Institute for Catastrophic Loss Reduction
Building resilient communities

Institut de Prévention des Sinistres Catastrophiques
Bâtir des communautés résilientes

Overview of ICLR Natural Hazard Mitigation Work

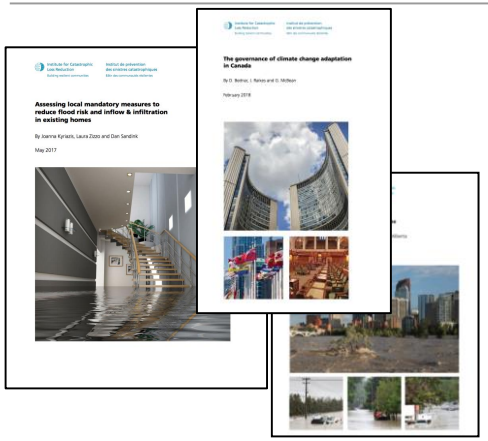
Dan Sandink, *Director of Research*
Clean Air Council, May 25 2018

What is ICLR?

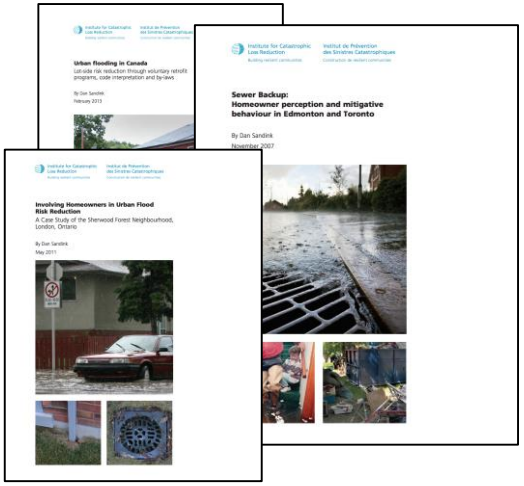
Western Institute for Catastrophic Loss Reduction (ICLR)

- Formed in 1997 by Canadian P&C insurance industry
- Independent, non-profit
  - Board includes insurance CEOs & executives, deans of science, engineering, social science @UWO
- Members insurers represent ~85% of Canadian (federally regulated) P&C insurance market

Research

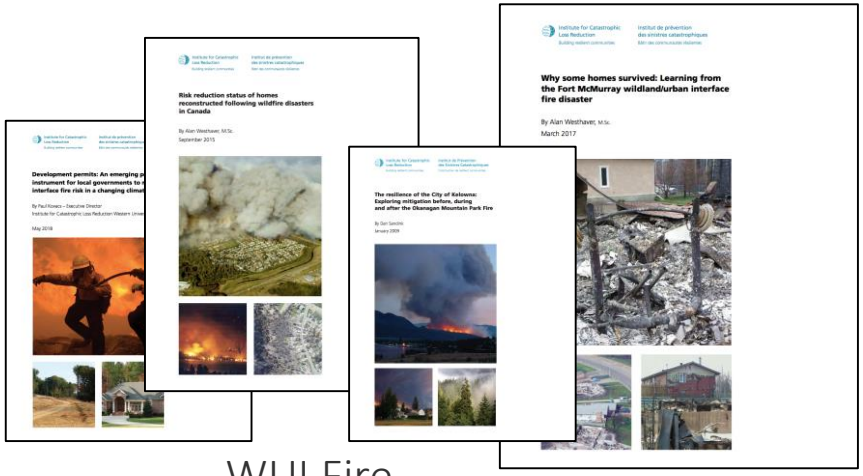


Governance, regulation

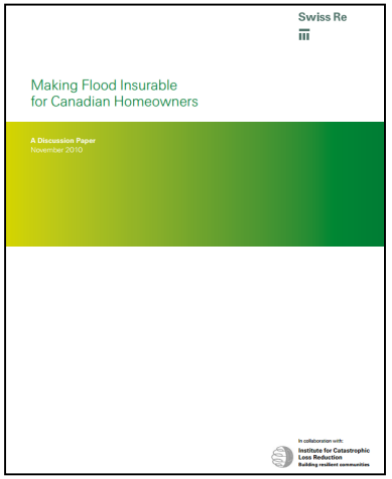


Basement flood, sewer backup

Construction Issues



WUI Fire

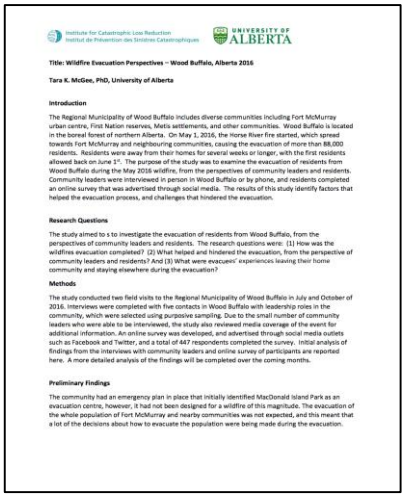


Res. Flood Ins.

Research – *Quick Response Program*

ICLR QUICK RESPONSE PROGRAM

- Travel, research grants
- Social sciences, economics
- Capture perishable data following disaster events
- Published as two-page summaries
- E.g., Fort McMurray, 2017 BC wildland fires, current call for NB and BC flooding



Title: Wildfire Evacuation Perspectives – Wood Buffalo, Alberta 2016

Tara K. McGee, PhD, University of Alberta

Introduction

The Regional Municipality of Wood Buffalo includes diverse communities including Fort McMurray urban centre, First Nation reserves, Metis settlements, and other communities. Wood Buffalo is located in the boreal forest of northern Alberta. On May 1, 2016, the Horse River fire started, which spread towards Fort McMurray and neighbouring communities, causing the evacuation of more than 88,000 residents. Residents were away from their homes for several weeks or longer, with the first residents allowed back on June 1st. The purpose of the study was to examine the evacuation of residents from Wood Buffalo during the May 2016 wildfire, from the perspectives of community leaders and residents. Community leaders were interviewed in person in Wood Buffalo or by phone, and residents completed an online survey that was advertised through social media. The results of this study identify factors that helped the evacuation process, and challenges that hindered the evacuation.

Research Questions

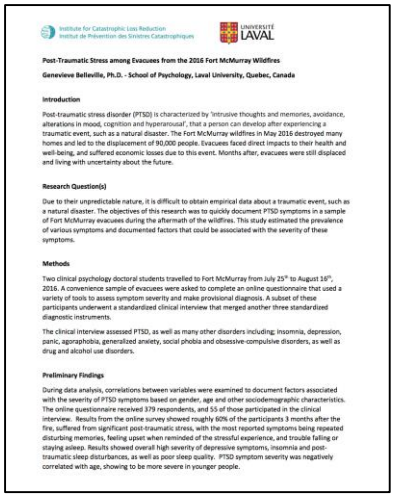
The study aimed to s to investigate the evacuation of residents from Wood Buffalo, from the perspectives of community leaders and residents. The research questions were: (1) How was the wildfires evacuation completed? (2) What helped and hindered the evacuation, from the perspective of community leaders and residents? And (3) What were evacuees' experiences leaving their home community and staying elsewhere during the evacuation?

