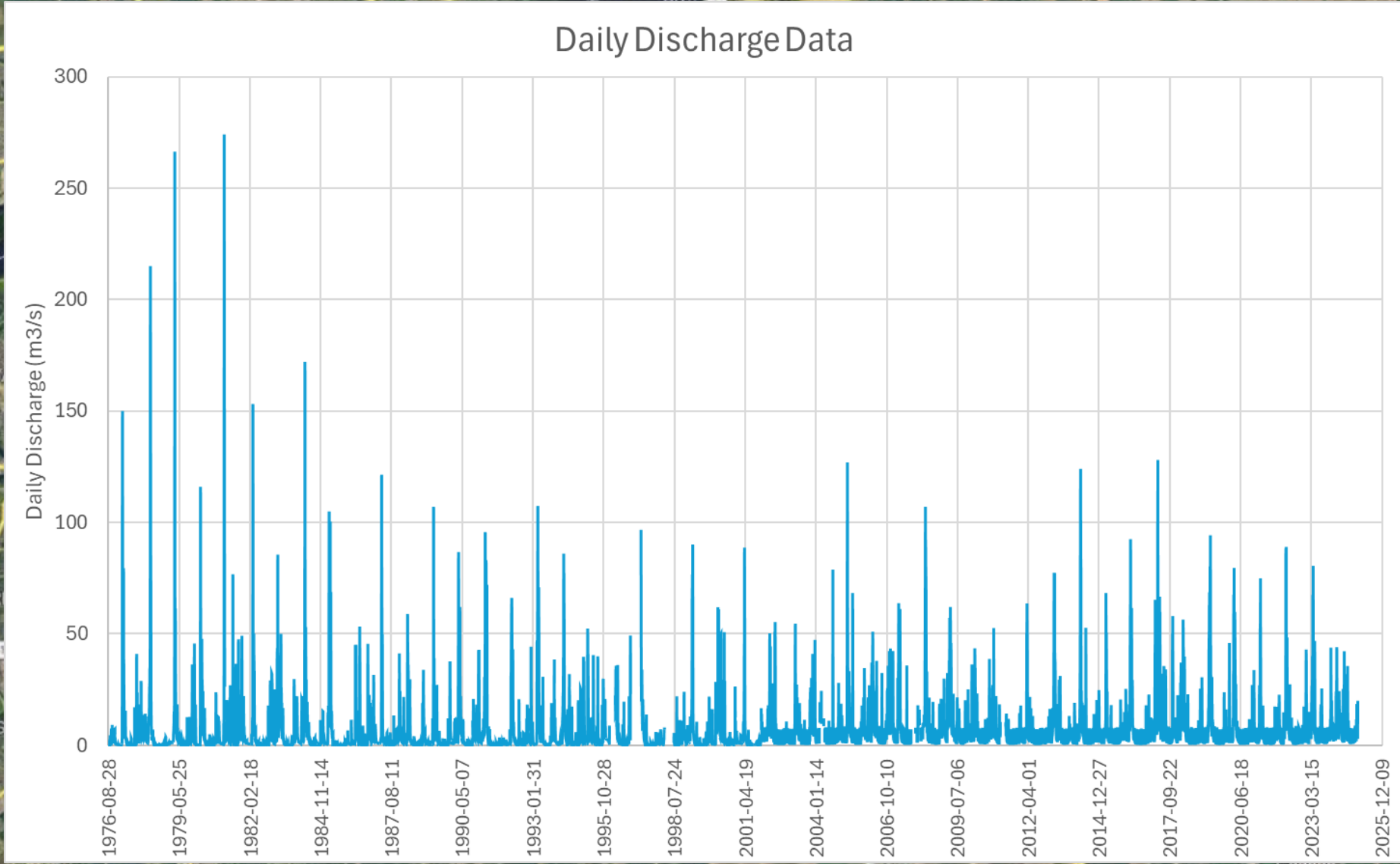
Spring flooding

Larger extent and longer duration

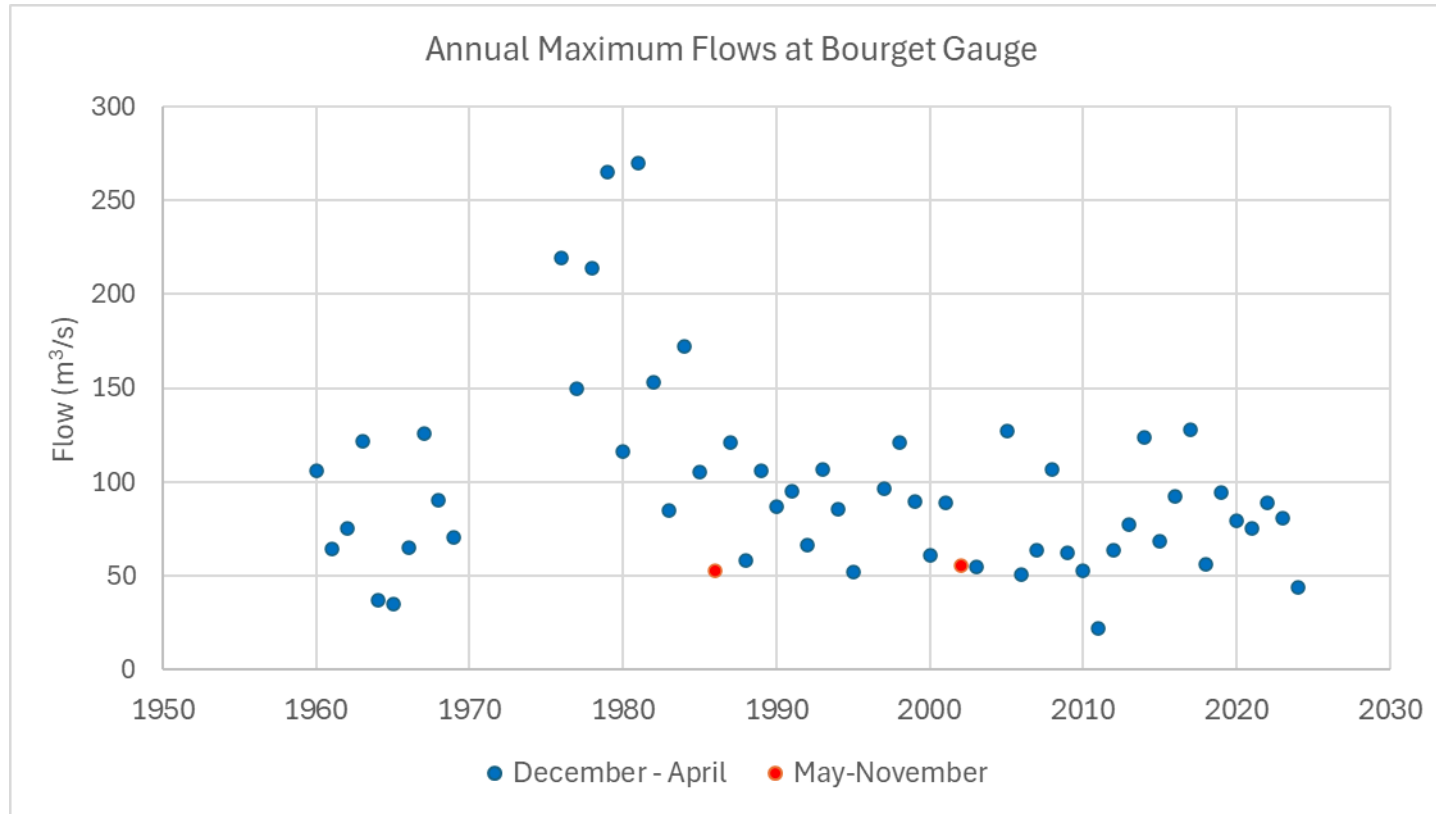
Occurs outside the crop growing season

Structural Damages

# When does Flooding Occur at Bourget Station?



# Flow Characteristics (Bourget Gauge)



Flood Frequency Analysis

Flow Events	Flow m <sup>3</sup> /s
2 year	89.1
5 year	130.5
10 year	160.8
20 year	192.3
50 year	236.8
100 year	273.1
350 year	345.7

No recorded occurrence of this happening during the agricultural growing season



# Spring vs Summer Flooding

Spring events

Year	Month	Day	Flow m <sup>3</sup> /s
1981	Feb	21	270
1979	Mar	25	265
1976	Apr	4	219
1978	Apr	15	214
1984	Apr	6	172
1982	Apr	2	153
1977	Mar	16	150

- Larger magnitude flows
- Longer duration (days to weeks)
- Drives major hydraulic loading

