ECS Lunch and Learn

Supporting internal knowledge transfer within TRCA

December 15, 2022

Toronto and Region Conservation Authority

Dam Safety 101

Dam Safety at TRCA

Presented by: Craig Mitchell, Acting Associate Director – Engineering Services

December 15, 2022

Toronto and Region Conservation Authority

Mica Dam, BC

What is a dam?

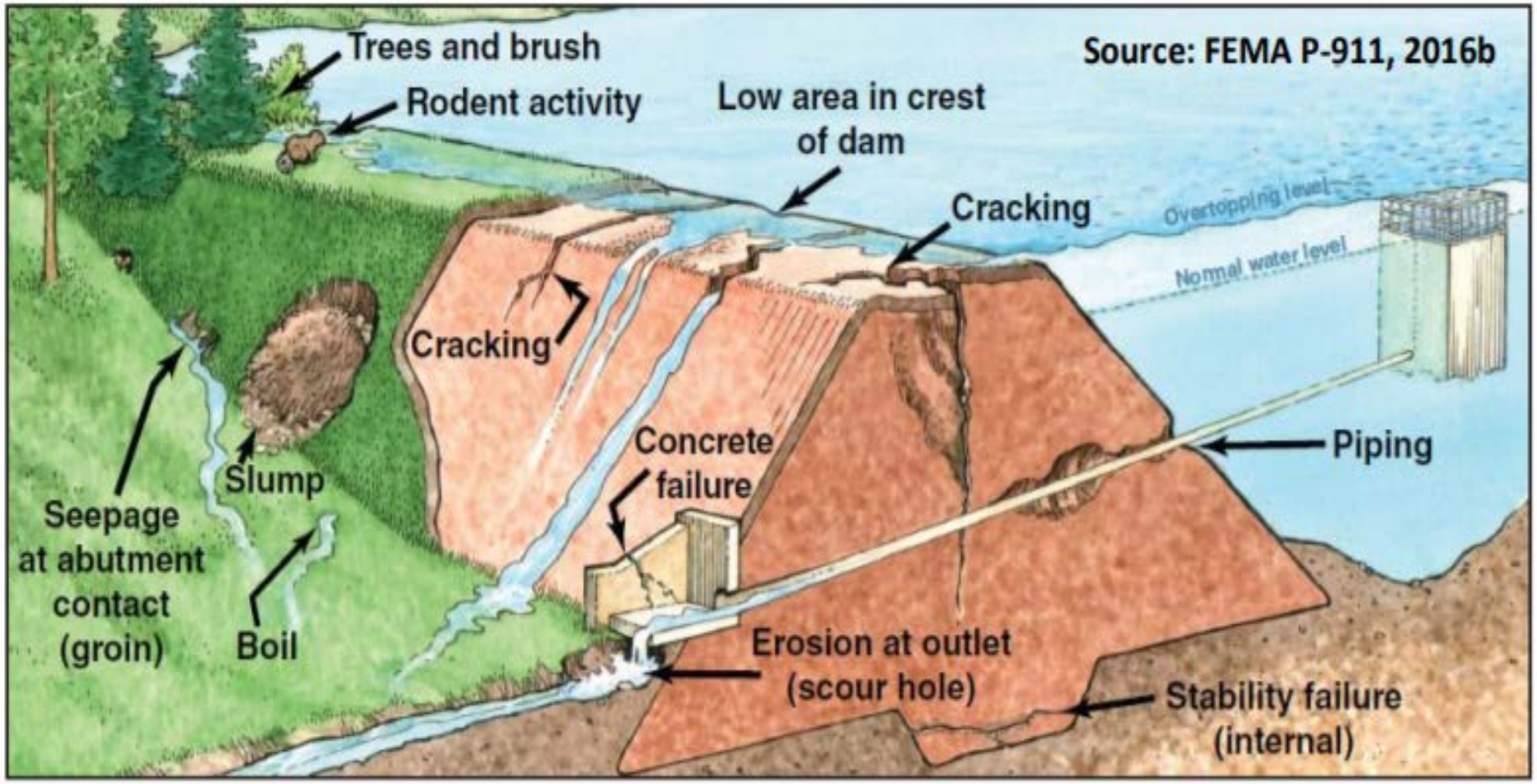
"A dam is defined as a structure that is constructed which forwards, holds back or diverts water in a river, lake, pond, or stream to raise the water level, create a reservoir to control flooding or divert the flow of water"

(LRIA, 2011)

Societal Reliance on Dams

- Hydroelectricity
- Water Supply
- Agriculture
- Flood Control
- Flow Augmentation
- Navigation
- Mine Tailings Management
- Recreation

How do Dams Fail?



Catalyst for Modern Dam Safety: Teton Dam

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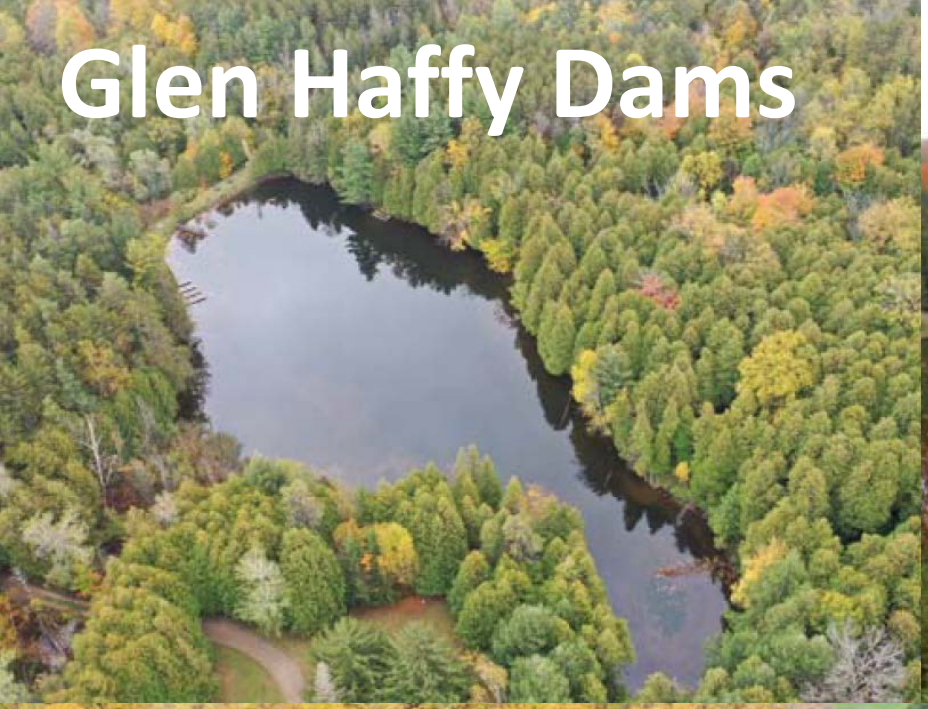
Catalyst for Modern Dam Safety: Teton Dam