Methods

The study conducted two field visits to the Regional Municipality of Wood Buffalo in July and October of 2016. Interviews were completed with five contacts in Wood Buffalo with leadership roles in the community, which were selected using purposive sampling. Due to the small number of community leaders who were able to be interviewed, the study also reviewed media coverage of the event for additional information. An online survey was developed, and advertised through social media outlets such as Facebook and Twitter, and a total of 447 respondents completed the survey. Initial analysis of findings from the interviews with community leaders and online survey of participants are reported here. A more detailed analysis of the findings will be completed over the coming months.

Preliminary Findings

The community had an emergency plan in place that initially identified MacDonald Island Park as an evacuation centre, however, it had not been designed for a wildfire of this magnitude. The evacuation of the whole population of Fort McMurray and nearby communities was not expected, and this meant that a lot of the decisions about how to evacuate the population were being made during the evacuation.



Post-Traumatic Stress among Evacuees from the 2016 Fort McMurray Wildfires

Genevieve Belleville, Ph.D. - School of Psychology, Laval University, Quebec, Canada

Introduction

Post-traumatic stress disorder (PTSD) is characterized by 'intrusive thoughts and memories, avoidance, alterations in mood, cognition and hyperarousal', that a person can develop after experiencing a traumatic event, such as a natural disaster. The Fort McMurray wildfires in May 2016 destroyed many homes and led to the displacement of 90,000 people. Evacuees faced direct impacts to their health and well-being, and suffered economic losses due to this event. Months after, evacuees were still displaced and living with uncertainty about the future.

Research Question(s)

Due to their unpredictable nature, it is difficult to obtain empirical data about a traumatic event, such as a natural disaster. The objectives of this research was to quickly document PTSD symptoms in a sample of Fort McMurray evacuees during the aftermath of the wildfires. This study estimated the prevalence of various symptoms and documented factors that could be associated with the severity of these symptoms.

Methods

Two clinical psychology doctoral students travelled to Fort McMurray from July 25th to August 16th, 2016. A convenience sample of evacuees were asked to complete an online questionnaire that used a variety of tools to assess symptom severity and make provisional diagnosis. A subset of these participants underwent a standardized clinical interview that merged another three standardized diagnostic instruments.

The clinical interview assessed PTSD, as well as many other disorders including; insomnia, depression, panic, agoraphobia, generalized anxiety, social phobia and obsessive-compulsive disorders; as well as drug and alcohol use disorders.

Preliminary Findings

During data analysis, correlations between variables were examined to document factors associated with the severity of PTSD symptoms based on gender, age and other sociodemographic characteristics. The online questionnaire received 379 respondents, and 55 of those participated in the clinical interview. Results from the online survey showed roughly 60% of the participants 3 months after the fire, suffered from significant post-traumatic stress, with the most reported symptoms being repeated disturbing memories, feeling upset when reminded of the stressful experience, and trouble falling or staying asleep. Results showed overall high severity of depressive symptoms, insomnia and post-traumatic sleep disturbances, as well as poor sleep quality. PTSD symptom severity was negatively correlated with age, showing to be more severe in younger people.

Rapid Impact Assessment of Fort McMurray Wildfire

The research team:
Dr. Rafat Alam, Assistant Professor, Economics, MacEwan University
Dr. Shahidul Islam, Associate Professor, Economics, MacEwan University
Eric Mosely, Alumnus, Economics, MacEwan University
Sean Thomas, Student, Economics, MacEwan University
Virginia Dowdell, Research Associate and Current Student, Communication, MacEwan University
Dawn Dool, Ministry of Environment, Government of Alberta, and Alumnus, MacEwan University

Introduction

In May 2016, a wildfire burned through Fort McMurray resulting in unprecedented loss in terms of homes destroyed by fire and other damages. Assessing the economic impact of wildfire is often complicated. There is value in addressing the impact from several dimensions. This may include vegetation burned, property destroyed, lives lost, and damage to the ecosystem. Some losses can readily be measured in dollars while others are difficult to measure.

Research Questions

This research seeks to quantify the immediate, medium-term, and longer-term economic, environmental, health, human, and ecosystem impacts of the Fort McMurray wildfire at the local, provincial, and federal level. The impacts are broadly categorized as direct and indirect impacts. The study also seeks to identify any positive impacts, and uncertainties with respect to the recovery process.

Methods

Estimates of loss and damage is derived from four sources: Published data from agencies including Statistics Canada, Government of Alberta, the Municipality of Wood Buffalo, and other organizations; municipal property data and interviews with municipal and provincial officials; estimates based on application of the existing literature; and, statements reported in the media.

Preliminary findings

The assessment provides a detailed examination of initial data available and also sets out assumptions that are used to estimate the loss and damage from the wildfire in Fort McMurray. The immediate direct impacts include: private insured and uninsured property and other asset losses; economic, financial, and fiscal impacts; evacuation and rehabilitation impacts; local and provincial government expenditure and revenue impacts; labour market impacts; production disruption impacts; charitable donation impacts; and housing and rental market impacts. Long-term direct impacts are local and provincial government expenditure impacts, labour market impacts, and reconstruction phase impacts. The indirect impacts include human health, mental health, and other social, institutional, and non-market impacts. Most of the indirect impacts are long-term, hardly quantifiable and qualitative in nature.

The study estimates a total direct and indirect cost of $10.9 billion for Canada. This is a partial estimate based on costs that can be quantified at this time. The total includes immediate direct net cost of $7.91 billion and indirect cost of $3.3 billion for Alberta. Total cost for Alberta is $9.4 billion and after adding the federal government expenditure, total cost for Canada is $10.9 billion.

Rebuilding Fort McMurray: A snapshot of the role planners can play in the rebuilding efforts

Leith Deacon, PhD, University of Alberta

Introduction

On May 1, 2016, a wildfire began approximately 15 kilometers southwest of Fort McMurray, Alberta, the urban service centre of the Regional Municipality of Wood Buffalo (RMWB). By May 3, the wildfire was responsible for destroying more than 2,400 homes and buildings, causing the largest wildfire evacuation in Alberta's history.

This research contributes to a broader effort by the principal investigator (PI) to consider two general topics: (1) what are the infrastructural needs of people living in a resource based community that will provide them with high satisfaction and encourage the resiliency of the community?; (2) how do answers to this question provide insight into how to address the problematic relationship(s) between resource extraction, values and knowledge, community well-being, and resiliency?

Over the previous 18 months, the PI had completed 15 case-studies of communities from Alberta and British Columbia, interviewing a total of 121 individuals including residents, politicians, decision-makers and other stakeholders. Thirty-three of the 121 were located in Fort McMurray.

Research Questions

The primary research question for this project is: Given the economic importance of Fort McMurray as the administrative centre for the Athabasca Oil Sands development and as the home of over 85,000 people, what role can planners have in preparing Fort McMurray and how can its residents utilise the events of the recent wildfire and the subsequent destruction as an opportunity to redevelop their community into a stronger and more resilient place for the future? This research question was addressed by considering three objectives:

1. Theoretical: to investigate how Fort McMurray and its residents respond to the experience of the fire and evacuation.

2. Practical: to work with municipal spokespersons and local residents/community groups during the immediate redevelopment process to identify areas of concern about the long-term sustainability and resiliency of the region.

3. Empirical: to gain experience and understanding of community response. In particular, how community planning can be utilized to best manage the opportunities for community redevelopment.