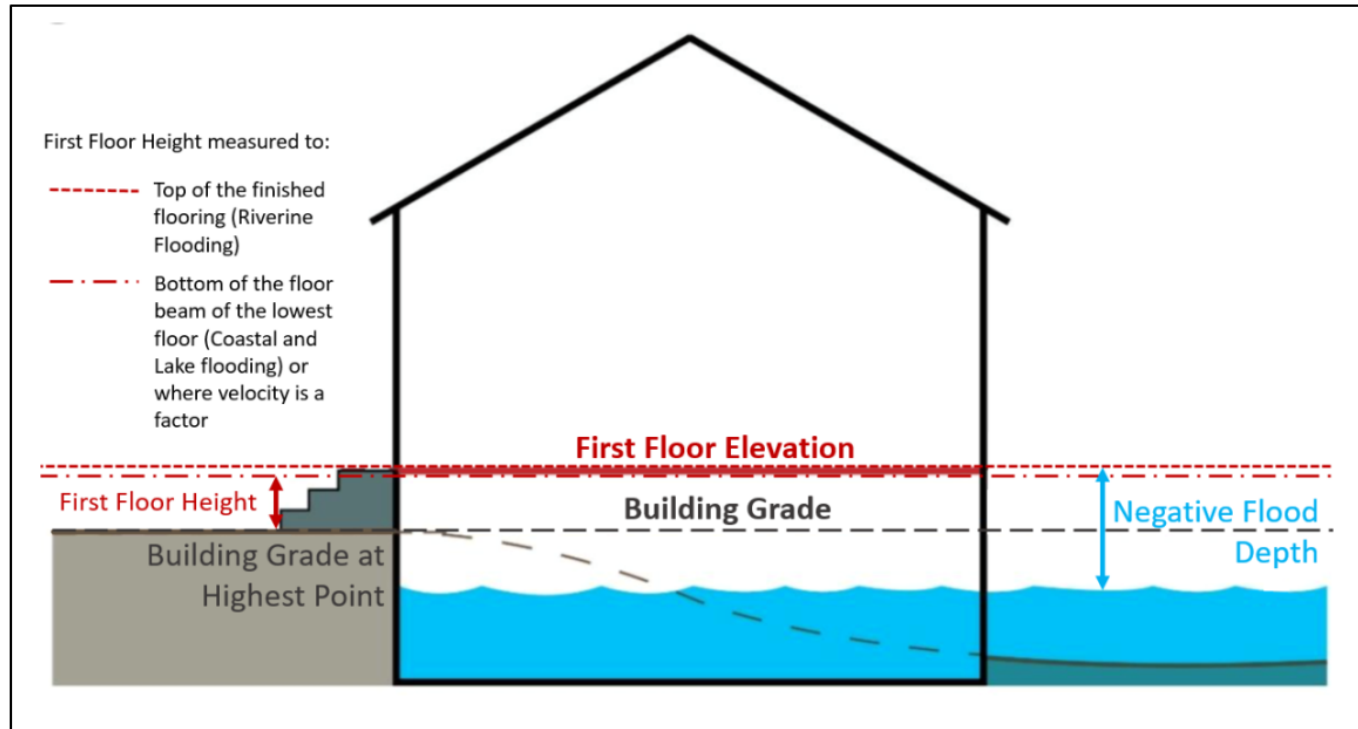
Summer events

Year	Month	Day	Flow m <sup>3</sup> /s
2004	Sep	10	78.9
1981	Jun	23	76.4
2017	May	2	66.7
2017	Nov	3	58.1
2017	Oct	31	50.2
1995	Aug	6	40
2007	Jul	21	35.9

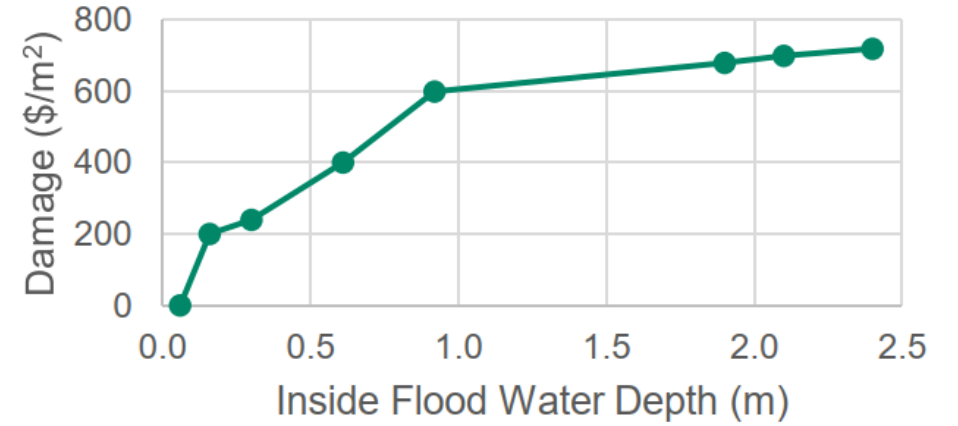
- Smaller flows
- Shorter duration
- Can still flood agricultural lands



