Syilx Okanagan Flood and Debris Flow Risk Assessment

Report 3 of 4 – Qualitative Study (R3) Appendices

R3 List of Appendices

Appendix A: Workshop 1 Participant List and Photos
Appendix B: Watershed Tour 1 Participant List and Photos
Appendix C: Watershed Tour 2 Participant List and Photos
Appendix D: Workshop 2 Participant List and Photos
Appendix E: Watershed Tour 3 Participant List and Photos
Appendix F: Workshop 1 Presentation Slides
Appendix G: Workshop 2 Presentation Slides
Appendix H: Workshop 2 Feedback
Syilx Okanagan Flood and Debris Flow Risk Assessment

Report 3 of 4 – Qualitative Study

Appendix A: Workshop 1 Participant List and Photos

Workshop 1 Title: t̓ik̓t (flood) in the Syilx Okanagan Territory

Participant List

<table>
<thead>
<tr>
<th>Participant Name</th>
<th>Organization - Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amanda Shatzko</td>
<td>RDNO – Chair</td>
</tr>
<tr>
<td>Anna Warwick Sears</td>
<td>OBWB</td>
</tr>
<tr>
<td>Arnie Baptiste</td>
<td>PIB – Knowledge Keeper</td>
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<tr>
<td>Bill Cohen</td>
<td>OKIB – Knowledge Keeper</td>
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<td>Chris Forster</td>
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<td>Erica Crawford</td>
<td>SHIFT</td>
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<td>Gail Given</td>
<td>RDCO – Councillor</td>
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<tr>
<td>Harron Hall</td>
<td>En’owkin Centre</td>
</tr>
<tr>
<td>Janet Terbasket</td>
<td>LSIB – Councillor</td>
</tr>
<tr>
<td>Jerry Marcellay</td>
<td>WFN – Knowledge Keeper</td>
</tr>
<tr>
<td>John Vassilaki</td>
<td>Penticton – Mayor</td>
</tr>
<tr>
<td>Jonathan Ford</td>
<td>WFN</td>
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<td>Karla Kozakevich</td>
<td>RDOS – Chair</td>
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<td>Lisa Wilson</td>
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<tr>
<td>Mike Allison</td>
<td>USIB – Knowledge Keeper</td>
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<tr>
<td>Mike Noseworthy</td>
<td>FLNRORD - Dam Safety</td>
</tr>
<tr>
<td>Robert Larson</td>
<td>Ebbwater</td>
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<td>Robin Irwin</td>
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<td>ONA</td>
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<tr>
<td>Todd Cashin</td>
<td>RDCO</td>
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</tbody>
</table>
Photos from Mapping Exercise (Credits: Ebbwater)
**Syilx Okanagan Flood and Debris Flow Risk Assessment**

**Report 3 of 4 – Qualitative Study**

**Appendix B: Watershed Tour 1 Participant List and Photos**

Watershed Tour 1 Location: *snipintkon* (Penticton)

**Participant List**

<table>
<thead>
<tr>
<th>Participant Name</th>
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</thead>
<tbody>
<tr>
<td>Amanda Shatzko</td>
<td>RDNO – Chair</td>
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<tr>
<td>Anna Warwick Sears</td>
<td>OBWB</td>
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<tr>
<td>Brody Eneas</td>
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<td>Brody Armstrong</td>
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<td>Chris Eneas</td>
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<td>Gina Mackay</td>
<td>Osoyoos</td>
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<td>Gail Given</td>
<td>RDCO – Councillor</td>
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<td>Gerry Marcellay</td>
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<td>Grouse Barnes</td>
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<td>Heather Murdock</td>
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<td>Michael Bezener</td>
<td>En’owkin Center</td>
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<td>Mike Noseworthy</td>
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<td>Richard Armstrong</td>
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<td>Robert Larson</td>
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<td>Taylor Carpenter</td>
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<td>Terry Olsen</td>
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<td>Tessa Terbasket</td>
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<td>Zoe Kirk</td>
<td>RDOS</td>
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<td>Luke Dempsey</td>
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<td>Thomas Pierre</td>
<td>PIB – Knowledge Keeper</td>
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</table>
Appendix B: Watershed Tour 1 Participant List and Photos