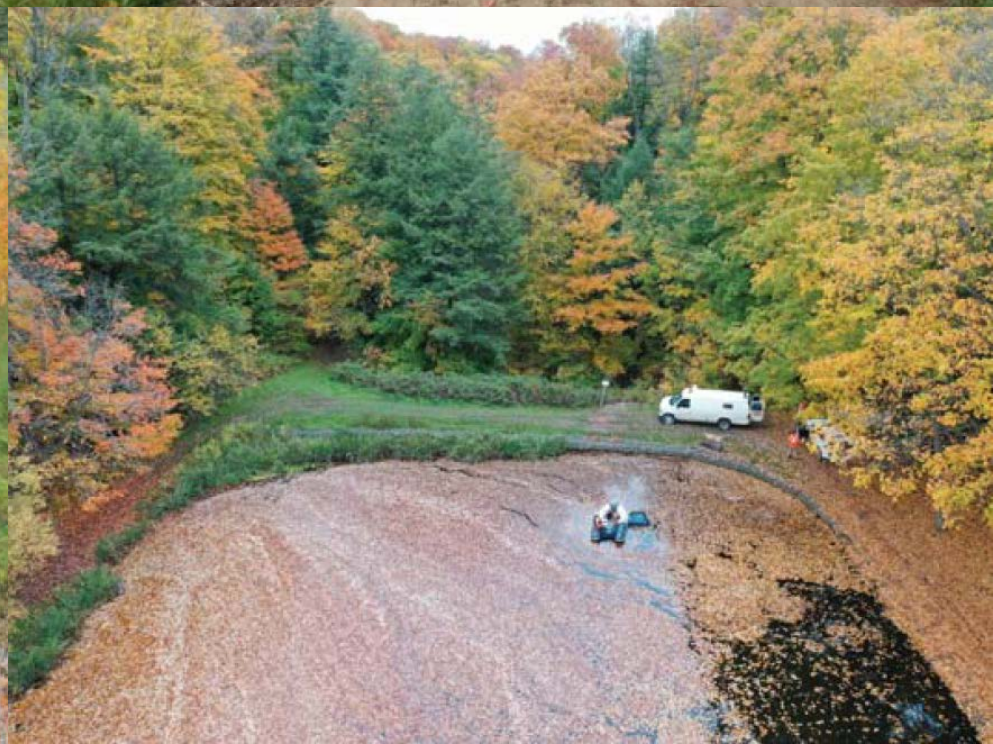
TRCA's Dams

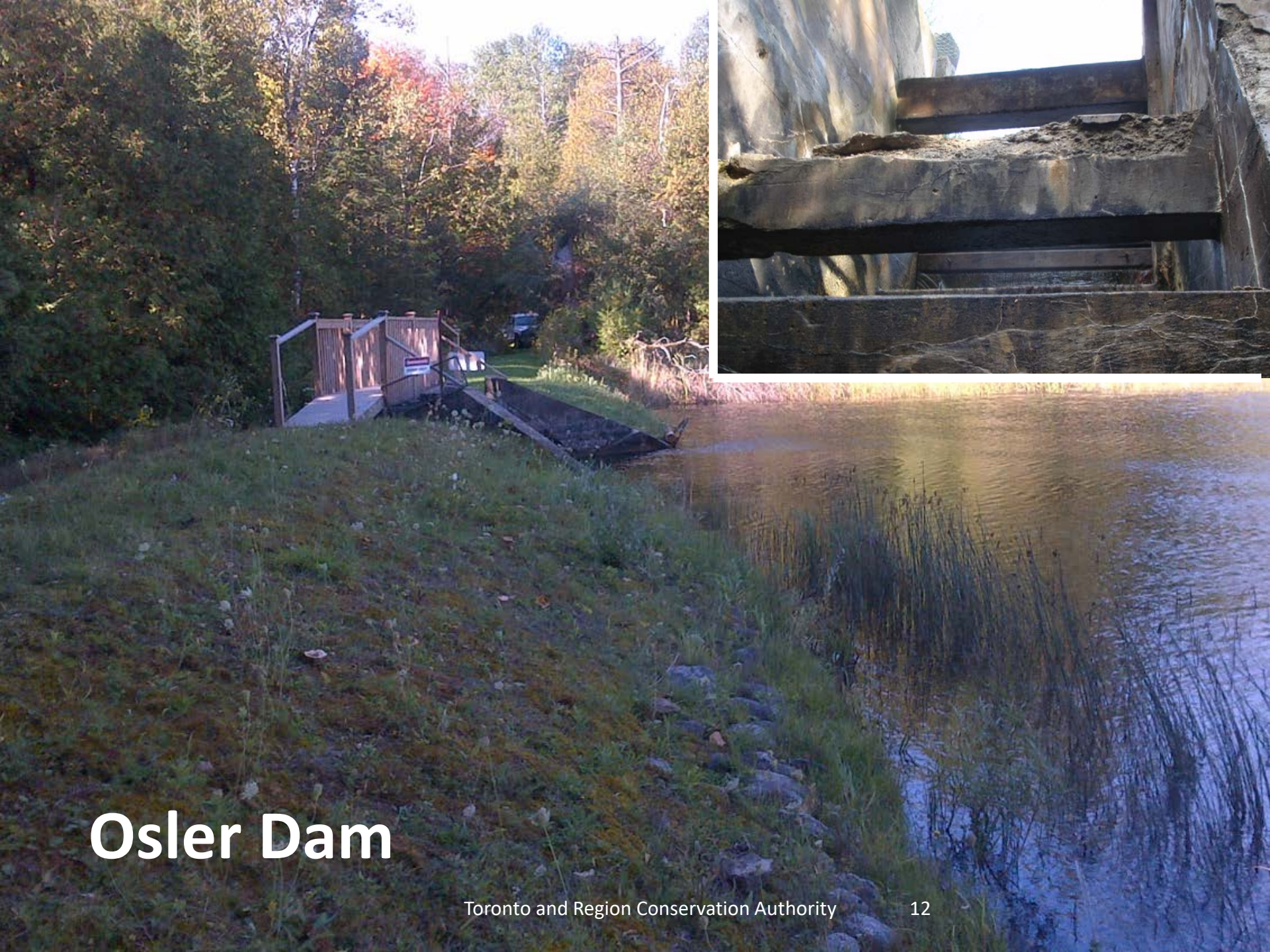
- TRCA has twelve dams
- Five of the dams were built for flood control
- Remaining dams are historical structures built as mills or for recreation
- Condition of dams range from "good" to "very poor"