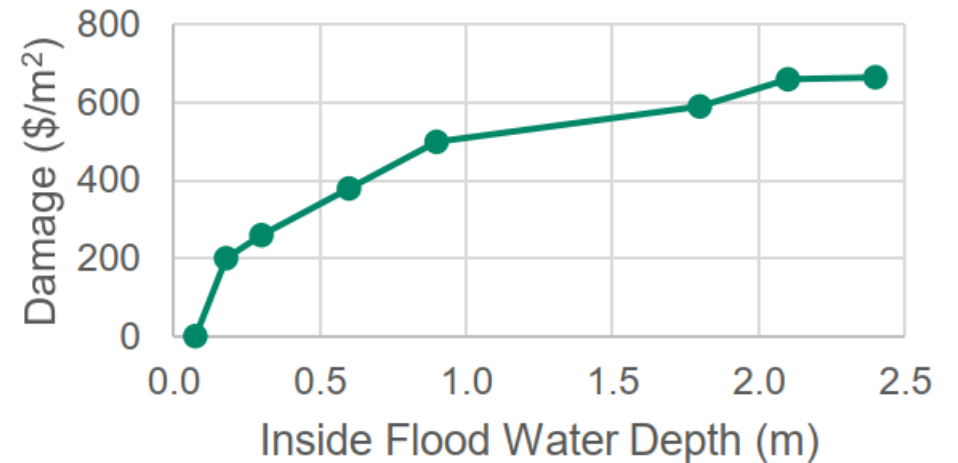
# Structural Direct Damages



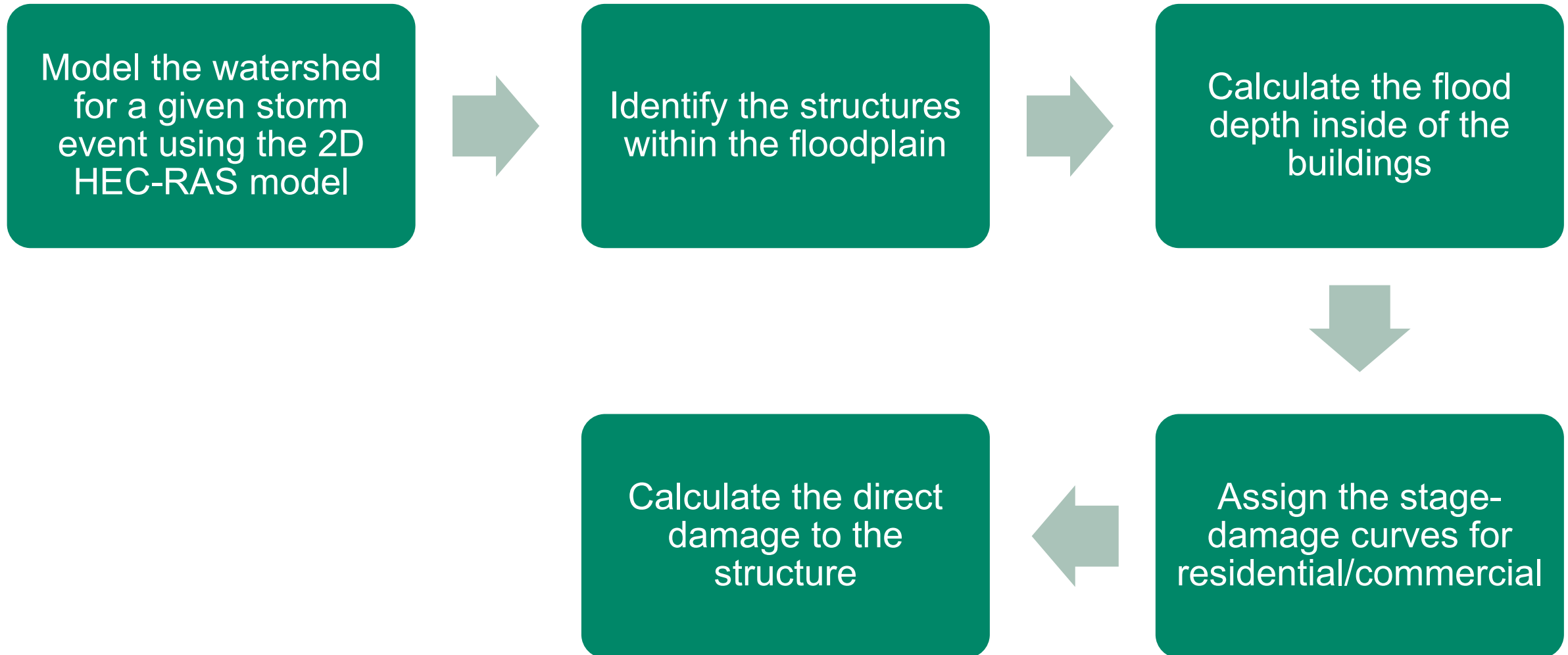
## Residential



## Commercial

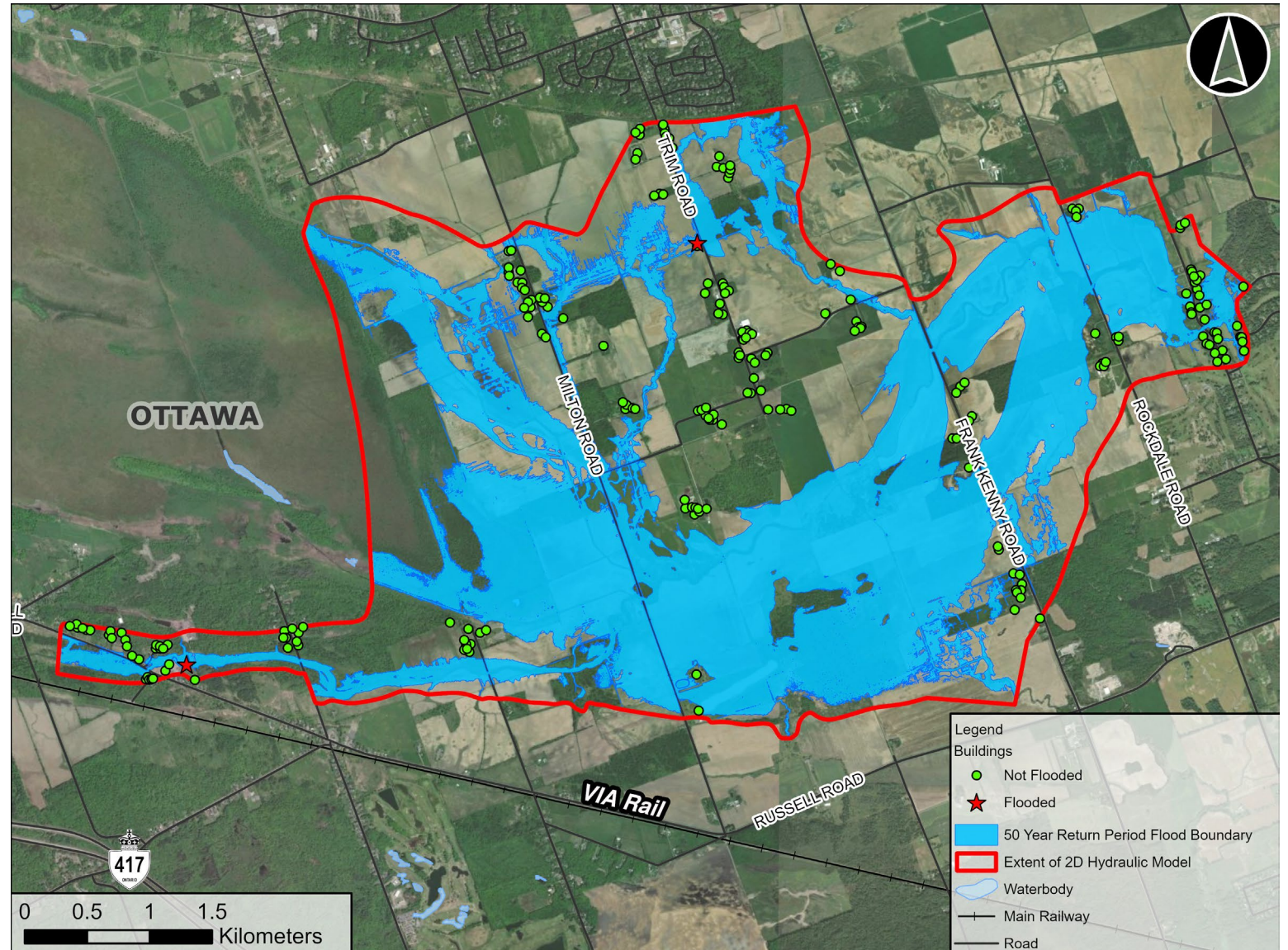


## Structural Direct Damages – Flow Chart



# Structural Damages

Return Period	Buildings in Floodplain
2	0
5	0
10	0
20	0
50	2
100	7
350	9



## Structural Damages

Return Period	Direct Damages	Indirect Damages	Total Damages
2	0.00	0.00	0.00
5	0.00	0.00	0.00
10	0.00	0.00	0.00
20	0.00	0.00	0.00
50	\$31K	\$13K	\$44K
100	\$62K	\$25K	\$87K
350	\$79K	\$32K	\$111K

# Crop Loss Assessment – Assumptions

## Data Sources

Flood extents and depths from 2D HEC-RAS model (SNC, 2025)

Crop damage functions from USDA SCS (Michigan Office)

Crop yields and prices from OMAFRA (2025)

Land cover from SNC GIS (crop + pasture classifications)

## Agricultural Exposure Assumptions

Sub 2-year events:  
40% cropland – 60% pasture

≥2-year events:  
75% cropland – 25% pasture

Cropland split equally between:  
Soybeans, Grain Corn, Winter  
Wheat

## Key Assumptions

Crop losses vary by growing season timing

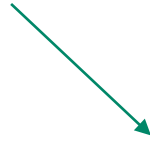
Minimal crop exposure during spring freshet

No indirect crop losses included

# Crop Losses

Monthly Crop Losses =

Loss Factor × Monthly Flooded Agricultural Area and Crop Values



*Monthly Crop Loss Severity × Monthly Probability of Flood Occurrence*

**Simply Put:**

Monthly Crop Losses = *How much crop value (\$) based on area is vulnerable to flooding in each month* ×  
*What is the percentage (%) of crop loss during flooding based on life stage in each month* ×  
*What is the likelihood (%) that flooding occurs in each month*