Methods

Methods and organization of the research fall into three main areas:

Academic

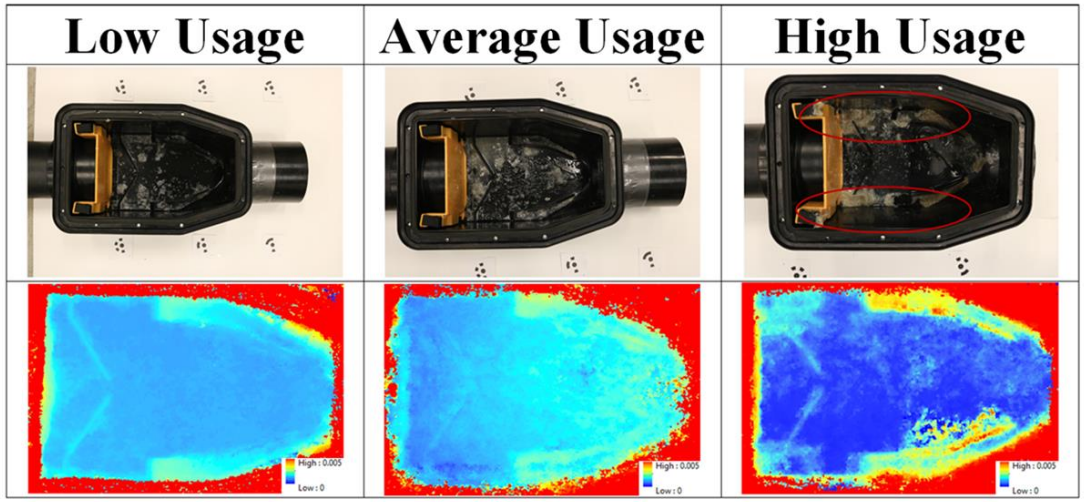
Flood protection technologies

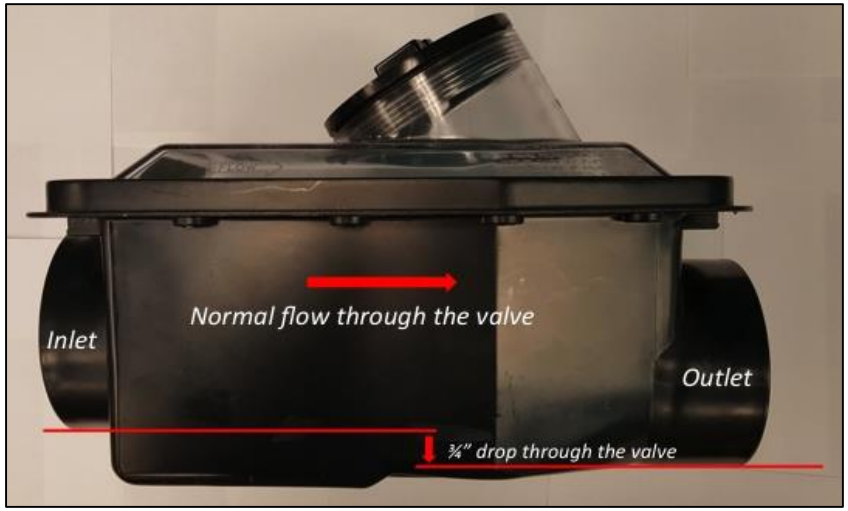
- Project 1: Physical lab, testing protocols (Prof. A. Binns) (2016)
- Project 2: Accumulation of debris, physical and mathematical modelling (Prof. E. McBean) (2016-2017)
- Project 3: NSERC CRD – 4 years (2017-2021)
  - Basement flood protection technology
  - BWVs, sumps, LID

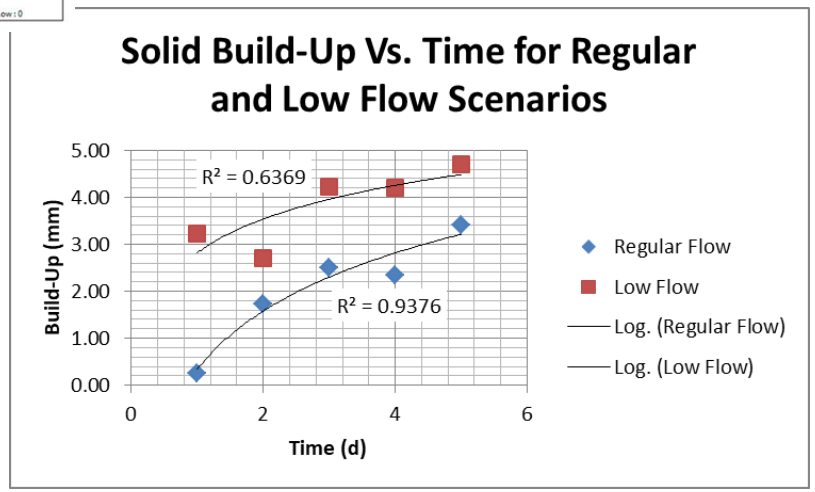
NSERC CRSNG GUELPH ENGINEERING Western UNIVERSITY · CANADA Institute for Catastrophic Loss Reduction