Photos (Credits: Ebbwater)

Stop 1: View west at the snowy, low-lying landscape at Upper Shingle Ck (HM)

Stop 2: Participants carefully walk down the Penticton Channel’s West Dike (RL)

Stop 2: An Elder talks about the importance of fish habitat at the outlet of Shingle Creek (RL)

Stop 2: An Elder talks about the importance of fish habitat at the outlet of Shingle Creek (RL)

Stop 2: An Elder talks about the changes experienced by Shingle Creek due to damming and channelization (RL)

Stop 2: Participants learn about aquatic habitat needs, and the changes that have occurred in this section of the river (RL)
Appendix B: Watershed Tour 1 Participant List and Photos

Stop 2: Participants learn about aquatic habitat needs, and the changes that have occurred in this section of the river (RL)

Stop 3: Lunchtime discussions at the En’owkin Centre (RL)

Stop 3: An Elder experiences the Penticton Virtual Tour (HM)

Stop 3: Participants share ideas about flood maps (RL)

Stop 4: An Elder explains plans to restore the floodplain on locatee lands (RL)

Stop 4: An Elder shares stories about the significance of the floodplain to syilx people (RL)
### Syilx Okanagan Flood and Debris Flow Risk Assessment

**Report 3 of 4 – Qualitative Study**

**Appendix C: Watershed Tour 2 Participant List and Photos**

Watershed Tour 2 Location: *nmalqaytkw* (Similkameen River)

**Participant List**

<table>
<thead>
<tr>
<th>Participant Name (photo credits)</th>
<th>Organization - Role</th>
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<tbody>
<tr>
<td>Arden Holley</td>
<td>Keremeos - Councillor</td>
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<td>Cory McGregor</td>
<td>Palmer</td>
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<tr>
<td>George Bush</td>
<td>RDOS – Director</td>
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<td>Jerry Marcellay</td>
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<td>Laurie</td>
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<td>Tim Roberts</td>
<td>RDOS – Director</td>
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<td>Trudy Peterson</td>
<td>LSIB</td>
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<td>Wendy Hawkes</td>
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<td>George Bush</td>
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<td>Glen Burgess</td>
<td>FLNRORD – Wildfire</td>
</tr>
</tbody>
</table>
Photos (Credits: Ebbwater and Palmer)

View upstream (west) of the icy Similkameen River (CM)

View downstream (east) of the Similkameen River (CM)

View downstream of the Similkameen River (CM)

Stop 1: The group completes introductions and reviews project objectives (CM)

Stop 1: Group photo of participants, standing at the edge of the landslide (RL)

Stop 1: View west down the path of the landslide (RL)
Stop 1: A participant looks over the edge of the slide path (RL)

Stop 1: The group debriefs and prepares to travel to the next stop (CM)

Stop 2: New culvert replaced on downstream side of Hedley Road (RL)

Stop 2: New culvert and headwall installed on upstream side of Hedley Road (CM)

Stop 2: The group discusses recent flood and debris flow impacts and their various causes, including uplands logging activity and wildfires (RL)

Stop 2: View upstream from replaced culvert, where debris flows occurred with flooding (RL)
Stop 3: The group contemplates the history and lack of local knowledge about this mine waste site (RL)

Stop 3: The was site is located approximately 30 m from the Similkameen River (CM)

Stop 3: The group learns about the history of this mine waste site (RL)

Stop 4: An Elder shares stories, including about how this land that was taken away from the syilx people (RL)

Stop 4: Signs of beaver activity on a tree along the left bank of the Similkameen River (CM)

Stop 4: View downstream of the Similkameen River; recent wildfire effects can be seen on forest slopes of the right bank (RL)
Workshop 2 title: Moving from *tikt* (flood) Risk to Adaptation