TRCA Dams

Glen Haffy Dams







Osler Dam


Secord Dam

Palgrave Dam

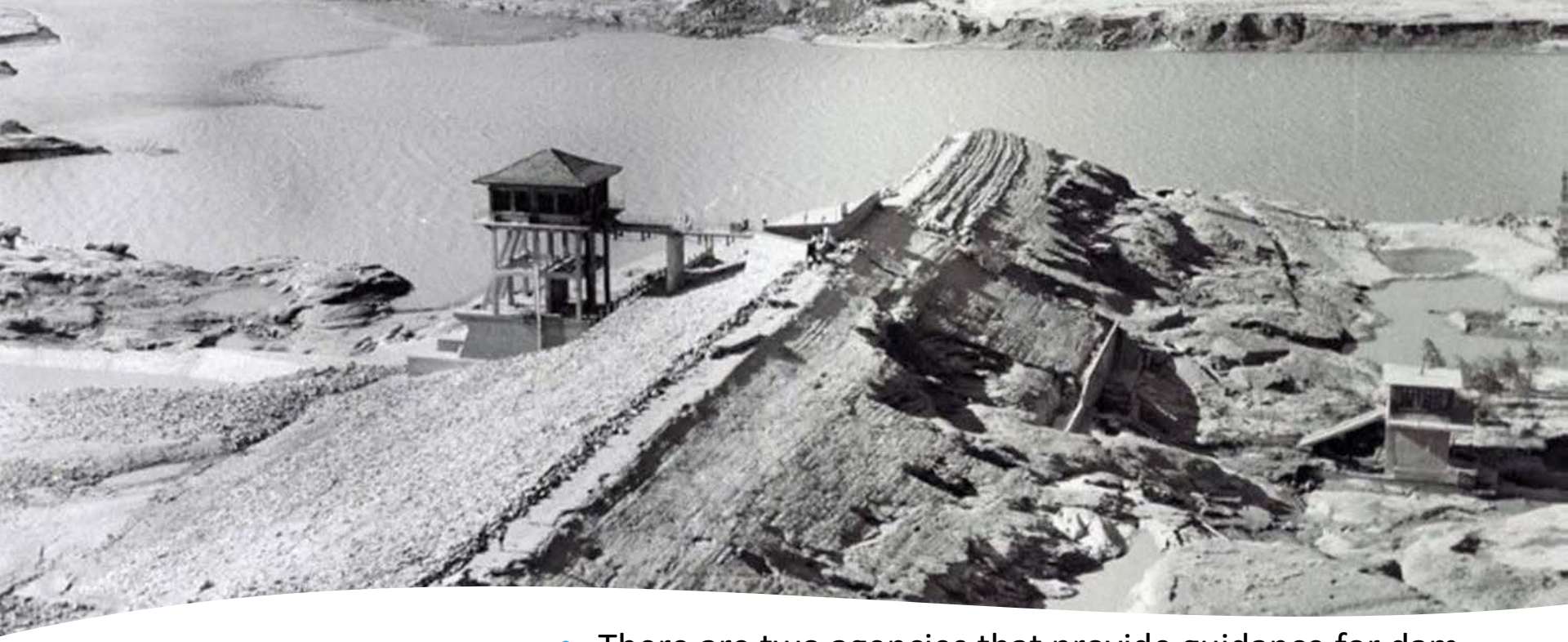

Black Creek Dam

Stouffville Dam


Milne Dam

Claireville Dam

G. Ross Lord Dam

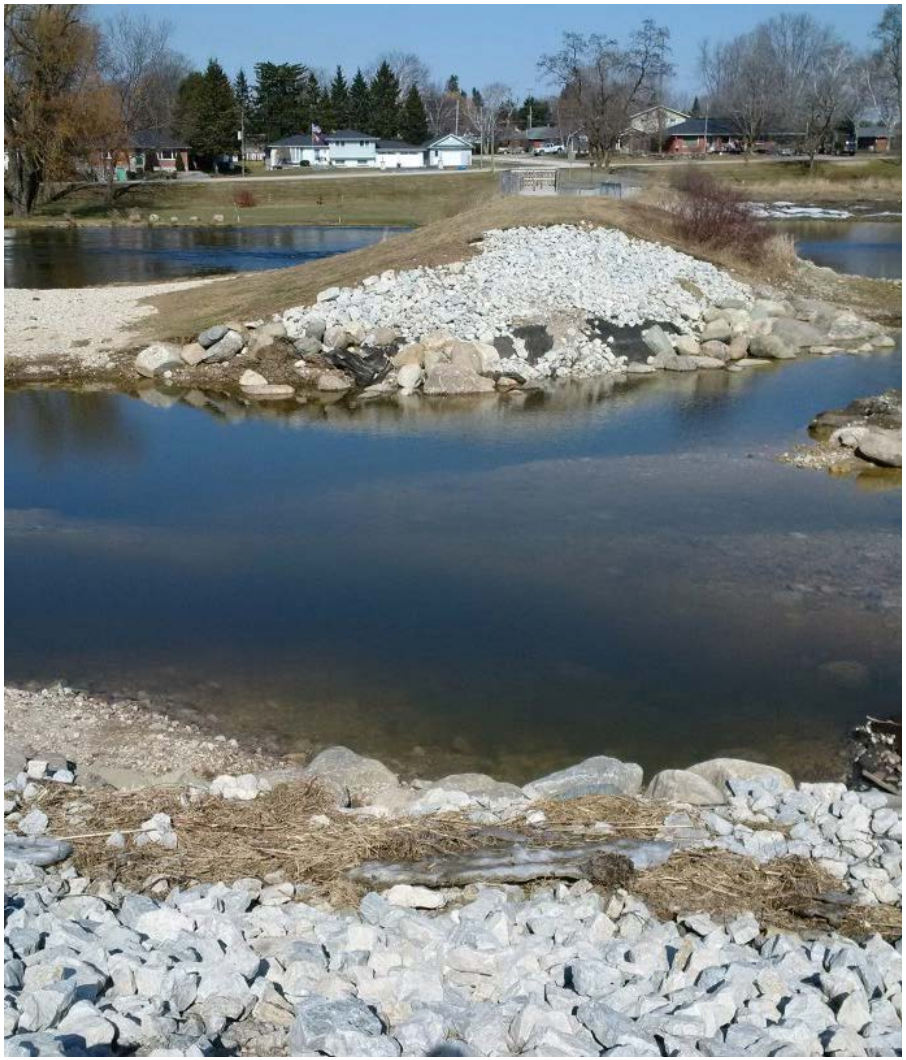


Regulatory Framework for Dams

- There are two agencies that provide guidance for dam safety in Ontario
- MNRF administers the Lakes and Rivers Improvement Act
- Canadian Dam Association (CDA) develops and maintains Dam Safety Principles, Guidelines, and Technical Bulletins for use by dam owners and professionals
- Guidelines are mainly complementary to one another

Lakes and Rivers Improvement Act (LRIA)

- In Ontario, the LRIA regulates activities in and around water including dams
- Dam safety requirements are described in a series of technical bulletins