BWV performance

Fullport Valve Solid Deposition over Five Days







GUELPH ENGINEERING

NSERC CRSNG

S. Dusolt, 2018

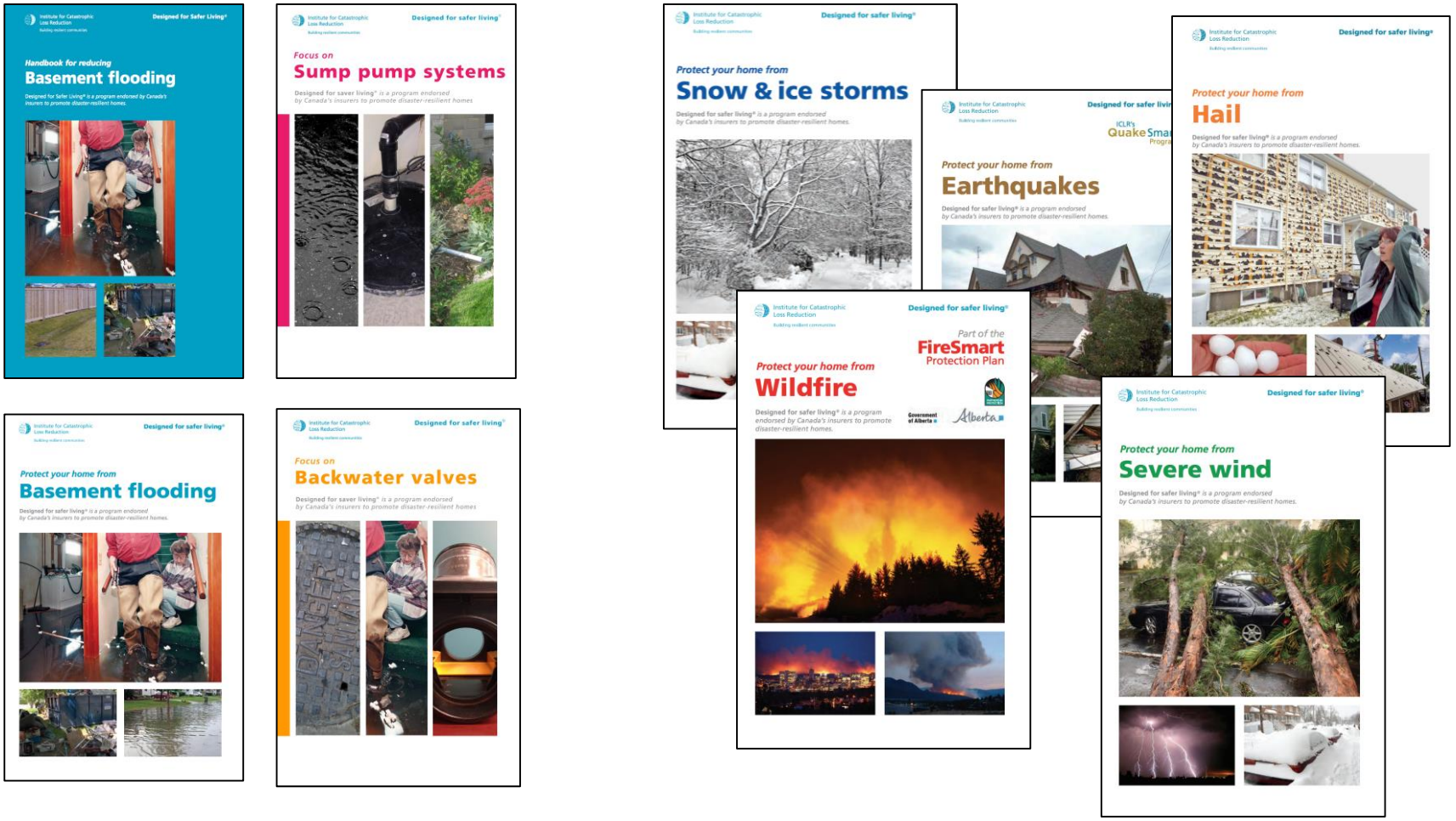
Scenarios

Flow	Valve condition	Lateral slope	Lateral condition	Wastewater material
Normal flow	Normal (well-maintained)	Recommended grade (2%)	Ideal condition of lateral pipe	Normal domestic grey and black water
Sloshing effect	Un-maintained (e.g., presence of biofilm, debris, etc.)	Steep grade (> 2%)	Root blockages	Presence of brine from water softener
Hydraulic high pressure jet flow (e.g., sewer flushing)	Improperly maintained (e.g., improperly tightened clean-out)	No grade	Standing water	Presence of non-disposable materials (e.g., baby wipes, Q-tips, etc.)
	Dried out (after prolonged period of non-use)	Reverse grade		Presence of excessive cooking materials (e.g., cooking oils)

Irwin, Howlett, Binns, Sandink, 2018. In press. Mitigation of basement flooding due to sewer backup: overview and experimental approach to investigate the performance of backwater valves. *Natural Hazards Review.*

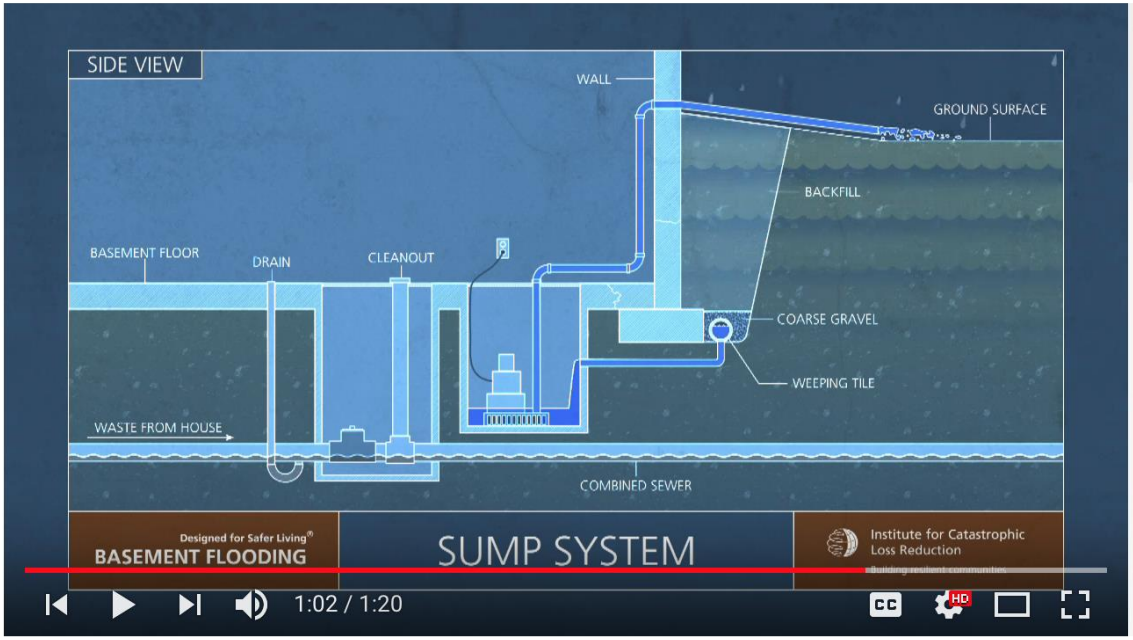
Consumer & industry education

- Retrofit orientation (English and French):



Videos, animations

- Basement flood protection videos, animations, Friday Forums, etc.



ICLR narrated animations on basement flooding

ICLRinfo - 6 / 6

3 **3 ICLR narrated animation: Infiltration flooding** 0:15
ICLRinfo

4 **4 ICLR narrated animation: Backwater valves** 0:22
ICLRinfo

5 **5 ICLR narrated animation: Backwater valves and disconnecting foundation** 0:41
ICLRinfo

▶ **6 ICLR narrated animation: Weeping tiles and sump pumps** 1:21
ICLRinfo

6 ICLR narrated animation: Weeping tiles and sump pumps

29,768 views LIKE DISLIKE SHARE

Why Interior Drain Tile for Basement Waterproofing?

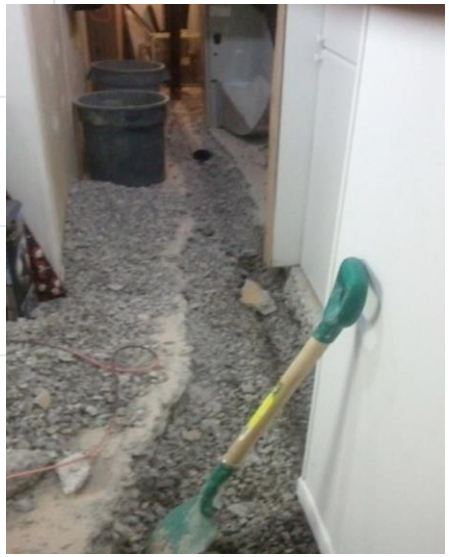
Standard Water Control Systems

Consumer & industry education

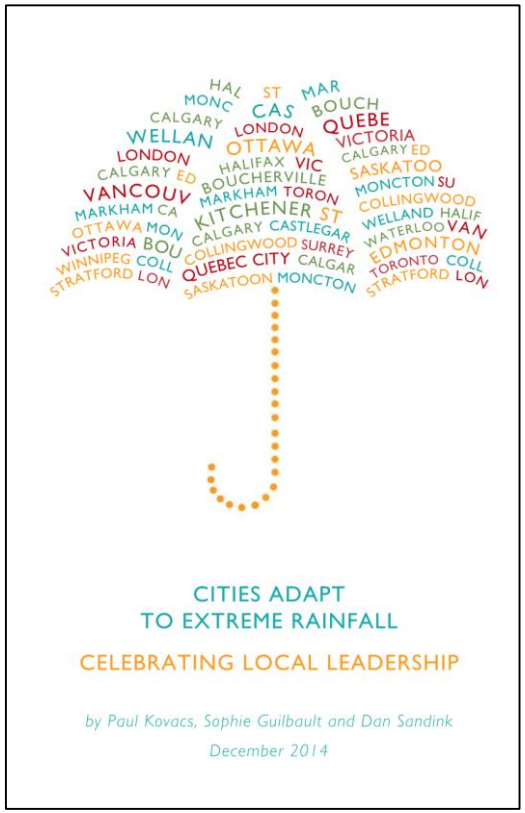
www.backwatervalveinstallation.com

- Reports are that BWVs *frequently* installed incorrectly (retrofit)
- Increased maintenance, increased risk of failure
- Lack of knowledge in contracting industry
- What are the steps for a “good” installation?