### Participant List

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<td>OKIB</td>
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<td>Dale Kronebusch</td>
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<td>Danika Dudzik</td>
<td>RDCO</td>
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<td>Erica Crawford</td>
<td>SHIFT Collaborative</td>
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<td>Shaun Reimer</td>
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<td>Shawn Goodsell</td>
<td>Oliver</td>
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<td>Shelley Martens</td>
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<td>Sherry Philpott-Adhikary</td>
<td>Keremeos – Councillor</td>
</tr>
<tr>
<td>Skyeler Folks</td>
<td>ONA</td>
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## Appendix D: Workshop 2 Participant List and Photos

<table>
<thead>
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<th>Participant Name</th>
<th>Organization - Role</th>
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<tr>
<td>Stephanie Paul</td>
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<td>Tamsin Lyle</td>
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<td>Trevor Scott</td>
<td>Vernon</td>
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<td>Wendy Hawkes</td>
<td>LSIB</td>
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</tbody>
</table>

**Photos from Mapping Exercise (Credits: Ebbwater)**
Syilx Okanagan Flood and Debris Flow Risk Assessment

Report 3 of 4 – Qualitative Study

Appendix E: Watershed Tour 3 Participant List and Photos

Watershed Tour 3 Location: nk’mapelqs (Head of the Lake)

Participant List

<table>
<thead>
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</thead>
<tbody>
<tr>
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<tr>
<td>Barb Marchand</td>
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<td>Burt Marchand</td>
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<td>Colleen Marchand</td>
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<td>Craig Moore</td>
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<td>Vernon</td>
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<td>Keith Louis</td>
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<td>Matt Vader</td>
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<td>Wilke John</td>
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</tr>
<tr>
<td>William Marchand</td>
<td>OKIB – Knowledge Keeper</td>
</tr>
</tbody>
</table>
Photos (all credits: ONA)

Stop 1: Group introductions at the New Horizons building.

Stop 2: Photo of a flower on Equesis Creek (Photo credit).

Stop 2: Section of Equesis Creek where flow path has changed.

Stop 2: Group discussion about flow path change on Equesis Creek where flow path has changed.

Stop 2: View of new water flow path landscape on Equesis Creek.

Stop 4: Whiteman Creek bridge.
Stop 4: Whiteman Creek bridge.

Stop 5: Whiteman Creek, view from right bank at water level and upstream.

Stop 5: Whiteman Creek, view from top of right bank and upstream.

Stop 5: Whiteman Creek, group shot. Staff from Rider Ventures (look it up)

Stop 5: Flooded field on Whiteman Creek.

Stop 6: Group discussion at the mouth of Equesis Creek.
Stop 6: Group discussion at the mouth of Equesis Creek.

Stop 6: Near the mouth of Equesis Creek.

Stop 6: Mouth of Equesis Creek at Okanagan Lake.

Stop 7: Group discussion at washed-out area on Equesis Creek.

Stop 8: Debris in Bouleau Creek.

Stop 8: Close-up of debris in Bouleau Creek bridge.
Syilx Okanagan Flood and Debris Flow Risk Assessment

Report 3 of 4 – Qualitative Study

Appendix F: Workshop 1 Presentation Slides
Setting the Stage: *tikt* (flood) in the *Syilx* (Okanagan) Territory

Workshop 1, February 13\textsuperscript{th}, 2018
# Agenda

<table>
<thead>
<tr>
<th>Time</th>
<th>Section</th>
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<tbody>
<tr>
<td>Morning</td>
<td>Registration/Welcome</td>
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<tr>
<td></td>
<td>Introduction to the Study Area and the Project</td>
</tr>
<tr>
<td></td>
<td>Break</td>
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<td>Two-Eyed Seeing Approach and Overview of Flood and Debris Flow</td>
</tr>
<tr>
<td>Lunch Break</td>
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<tr>
<td>Afternoon</td>
<td>What is Resilience and Where Do We See Impacts?</td>
</tr>
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<td></td>
<td>Mapping Exercise to Identify Past and Future Impact Areas</td>
</tr>
<tr>
<td></td>
<td>Reflections and Closing</td>
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</table>
Workshop Objectives

• Provide an opportunity for flood resilience community-building in the region.
• Share perspectives on flood resilience, including positive and negative implications.
• Review maps of likely flood and debris flow occurrences in the study area.
• Identify what’s in the path of the water and what matters to people who live in the Okanagan.