**Annual average crop losses in the study area: \$139k**

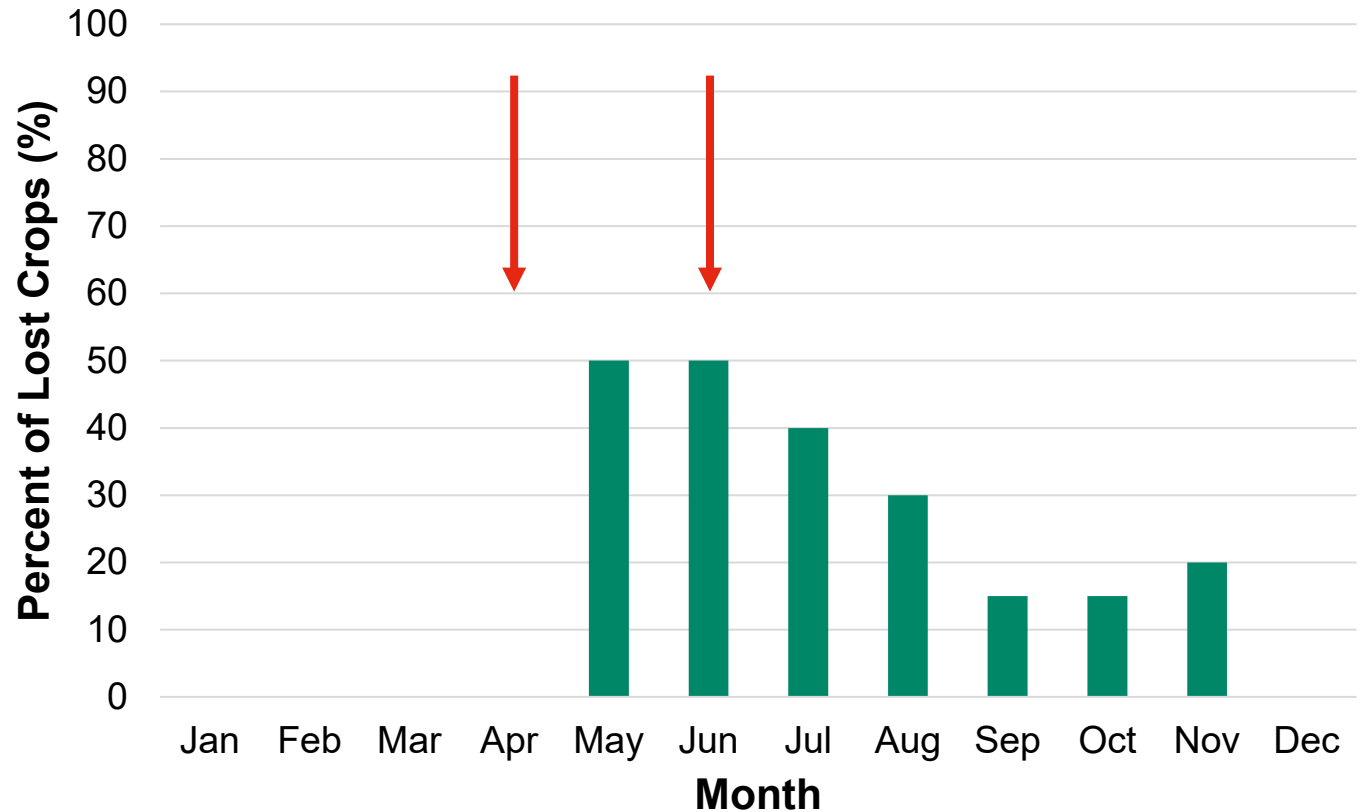
# Crop Losses Example: Grain Corn

## Scenario:

- Completely flooded 10 ha field (24.7 ac) of grain corn:
  - Value of \$22,000 (173.1 bushels/acre at \$5/bushel)
- 35% of a 2-year flood event
- Flood depth of 0 - 0.3 m

We will go through the crop loss calculations for an event in April and June

Severity of Grain Corn Loss at Flood Depths of 0 - 0.3 m for Each Month (USDA SCS)



# Crop Losses Example: Grain Corn

## April Event

- Crop loss severity: 0%
- Probability of flood occurrence: 12%
- Crop value: \$22,000 for 10 ha

### Step 1: Calculate loss factor (%)

Loss factor = crop loss severity x probability of flood occurrence

$$\text{Loss factor} = 0 \times 0.12$$

$$\text{Loss factor} = 0\%$$

### Step 2: Calculate crop loss (\$)

Crop Loss = Loss factor x Crop value

$$\text{Crop Loss} = 0 \times \$22,000$$

$$\text{Crop Loss} = \$0$$

## June Event

- Crop loss severity: 50%
- Probability of flood occurrence: 8%
- Crop value: \$22,000 for 10 ha