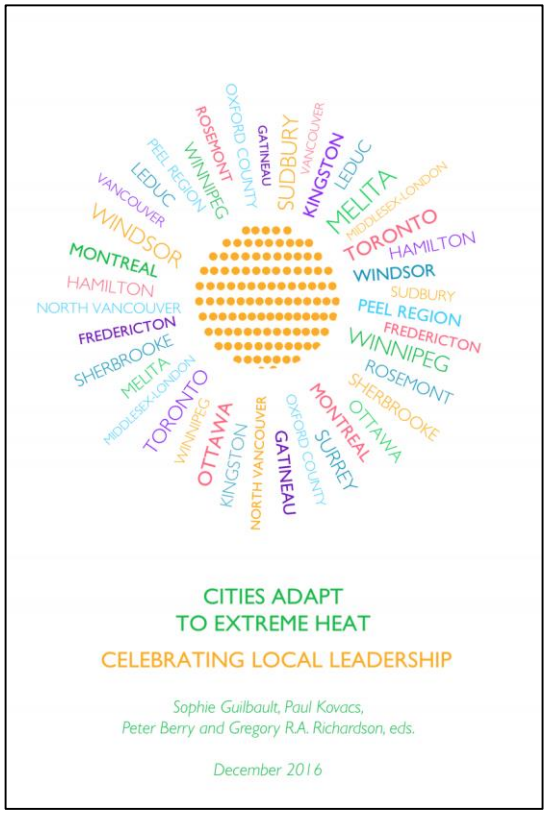
1. Getting the right information
2. Selecting a plumber/contractor ?
3. Plumbing investigation ?
4. Choosing the right valve ?
5. Grading of the valve
6. Checking the installation
7. Maintaining your backwater valve



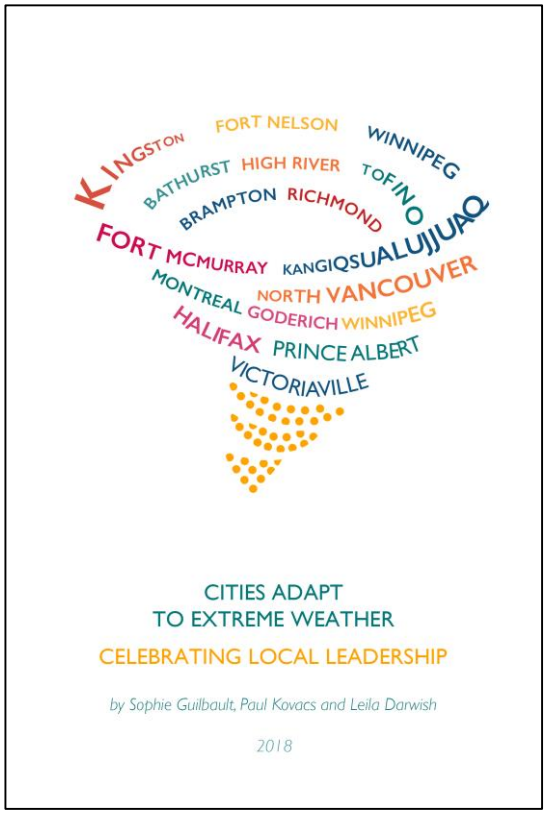
Cities Adapt – case studies



Extreme rain/basement flood



Extreme heat



Extreme weather/emergency management (TBC)

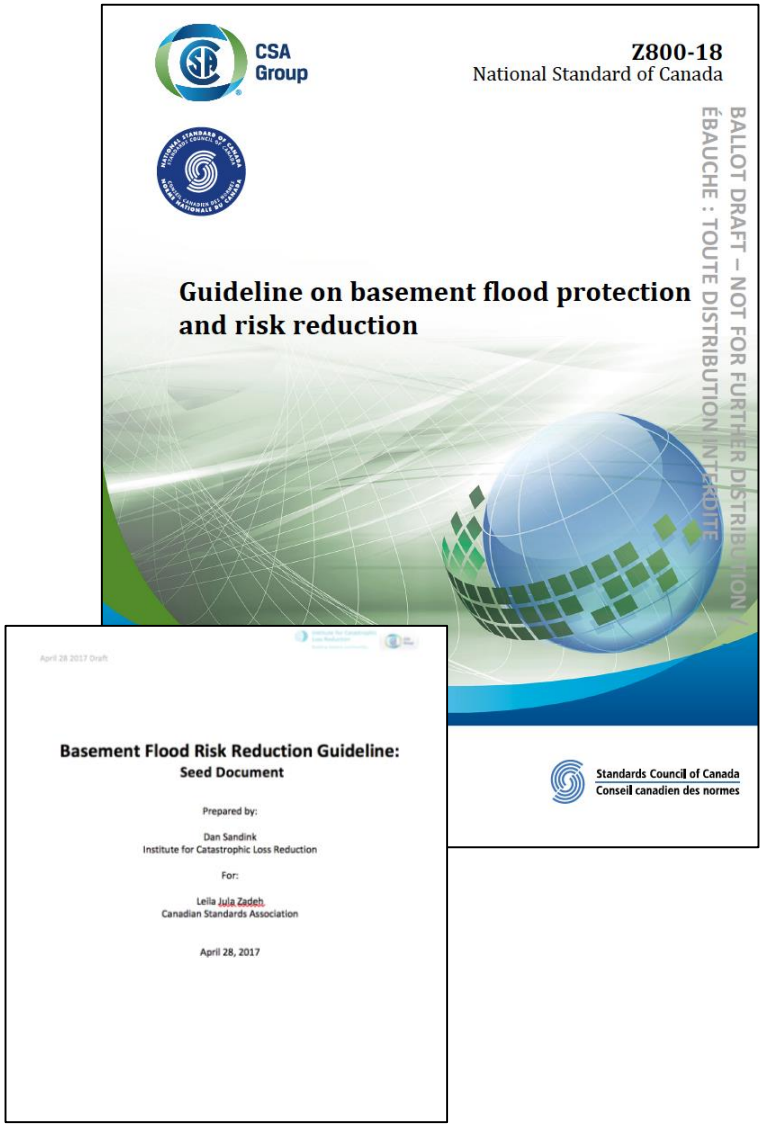
Application

- Insurers Rebuild Stronger
  - Has translated into $1,000 insurance subsidies for basement flood mitigation (starting with Aviva, now wider adoption)