Source: Heather Murdock
Project Timeline

Dec 2018
- Confirm team, deliverables, responsibilities
- Project Kick-off and First Steering Committee meeting
- Data collection

January 2019
- Hazard Mapping
  Develop, Coordinate Watershed Tour / Workshop 1

February 2019
- Workshop 1
  Okanagan Watershed Tour
  Collect exposure / vulnerability data

March 2019
- Risk Assessment
  Rescheduled Similkameen Watershed Tour
  Develop, coordinate Workshop 2

Apr-May 2019
- Ground truthing with stakeholders
  (Workshop 2 and Watershed Tour)
  Prepare risk assessment report

June 30, 2019
- Final Report
  Presentation to Steering Committee
Introductions Around the Room
Introduction to the Land and Waters of the Syilx Territory

Arnie Baptiste
Bill Cohen
Introduction to the Project

Tessa Terbasket | ONA
Tamsin Lyle | Ebbwater
siw\l\k^w \ (water)  
Declaration  
Dallas Goodwater
Flood is a wicked problem

- High degree of technical complexity
- Multiple dimensions of uncertainty
- Multiple objectives
- High stakes, high emotions
- Intense political scrutiny
- High expectations for quality and transparency
- Limited resources in terms of time, money and personnel.
That historically settlers have managed with arrogance
Man Will Conquer Nature

Natural Condition

Dike Confinement
In the US, a 45% increase in spatial extent of the 100-Year floodplains is projected by the year 2100 (NFIP 2014).
And is causing more and more losses

$2.4Bn losses annually
$673M paid by DFAA

Flood Disaster Occurrences in Canada 1900-2015
(Canadian Disaster Database)

Annual Loss Estimate from Government of Canada
(Parliamentary Budget Office 2016)
Forcing a change:
The evolution of flood management

Sayers et al. 2014
Sendai Framework
Canada AND British Columbia are signatories

1 OUTCOME
The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries.

1 GOAL
Prevent new and reduce existing disaster risk through the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures that prevent and reduce hazard exposure and vulnerability to disaster, increase preparedness for response and recovery, and thus strengthen resilience.

4 PRIORITIES
- Understanding disaster risk
- Strengthening disaster risk governance to manage disaster risk
- Investing in disaster risk reduction for resilience
- Enhancing disaster preparedness for effective response, and to “Build Back Better” in recovery, rehabilitation and reconstruction

7 TARGETS
- Disaster Mortality by 2030
- Number of affected people by 2030
- Economic loss by 2030
- Infrastructure damage by 2030
- DRR national/local strategies by 2020
- International cooperation by 2030
- EWS and DR information by 2030

Western Science
Or at least the leading edge of it

The 10 Golden Rules of Flood Management
Sayers et al. 2014
Accept that absolute protection is not possible and plan for exceedance.

1. Cornerstone Idea
   - e.g. A dike

2. Brick Idea
   - complemented with property-level-protection

3. Brick Idea
   - improved with habitat enhancement and a bike path
Promote some flooding as desirable
3 Base decisions on an understanding of risk and uncertainty

- **Hazard**
  - Where and how big is the event?

- **Vulnerability**
  - What is the susceptibility of exposed elements?

- **Exposure**
  - What is in the way of the hazard?

- **Likelihood**
  - What is the chance it will occur?

- **Consequence**
  - What are the impacts?

- **Risk**
  - What are the potential impacts over time?
Recognize that the future will be different from the past

% increase in annual precipitation in the Central Okanagan

Data from Plan2Adapt.ca
Do not rely on single measure but implement a portfolio of options

- Do Nothing
- Adapt
- Protect
- Retreat
6 Utilize limited resources efficiently and fairly to reduce risk

7 Be clear on responsibilities for governance and action
Communicate risk and uncertainty effectively and widely.

City of Dawson Creek Risk Assessment
9 Promote stakeholder participation in the decision process

Talk to people; not just those you like

Image sources: West Coast Environmental Law
10 Reflect local context and integrate with other planning processes
Break
Two-Eyed Seeing