### Step 1: Calculate loss factor (%)

Loss factor = crop loss severity x probability of flood occurrence

$$\text{Loss factor} = 0.5 \times 0.08$$

$$\text{Loss factor} = 4\%$$

### Step 2: Calculate crop loss (\$)

Crop Loss = Loss factor x Crop value

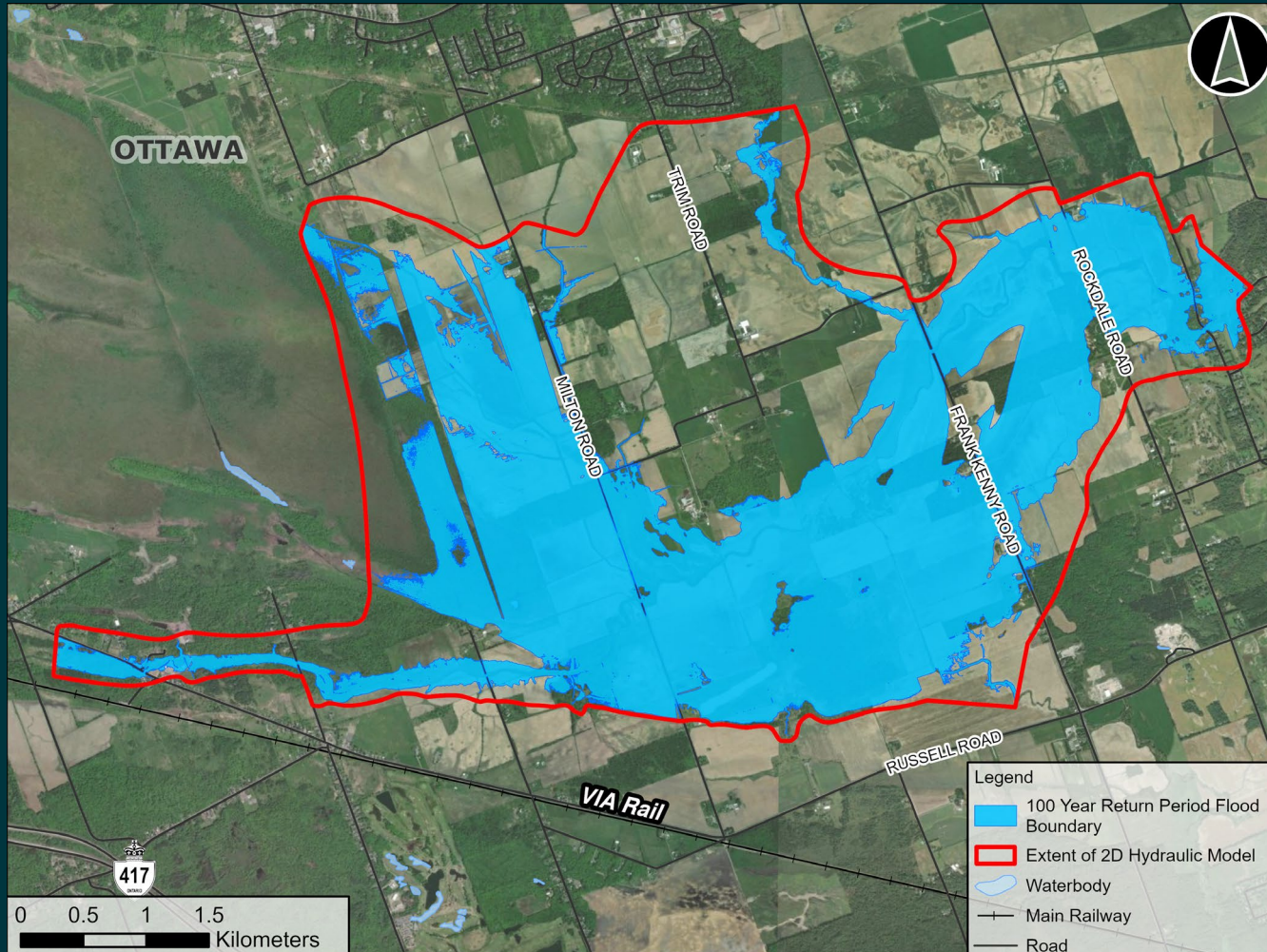
$$\text{Crop Loss} = 0.04 \times \$22,000$$

$$\text{Crop Loss} = \$880$$

# What Options Are Available?

Potentially Viable Solutions  
to Mitigate Flooding

# Mitigation Options - Do Nothing



## Pros

No capital cost

No construction cost

Maintains the existing system

## Cons

No reduction in flooding

Ongoing crop loss

No improvement to structural risk

# Mitigation Options - Land Use Management / Procurement



## Pros

Reduces long-term flood risk by reducing exposure

Supports natural floodplain function

Low maintenance and sustainable

## Cons

High upfront cost

Does not reduce flood levels

Requires policy coordination and long implementation timeline

# Mitigation Options - Culvert and Crossing Upgrades



## Pros

Improves conveyance locally

Targeted, site-specific improvements

Reduces upstream flood elevations

## Cons

Limited benefit in flat systems

May shift flooding downstream

Single upgrades provide limited benefit

# Mitigation Options - Storage Areas



## Pros

Reduces peak flows  
(short-duration events)