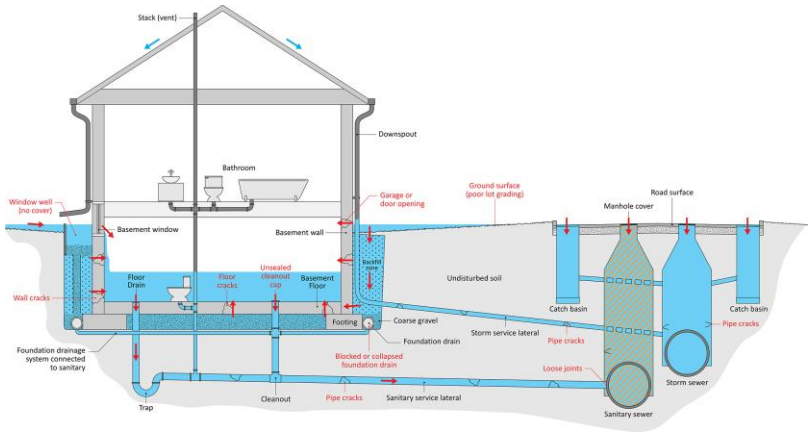
- Construction Codes, Guidance, Standards

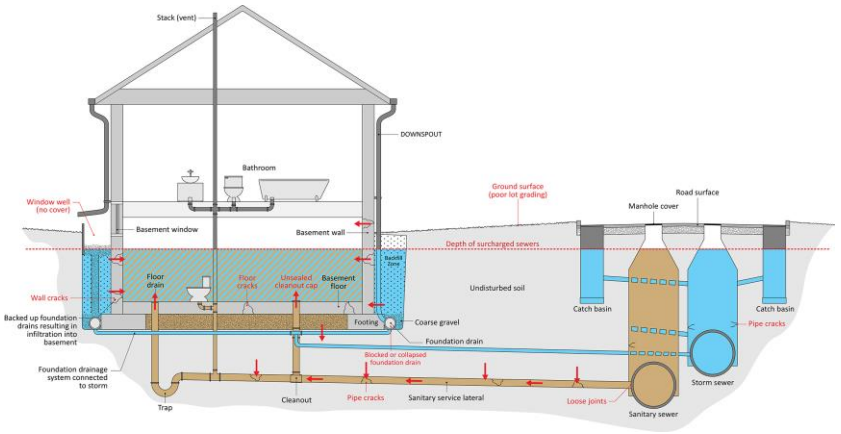
CSA basement flood protection guideline

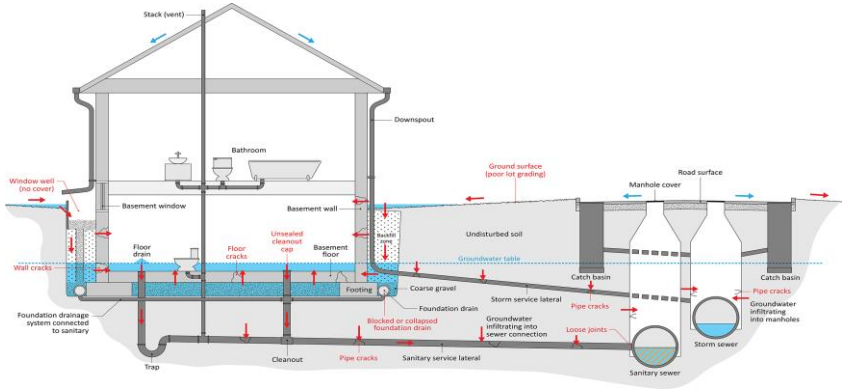
- Focussed on extreme, short-duration rainfall related flooding in urban areas
- 25 TC participants
- Norton Engineering, ICLR serve as chair, vice-chair
- Z800-18 – currently in balloting/voting phase



Overview of content







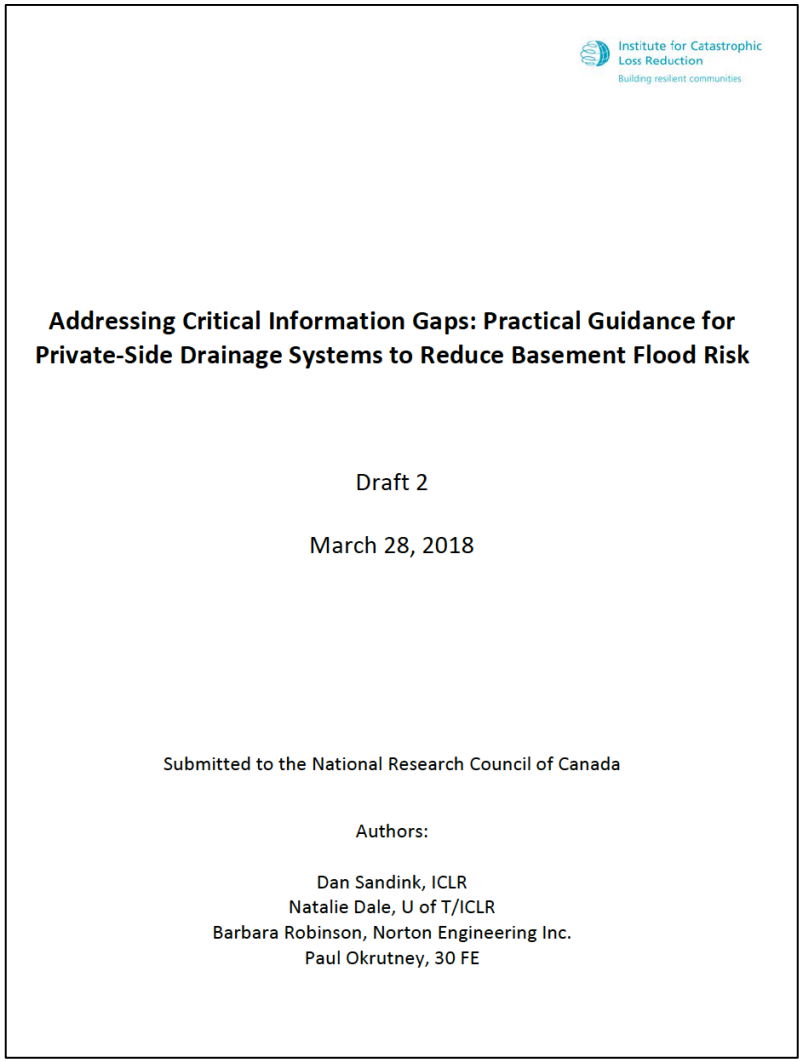
Failure of sump systems, failure of lateral connections, flooding associated with improper installation, operation, maintenance of flood protection devices, etc.