- MNRF, through the LRIA, reviews and approves new dam construction and dam repairs ensuring structures meet requirements



Canadian Dam Association (CDA)

- The CDA is comprised of volunteer dam safety experts
- Provides principles and guidelines on dam management, design, construction, emergency preparedness, public safety, technical requirements, etc.
- Internationally renowned organization providing support to dam owners worldwide

Dam Safety Reviews

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Hazard Potential Classification (HPC)

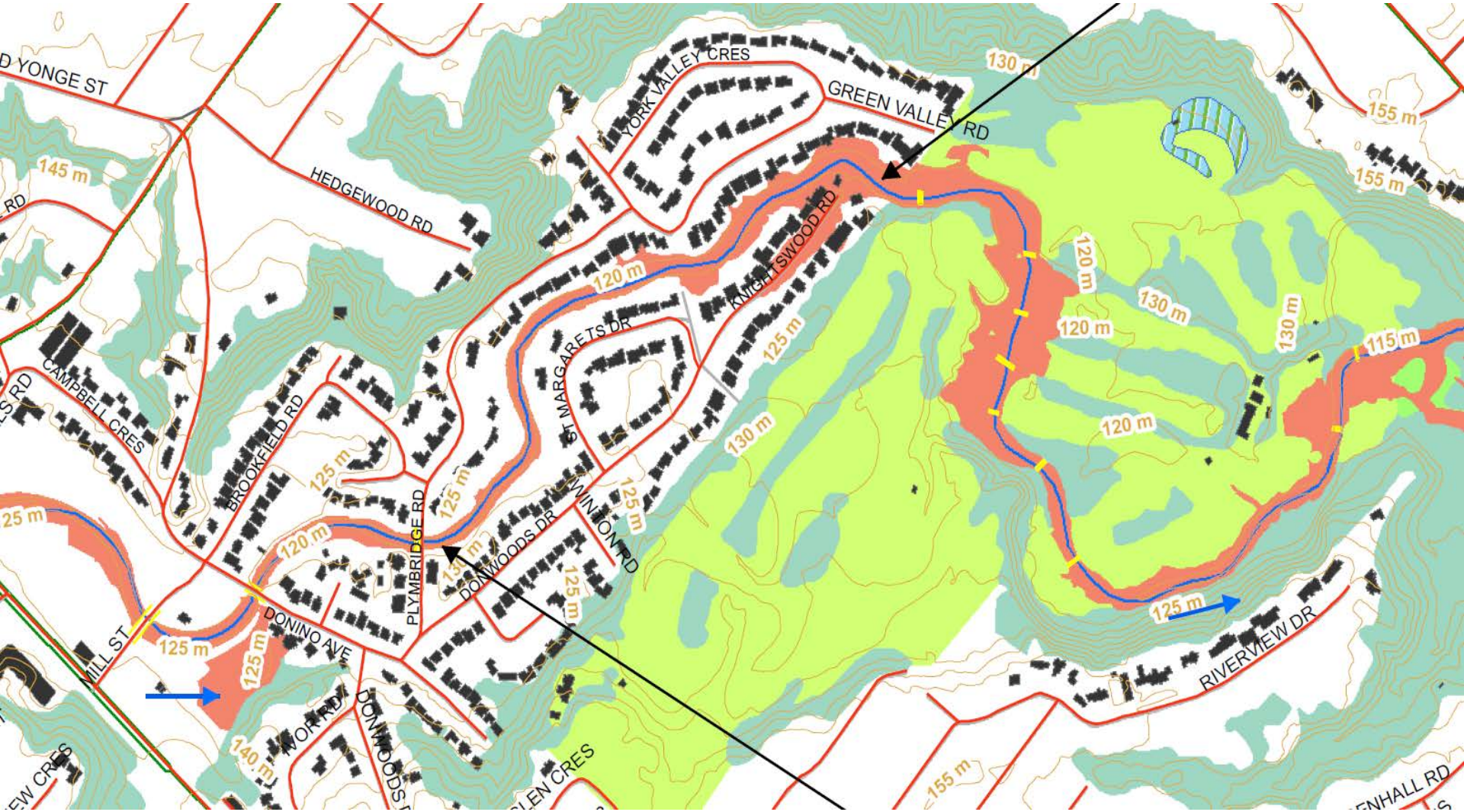
- The HPC is a method for determining the risk associated with a dam
- What happens if the dam fails? (sunny-day and flood failure scenarios)
- Primarily focused on loss of life
- The higher the HPC, the more rigorous the standards for the dam

