Full Spectrum Flood Risk Management

TRCA activities to manage riverine and lake-based flood risk

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Presentation Outline

Riverine Flood Risk Management
- The nature of flood risk in our region
- Flood risk management approaches and activities
- New tools and industry thought leadership

Toronto Islands Flood Risk and Mitigation
- Overview of Island flooding – 2017 and 2019
- Highlights from Flood Mitigation Report
Riverine flood risk in TRCA jurisdiction

>14,000 Hectares of floodplain

41 Flood-Vulnerable Clusters

>43,000 Residents affected in the Regulatory storm event

>41,000 Employees affected in the Regulatory storm event

>9,900 Buildings affected in the Regulatory storm event

195km of Impassible road segments in the Regulatory storm event
Flooding can happen any time of year

**Spring**
- **Spring freshet** – accumulation of snow during the winter season can lead to flooding during the early spring, if conditions are right. When temperatures rise, snow melts and turns to runoff.

**Summer**
- **Thunderstorms with significant rainfall** – within a short period of time, intense localized downpours from thunderstorms can produce flash flooding.

**Fall**
- **Seasonal weather systems** – large wet weather such as tropical storms, can last several days. Prolonged and heavy precipitation on top of already saturated soils causes rivers to rise.

**Winter**
- **Ice jams** – when a rise in water level or a thaw in the ice breaks into large chunks, these chunks can become jammed at bridges or other obstructions. The rise will become backed up and can overflow its banks.
**Riverine Flooding** is the partial or complete inundation of the floodplain, caused by **bank overtopping** when the conveyance capacity of rivers and streams is exceeded. It falls under the mandate of Conservation Authorities.

**Urban flooding** is the inundation of a built environment, caused by rainfall overwhelming the capacity of drainage systems, such as storm sewers and roads. Also called pluvial flooding, it falls under the mandate of municipalities.
Who deals with floods?

• Federal and provincial governments: Funding, policy guidance, MNRF direct responsibilities, weather warnings

• Conservation Authorities: Land-use, permitting, flood forecasting and warning (as delegated from the province), etc.

• Municipalities: Primary responsibility for all types of emergency response, including flooding (under Emergency Management and Civil Protection Act); storm drainage infrastructure and urban (pluvial) flooding

• Individuals: Personal preparedness and property-level measures

• Insurance: Financial risk mitigation
No silver bullets…

…but many bronze ones
Prevention and Mitigation

- Floodplain mapping and the engineering studies that support it
  - Hydrology
  - Hydraulics
- Flood Risk Assessment
- Land Use Management
  - Stormwater Management
  - Living City Policies
- Flood Control Infrastructure
  - e.g. G. Ross Lord Dam
- Capital works for flood protection
  - e.g. Port Lands Flood Protection
Flood Risk Assessment and Ranking Project

Overlay and analyze information

Flood Risk

Hazard
- Probability
- Extent
- Buildings / Infrastructure

Exposure
- Population at risk

Vulnerability
- Tangibles
- Intangibles
Flood Risk Assessment and Ranking Project

1. Rockcliffe
2. Jane-Wilson
3. Dixie-Dundas
4. Pickering Village
5. Bolton Core
6. Avondale/Spring Creek
7. Progress Business Park
8. Lower Don
9. Lake Wilcox
10. Markham Industrial (Don Mills Ditch)
Preparedness

• Emergency Management Planning
  • Flood Contingency Plan
  • Municipal emergency plans
  • IMS structure

• Training
  • Flood Duty Officer training
  • IMS training
  • Partnership with municipalities

• Public Education
  • Emergency Preparedness Week
  • Flood preparedness curriculum partnership with Education
  • Flood Risk Outreach Strategy
  • Floodplain information on the web
Flood Response

Conservation Authorities

- **Monitor** watershed and weather conditions and operate a flood forecasting and warning system
- **Issue** Flood Messages
- **Operate** Conservation Authority dams and flood control structures
- Provide **technical advice** to municipalities
- Maintain communications with municipalities and other agencies

Municipal Role

- **Notify** appropriate municipal officials, departments and agencies.
- Determine the appropriate response and **deploy municipal resources** to protect life and property.
- If required, **declare a flood emergency** and implement their emergency response plan.
- **Request provincial assistance** if needed
High flows, unsafe banks, melting ice or other factors that could be dangerous for recreational users such as anglers, canoeists, hikers, children, pets, etc. Flooding is not expected.

Early notice of the potential for flooding based on weather forecasts calling for heavy rain, snow melt, high wind or other conditions that could lead to high runoff, cause ice jams, lakeshore flooding or erosion.

Flooding is possible in specific watercourses or municipalities. Municipalities, emergency services and individual landowners in flood-prone areas should prepare.

Flooding is imminent or already occurring in specific watercourses or municipalities.

A notice that critical high water levels and waves are imminent and/or occurring, which could result in shoreline flooding and/or erosion.
Flood Risk Outreach Program and Site-Specific Flood Response Plans
Focus efforts on priming audiences

- Threat Detected or Notification Received
- Warning Issued
- Warning Received
- Protective Action Initiated

Warning Delays Time
Warning Diffusion Time
Protective Action Initiation Time

No Lead Time
Next Gen. Flood Forecasting Models
Public Outreach to Flood Vulnerable Areas
Site-Specific Flood Response Plans
TRCA Flood Monitoring (Gauging) Network
Flood Forecasting Decision Support System
Recovery

- Impact Tracking
- Post-event analysis
- Data collection
- Lessons learned
Lake Ontario High Levels

Photo credit: Sean Tamblyn
TRCA support for flood response
Leveraging lessons learned from 2017
Long-term mitigation measures
Multi-functional flood protection
Next Steps

• Update Flood Characterization to account for this year’s water levels
• Sort recommendations into short-term, medium-term, and long-term, and confirm whatever additional studies may be required (ie: confirmatory soils studies, Environmental Assessments, etc.)
• Work with City of Toronto to pursue DMAF and other funding sources and to move towards implementation of preferred solutions