Climate Resilience Standard for New Houses

- **Basement flood**
- Wind
- Heat (heat-health)

Addressing Critical Information Gaps

- Seed document on “critical information gaps”
- Gaps in information identified based on Durham Standard, CSA Z800-18 development
- Development of NRC Technical Committee, additional national guidance



Institute for Catastrophic Loss Reduction
Building resilient communities

Addressing Critical Information Gaps: Practical Guidance for Private-Side Drainage Systems to Reduce Basement Flood Risk

Draft 2

March 28, 2018

Submitted to the National Research Council of Canada

Authors:

Dan Sandink, ICLR
Natalie Dale, U of T/ICLR
Barbara Robinson, Norton Engineering Inc.
Paul Okrutney, 30 FE

Wind Resilience Seed Document

Institute for Catastrophic Loss Reduction
Building resilient communities

Standards Council of Canada
Conseil canadien des normes

Western
UNIVERSITY · CANADA

- Wind is second most significant cause of insured loss in Canada (after basement flood)
- Based on Durham Standard
- Wind resistance measures – low-rise residential (i.e., NBCC Part 9)
- Continuous vertical load path

Photo: G. Kopp

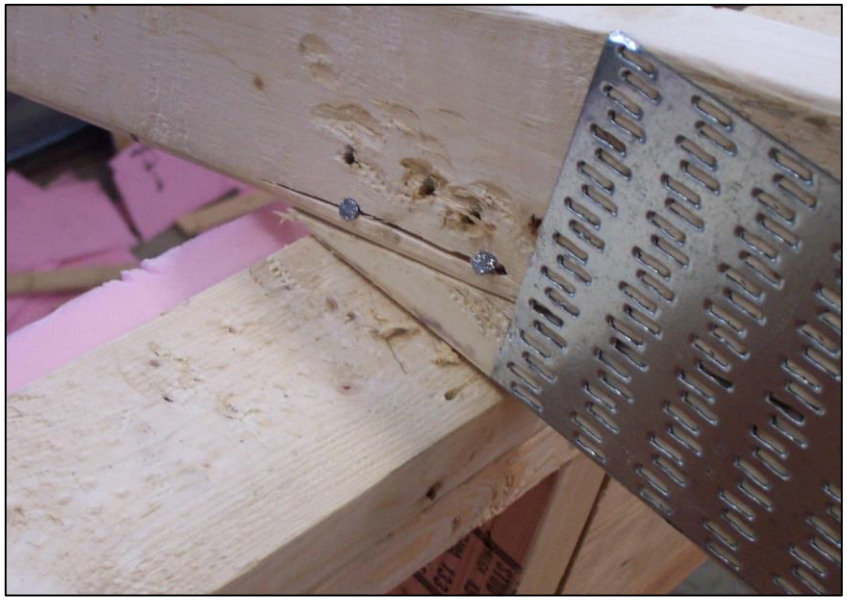
Input

- Post-tornado damage investigations in Canada/Ontario
- Full-scale testing facility (3LP)
- Boundary Layer Wind Tunnel
- Construction code change requests: OBC, NBC
- Co-authored with: Prof. Greg Kopp, UWO (Durham Standard and SCC)