Hazard Potential Classification under LRIA

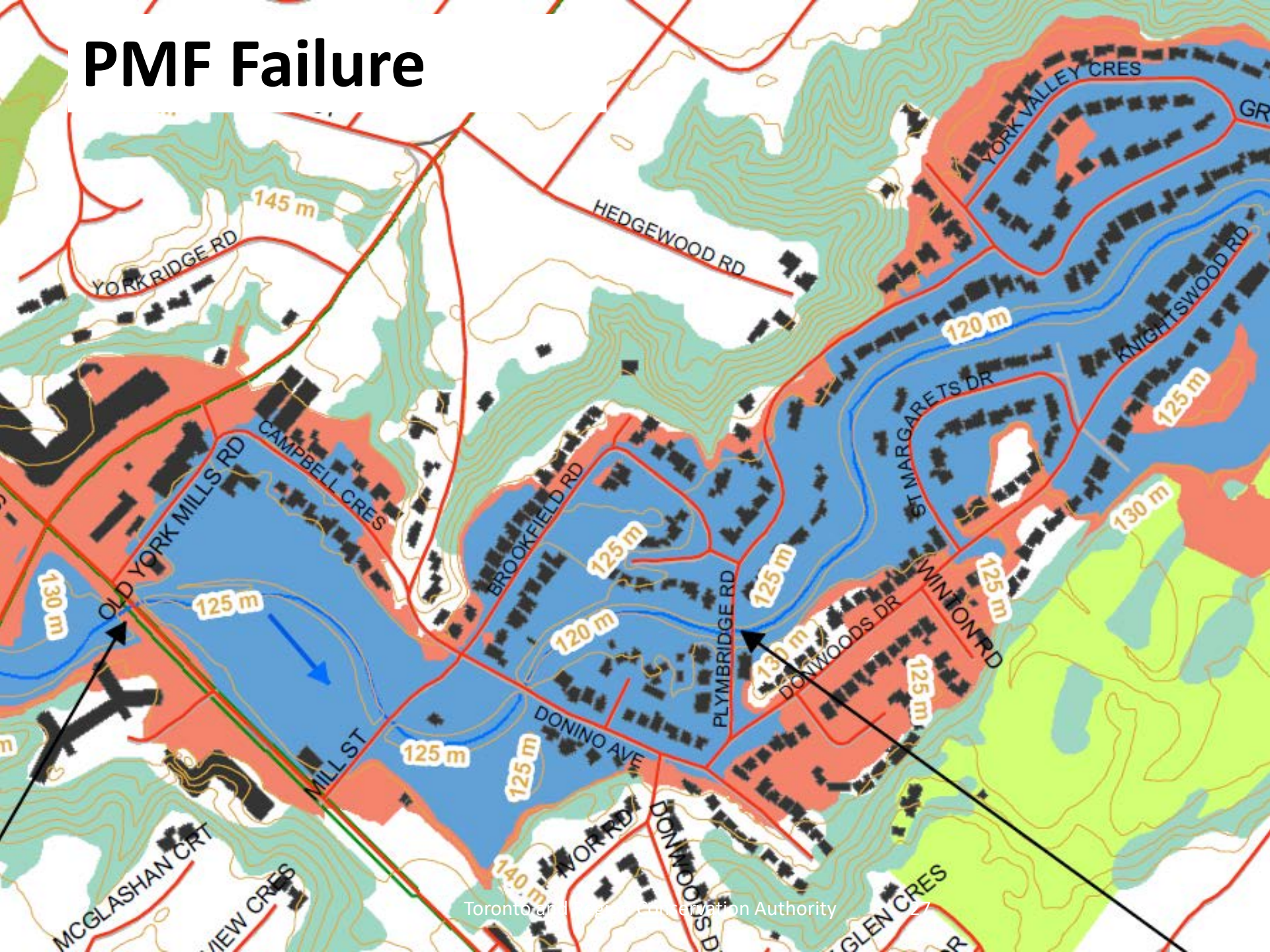
Classification	Loss of Life	Property Damage
Low	0	<$300K
Moderate	0	<$3 Million
High	1-10	<$30 Million
Very High	>10	>$30 Million

Environmental and cultural damages are also considered.

Sunny-day Failure



PMF Failure


145 m
YORK RIDGE RD
HEDGEWOOD RD
YORK VALLEY CRES
120 m
KNIGHTSWOOD RD
ST MARGARETS DR
125 m
130 m
OLD YORK MILLS RD
CAMPBELL CRES
BROOKFIELD RD
125 m
120 m
PLYMBRIDGE RD
DONWOODS DR
WINTON RD
MILL ST
DONINO AVE
MCGLASHAN CRT
GLEN CRES

Dam Safety Management Components

Dam Safety Reviews (DSRs)

- DSRs are a comprehensive engineering assessment of a dam.
- Disciplines include geotechnical, hydrotechnical, structural, electrical, mechanical, etc.
- Report is generated listing all the deficiencies that need to be corrected to bring the dam in to compliance with guidelines and regulations