Can be used to target  
agricultural flooding

Potential to integrate  
with natural features

## Cons

Ineffective for long-  
duration, large volume  
events

Requires large  
volumes/area in flat  
terrain

Spatial and  
constructability  
constraints

# Mitigation Options - Channel Enlargement



## Pros

Increases conveyance capacity

Reduces local flooding levels

Works well in confined systems

## Cons

Limited benefit in flat areas

Potential environmental impacts

High cost and disruption

# Mitigation Options - Relief Channels



## Pros

Provides alternative flow paths

Reduces pressure on main channel

Can redirect flows away from sensitive areas

## Cons

Requires significant space

May impact adjacent lands

Complex design and permitting

# Mitigation Options - Dykes



## Pros

Directly reduces flood exposure

Effective for targeted protection

Can be designed for specific events

## Cons

Does not reduce flood volume

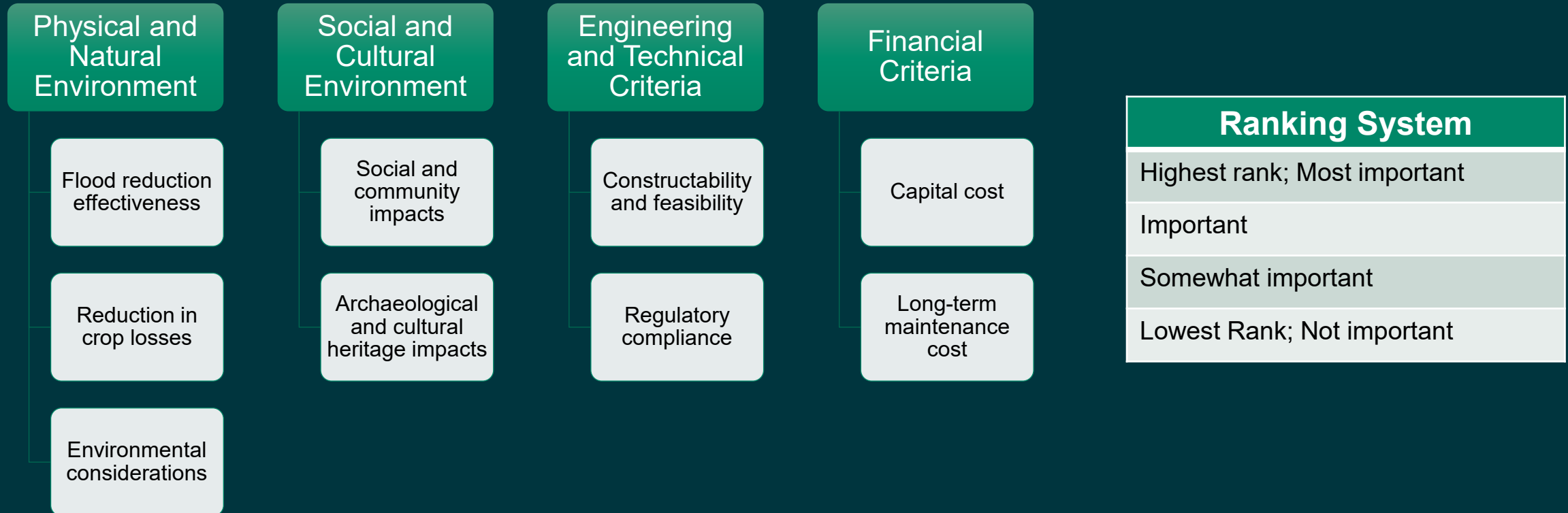
May increase flooding elsewhere

Requires ongoing maintenance and potential pumping

# Preliminary Evaluation Criteria

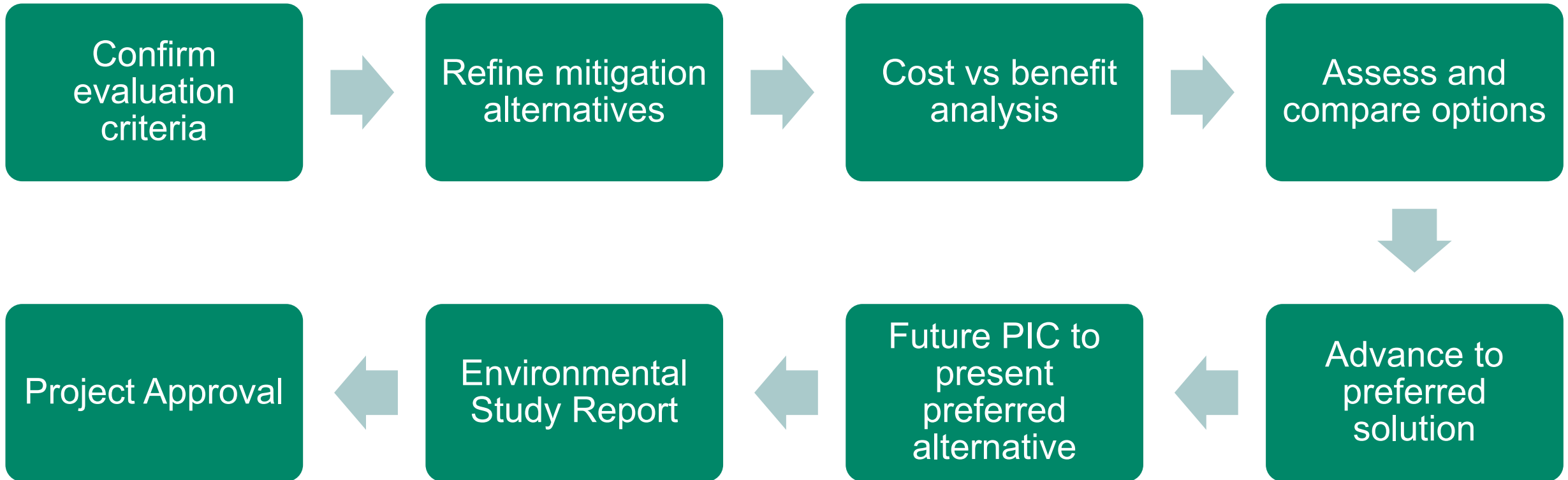
## How Do We Identify the Preferred Solution?

Qualitative review of the preliminary mitigation options using a ranking system that rates the level of impact that each option has on the following list of criteria. The ranking system will identify which option is the most preferred based on the evaluation results. The lowest ranking represents the least preferred option while the highest ranking represents the most preferred option.



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## Next Steps



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## We Want Your Feedback!

Please fill out the **Bear Brook Watershed Study Flood Mitigation – Information Session Feedback Form** and let us know:

- Have you experienced flooding?
- Which mitigation options do you support?
- What do you think the weighting of the criteria should be?
- Is there any criteria we missed?



**AECOM** Delivering a  
better world



**Please Share Your Feedback**

Partagez vos commentaires

<https://nation.on.ca/en/monitoring-conditions/watershed-planning/bear-brook-watershed>

**[nation.on.ca/consultations](https://nation.on.ca/consultations)**

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Our Local Environment, We're in it Together.



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