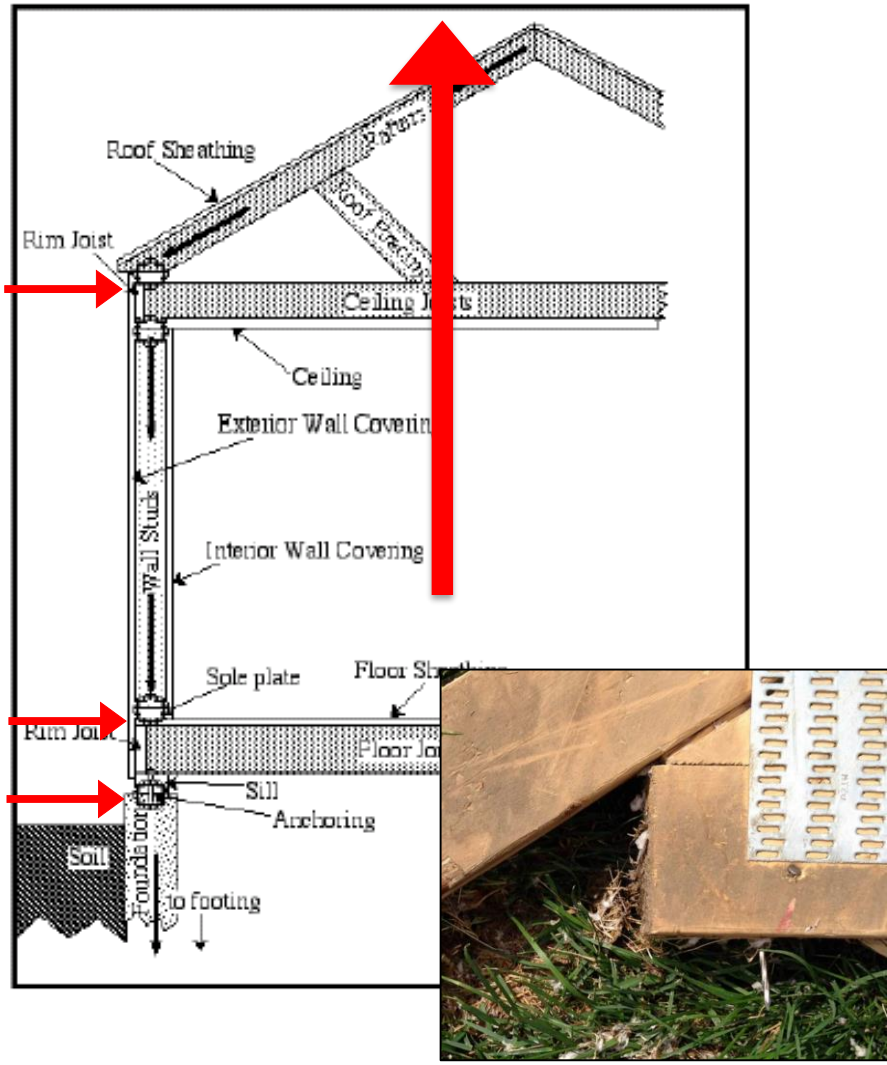
- Dufferin County program

Images: G. Kopp, UWO

Wind Resilience Seed Document



RTWCs critical – evidence suggesting often improper installation

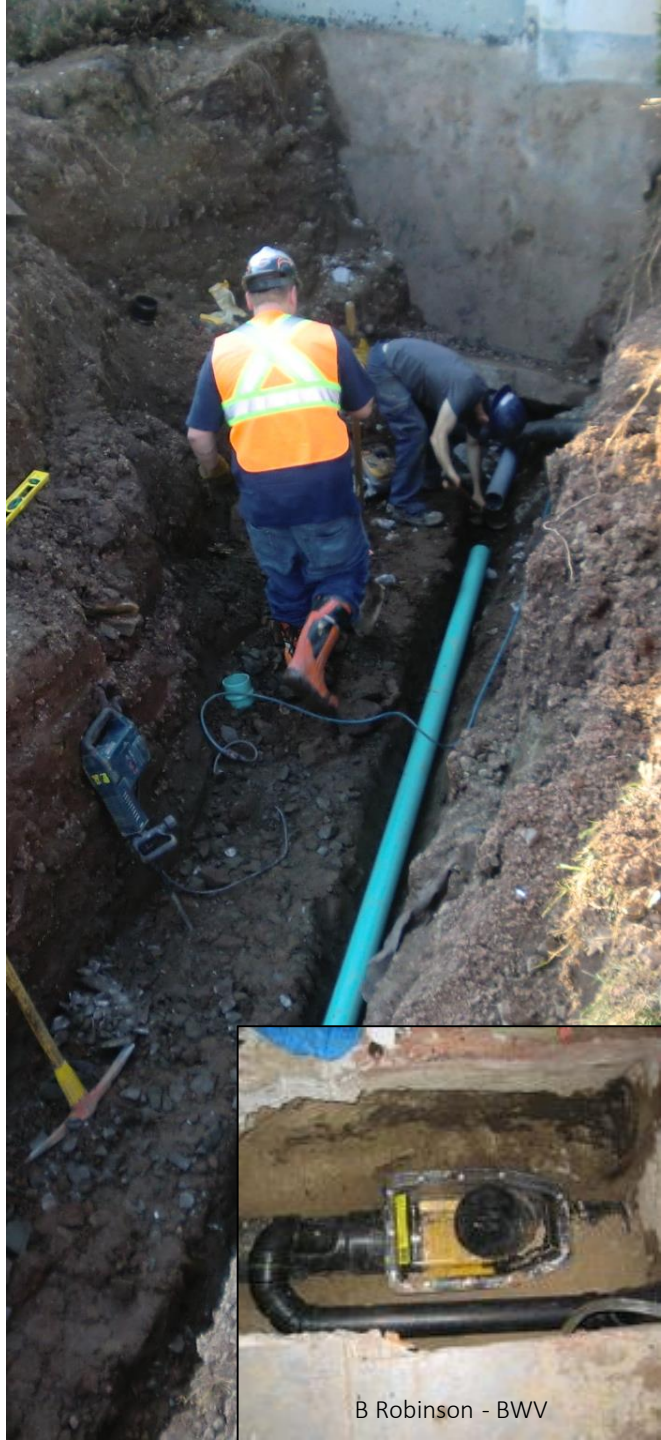


Some observations

- There is (almost) no perfect retrofit – conceptually simple but technically difficult, iterative/expensive, contractors often lack knowledge, installations may create new problems
- It may not be clear what caused the flooding in the first place
- Basement flood protection technologies are imperfect

- Good news: NBC/NPC, interest from NRC, SCC – this is new (NRC: WUI fire, flood), SCC (wind) -- there is room in construction codes for improvement
- At least – do not repeat same errors in new homes

- Methods for increasing uptake – codes, code interpretation, existing regulatory measures, combined with available voluntary measures



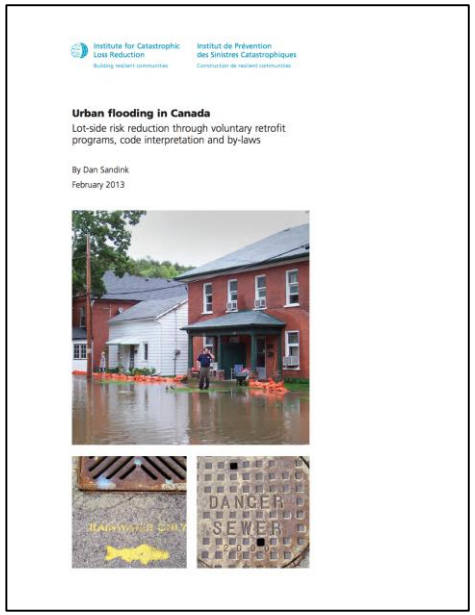
Legal measures study

- Previous ICLR studies, feedback from municipalities, insurers – continuing low uptake of incentives for private-side mitigation, I/I management
- What authority do municipalities have to *require* measures in existing subdivisions?
- Example measures explored:
  - Access to private property for purposes of inspections (e.g., lateral, sump connections)
  - Required maintenance, repair of laterals
  - Inspection, repair of lateral during major renovation, time of sale – windows of opportunity

Kyriazis, Zizzo & Sandink, 2017

Interpretation of NPC wording

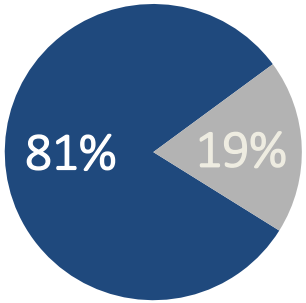
- NPC 2.4.6.4.(3) – "…where *a building drain* or a *branch* may be subject to *backflow*…"



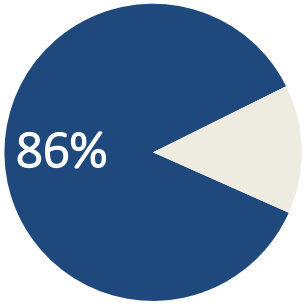
All, most

Rare, none

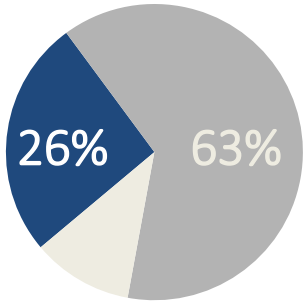
Alberta



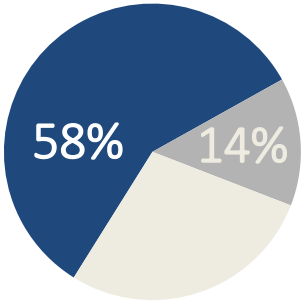
Saskatchewan



Ontario



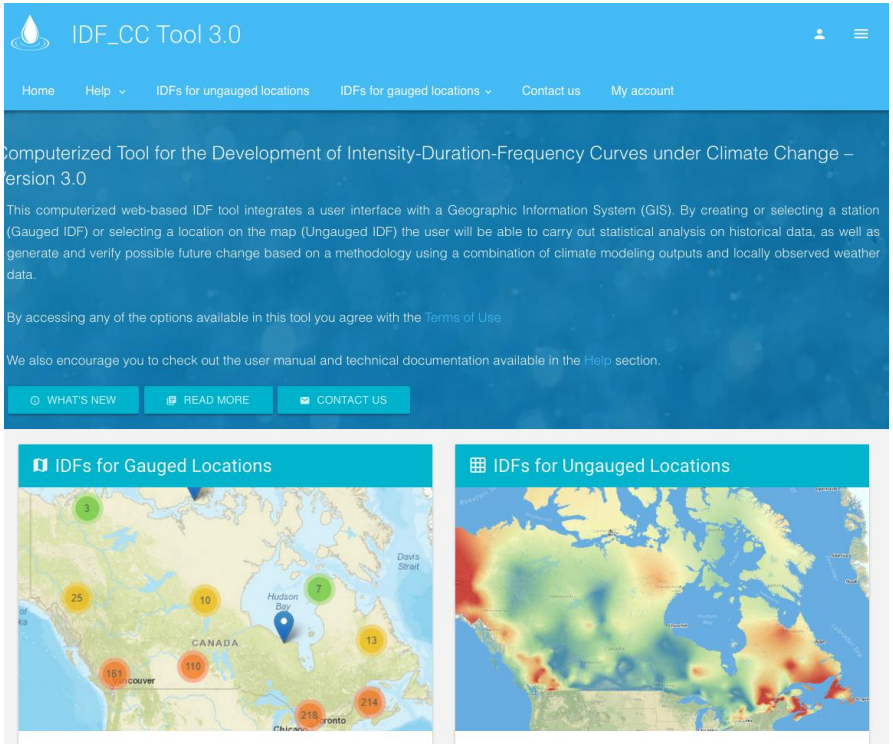
New Brunswick/ Nova Scotia



June 20 – IDF_CC Tool (V 3.0) Workshop

www.idf-cc-uwo.ca

- Mississauga Convention Centre, June 20
- Overview, methods of updated version of IDF_CC Tool
- Hands-on session (reviewing new features)
- Discussion related to use/application
- Register with Natalie Dale: ndale@iclr.org by June 4



Thank you!

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www.iclr.org