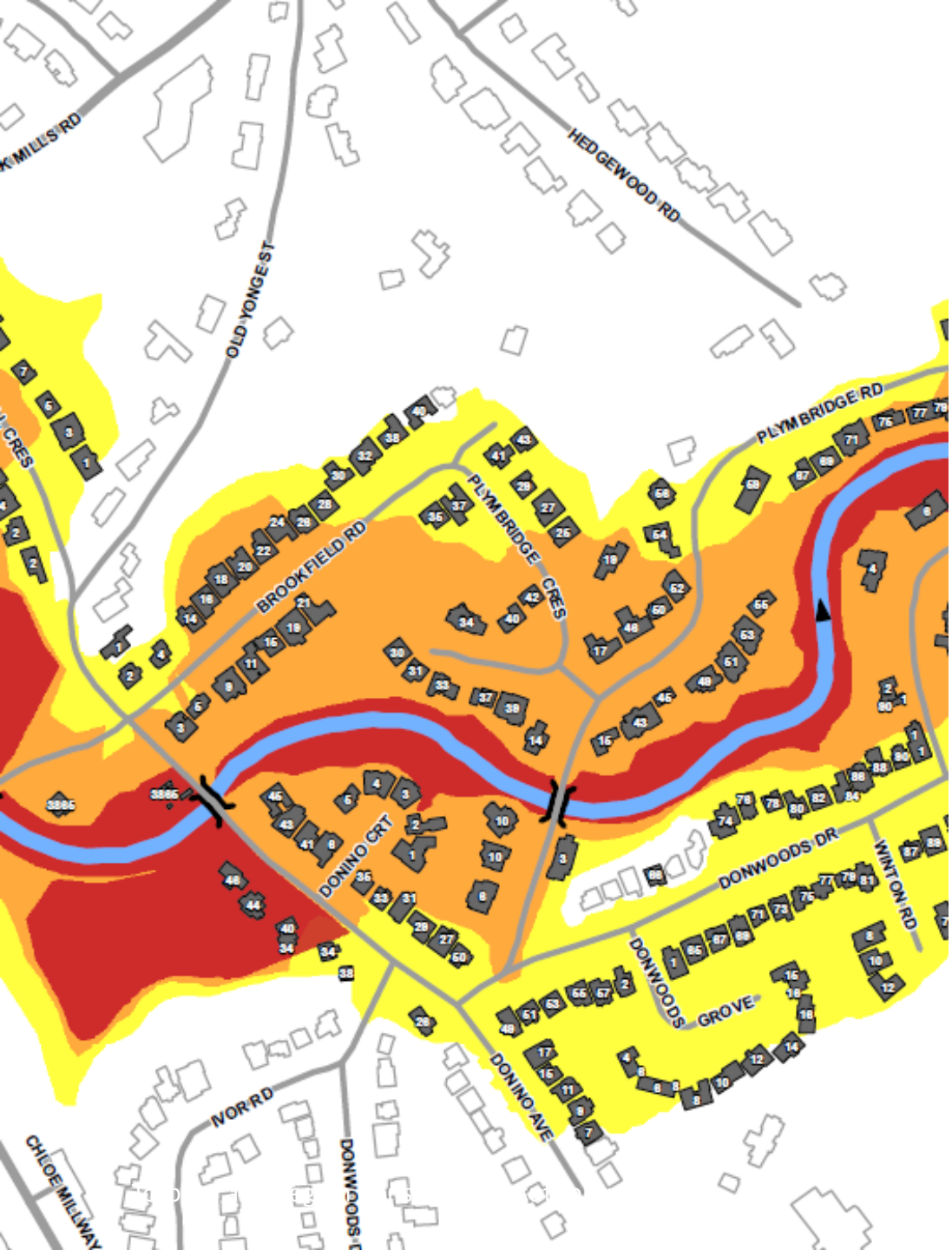
Public Safety Around Dams

- Most fatalities and injuries around dams are not because of dam failures
- They are people interacting with the dam in unsafe ways
- Drownings, falls, electrocutions, etc.
- Dams need to assess risk and implement mitigation – fencing, signage, safety booms, etc.

Water Level Range	Criteria for Rise	Low-Level Gates	Ra
169 m to 172.3 m	No operation	Closed	Closed
172.3 m to 174.3 mm (up to Radial gate Sill)	No operation	Closed (except during drawdown)	Closed
174.3 m to 178.9 m	600 mm/h [150 mm in 15 minutes]	When rate of rise is exceeded in a 15 minute period, gates are opened 300 mm (1 ft.) increment[(1)]	Radial gat 300 mm (1 after the l are fully o
178.9 m to 179.8 m	300 mm/h	As above when rate of rise is exceeded, gates are opened by 300 mm (1 ft.) increment [(1)]	Radial gat 300 mm (1 after the l are fully o
179.8 m to 180.4 m	150 mm/h	As above when rate of rise is exceeded, gates are opened by 300 mm (1 ft.) increment [(1)]	Radial gat 300 mm (1 after the l are fully o
180.4 m to 181.1 m	90 mm/h	As above when rate of rise is exceeded, gates are opened by 300 mm (1 ft.) increment [(1)]	Radial gat 300 mm (1 after the l are fully o
181.1 m to 181.36 m	30 mm/h	As above when rate of rise is exceeded, gates are opened by 300 mm (1 ft.) increment [(1)]	Radial gat 300 mm (1 after the l are fully o

Operation, Maintenance, and Surveillance(OMS) Manuals

- OMS manuals is the document where everything needed to manage the dam is located.
- How to operate
- How to maintain
- How to inspect



Emergency Management

- There are two major components of a dam emergency management program.
- Emergency Preparedness Plans
- Emergency Response Plans

Other Considerations…

Dams are really bad for the environment

- Block the natural migrations of fish and wildlife
- Create sedimentation and erosion
- Thermal impacts to rivers
- Other negative impacts

Dam Decommissioning

- Risk of failure, cost of repairs, obsolete use, environmental considerations may make dam removal the preferred option
- TRCA has removed several dams over the last couple of decades

Health and Safety

- TRCA dams require staff to have advanced health and safety training
- Swift Water Rescue Technicians
- Confined Space Rescue
- Working at Heights
- Advanced equipment requirements

Climate Change

- Climate change may increase the chance of dam failure
- More extreme flood events may make dams vulnerable to overtopping
- Climate change may require more dams be built

How can you help TRCA's Dam Safety Program?

Thank you!

Questions?

Toronto and Region Conservation Authority

Upcoming 2023 ECS Lunch and Learns!

Wednesday, January 25
11:00am-12:00pm

TRCA's Draft Significant Wildlife Habitat

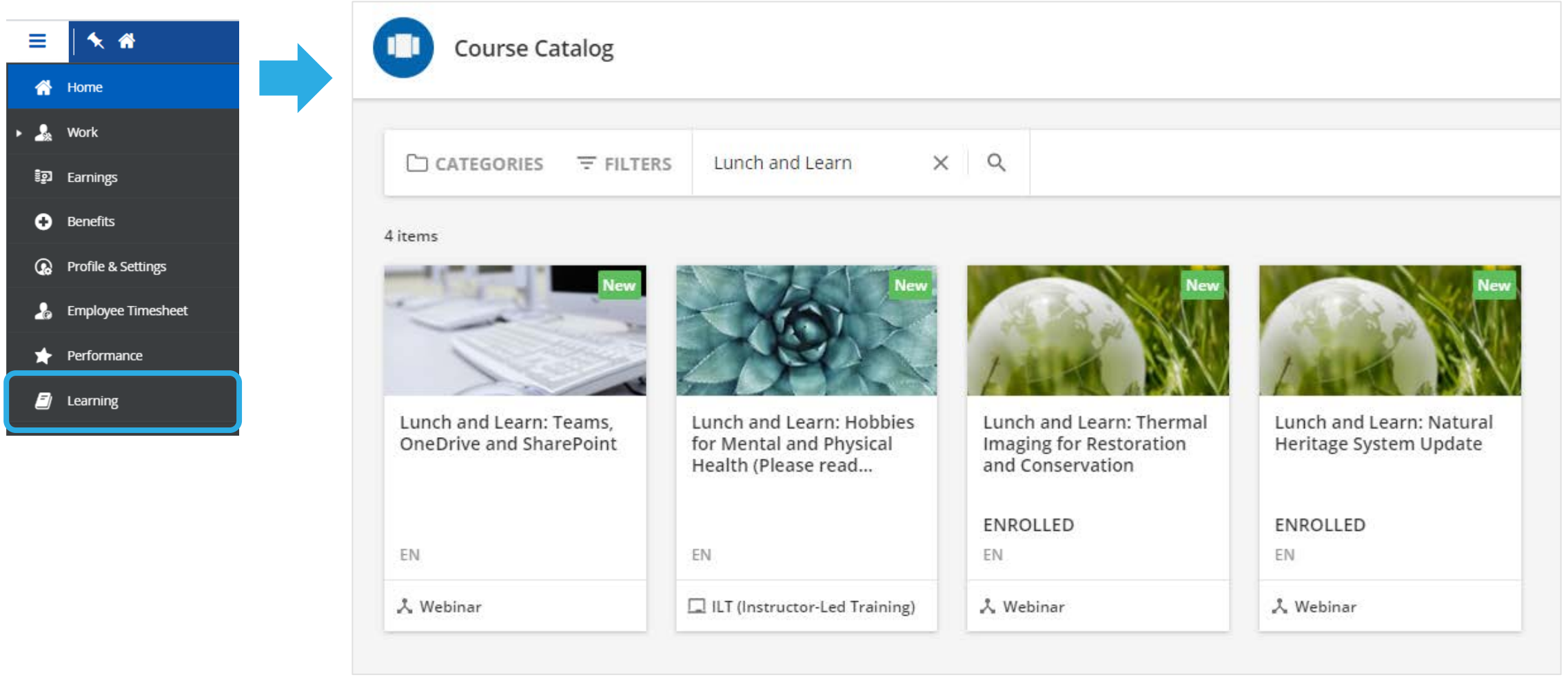
By Lyndsay Cartwright

Wednesday, February 8
11:00am-12:00pm

Ecosystem Service Valuation of Toronto's Parks and Green Spaces

By Aidin Akbari

Learning Management System



Scientific Knowledge Sharing Hub

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Home > Scientific Knowledge Sharing

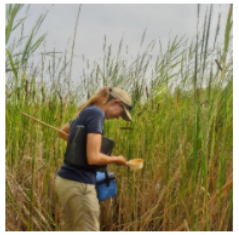
Scientific Knowledge Sharing

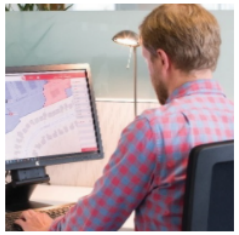
Evidence-based decision making is at the core of what TRCA does. Several of our Business Units engage in generating new scientific knowledge to support watershed management actions and decisions.

It is critical that the knowledge generated is effectively shared.

The Scientific Knowledge Sharing platform is dedicated to sharing the latest scientific knowledge generated by TRCA and our partners. It is a place where staff can learn about and engage in the scientific work TRCA is undertaking.

PLEASE NOTE: *There are several TRCA teams engaged in generating new scientific knowledge. Currently the content on the platform is specific to the Watershed Planning and Ecosystem Science business unit. Additional content from other TRCA teams will be added as the platform develops.*





Knowledge Sharing: Learn More

- Watershed and Ecosystems Reporting Hub
- Environmental Monitoring
- Research and Science Working Group
- TRCA Research Agenda
- Development and Engineering Services Hub Space

SUBMIT A RESOURCE

GET E-MAIL UPDATES

Knowledge Sharing: Latest Updates

Knowledge Sharing – Climate Change Analysis at the Local Scale

April 19, 2021 by Hub Admin Featured

EXPLORE THE RESOURCE LIBRARY

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- Presentations to Partners +
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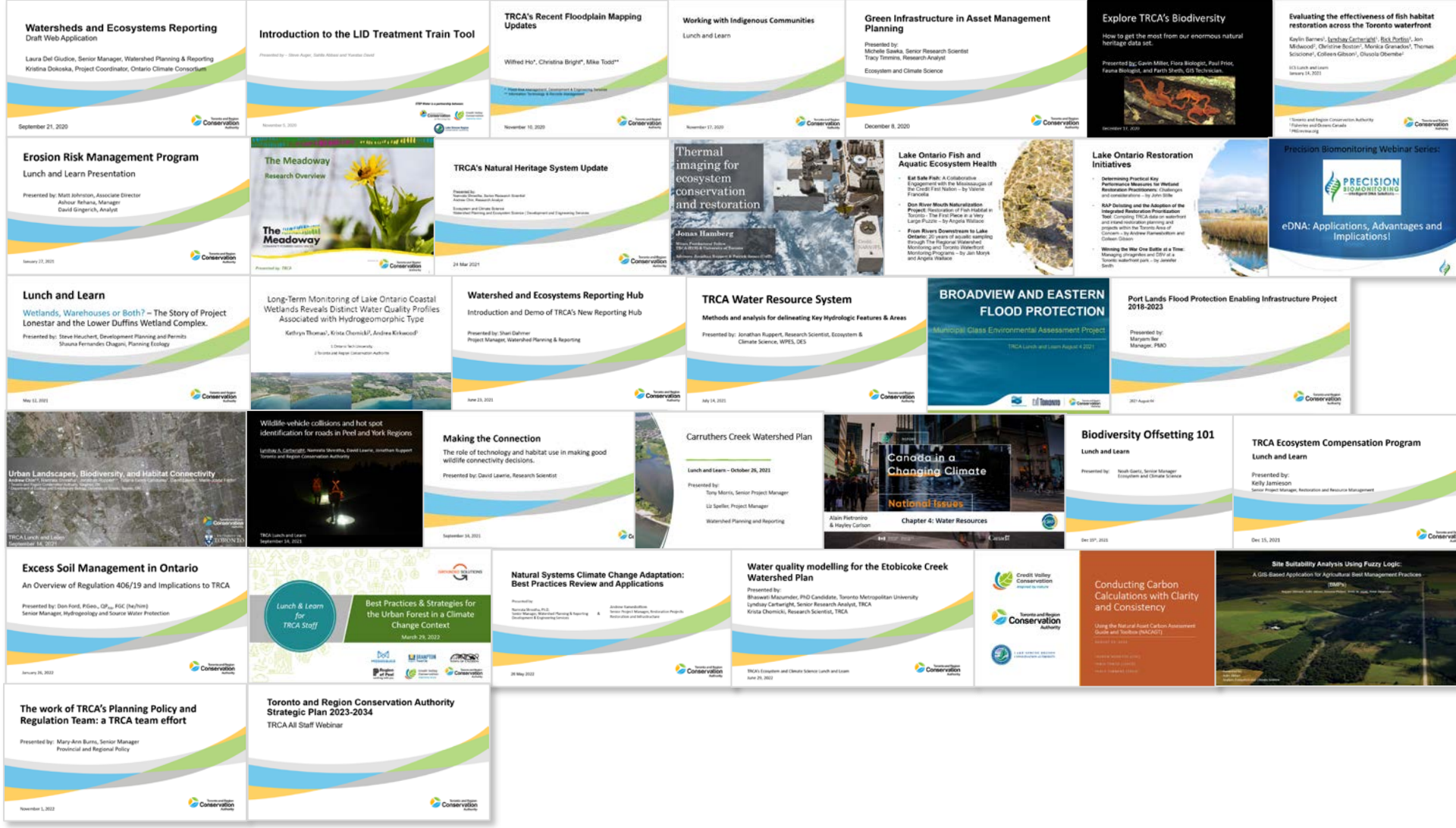
- Technical Protocols & Best Practices +
- Videos +
- Webinars and Lunch & Learns +

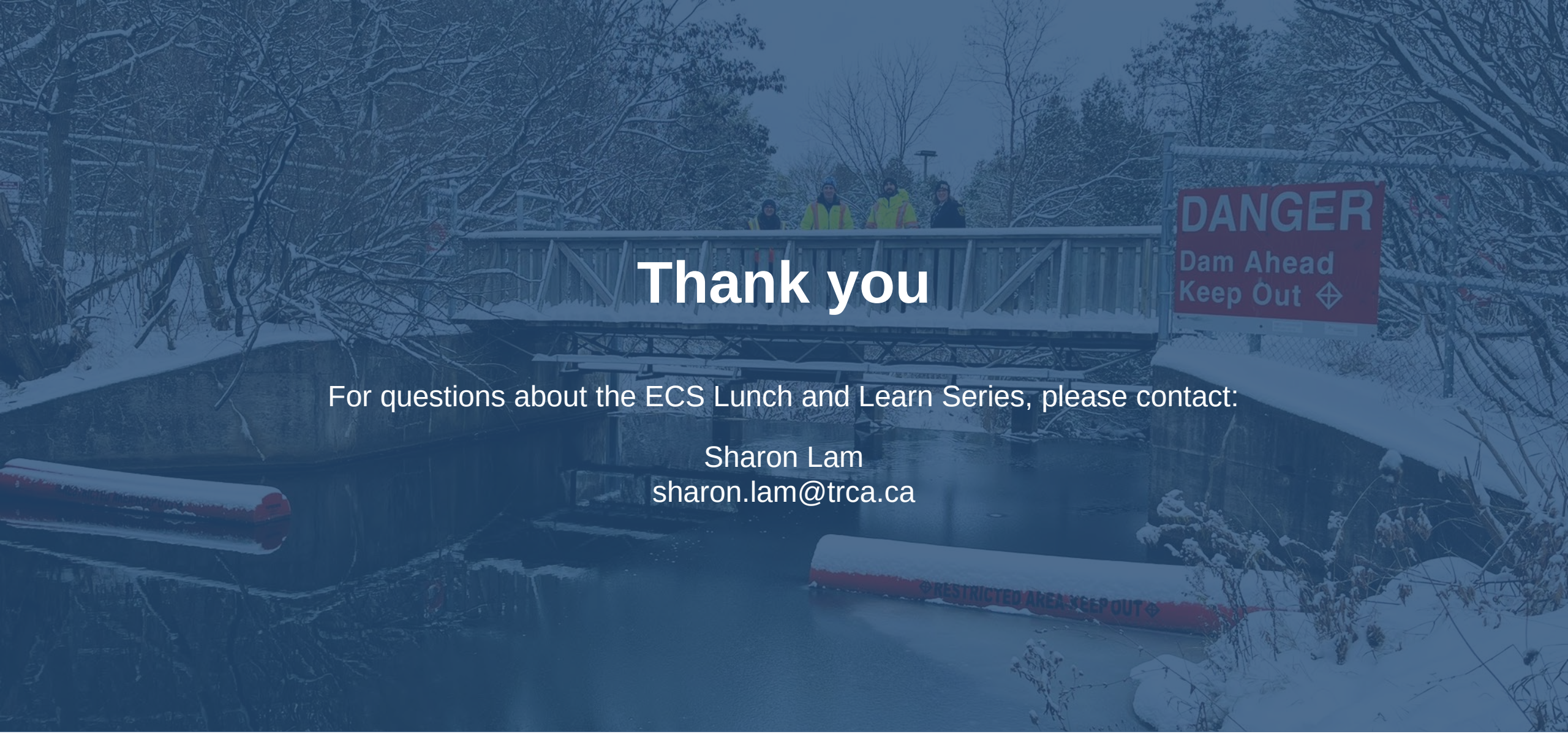
Past Recordings



Climate Change Symposium

WATCH THE SYMPOSIUM VIDEO RECORDING

www.trca.ca/climate-change-symposium/



Thank you

For questions about the ECS Lunch and Learn Series, please contact:

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sharon.lam@trca.ca

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