Erica Crawford | SHIFT
Tessa Terbasket | ONA
1. Discuss the first lens with a partner
2. Discuss the second lens with a different partner (same side of the room)
3. Find another partner, discuss strengths of two eyes together
4. Choose an image or phrase to describe what emerges from seeing through two eyes together
Overview of Flood and Debris Flow in the Study Area

Robert Larson | Hydrologist | Ebbwater Consulting
Cory McGregor | Geoscientist | Palmer Environmental Consulting Group
Communication Challenge

Syilx Perspective

Technical

Non-Technical
Learning a New Worldview

Concepts
- tikt (flood)
- Tmxwulaxw (land)

Language
- nsyilxcan

Place Names
- klúsxnítkw (Okanagan River)
- nmalqaytkw (Similkameen River Tributary)

Project Direction

Ethics
- Captikʷə (natural laws)
- siwɬkʷ (water)
What is a Flood?

Flood Characteristics:

• Driven by climate processes that have influence on the watershed scale.
• Mechanisms can include heavy rain and rain-on-snow; snowmelt; rising water table; debris blockages and ice jams; breaking or breaching of flood defenses; and high lake levels.
• Can be linked to reservoir regulation.

Kelowna, May 8, 2018 (Source: Kelowna Now)
Building a Flood and Debris Flow Information Library for the Territory
Observations of watercourses that have historically flooded


Flood Prone Reaches

1808 - 2016
Flood Mapping

- Federal Disaster Reduction Program
- Floodplain bylaws (RDOS, Kelowna)

Approx. 1980-2010
Flood Prone Areas

- Screening-level mapping
- Based on geological and soils mapping

2016
Recent/Current Flood Mapping

- Penticton, Armstrong, Lumby (Done)
- Kelowna Mission Creek (ongoing)
- Others?

2017-present
We applied AE (2016) method to entire study area
Terrain Analysis Methods

- Global Floodplain Map
- Geomorphic Flood Index (to be completed)

2018
Terrain Analysis Methods

- Debris Flow Susceptibility

2018
What is a Debris Flow?

Debris Flow Characteristics:

- Composed of saturated, loose material or ‘debris’
- Moves as a flowing slurry that can resemble wet concrete
- Rapid velocity
- High discharge
- Failures typically channelized and recurring
- Can grow in size as flow picks up new material and water
- Commonly triggered by addition of water (e.g. heavy precipitation, rapid snowmelt, human activity)

Testalinden Creek Debris Flow, June 2010
(Source: Oliver Daily News)
How Debris Flows Move
Terrain Susceptibility to Debris Flows

Debris Flow Initiation Factors:
• Slope steepness
• Surface material type
• Proximity to steep creeks and drainages
• Regional geology
• Sediment availability

External Factors
• Precipitation
• Deforestation (e.g. forest fire)

Johnsons Landing Debris Flow, July 2012
(Source: The Tyee)
Modelling Debris Flow Susceptibility

Model approach:

- Selection of predictive layers
- Determination of values within layers
- Layer ranking and weighting and combination
- Validation and adjustment

A. Slope gradient (40%) + B. Surface Material (30%) + C. Distance to creeks (20%) + D. Bedrock Geology (10%)
Debris Flow Susceptibility Classification

- Qualitative 5-class system (Very Low to Very High)
- Combination of model inputs

<table>
<thead>
<tr>
<th>Type</th>
<th>Layer</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>35° (High)</td>
<td>Slope Gradient (40%)</td>
<td>10° (Low)</td>
</tr>
<tr>
<td>Loose Material (High)</td>
<td>Surface Material (30%)</td>
<td>Till (Moderate)</td>
</tr>
<tr>
<td>30 m (High)</td>
<td>Distance to Creek (20%)</td>
<td>360 m (Low)</td>
</tr>
<tr>
<td>Granite (Low)</td>
<td>Bedrock Geology (10%)</td>
<td>Volcaniclastic (Moderate)</td>
</tr>
<tr>
<td>Very High (0.9)</td>
<td>Susceptibility Class</td>
<td>Low (0.4)</td>
</tr>
</tbody>
</table>
Debris Flow Validation:

Testalinden Creek Debris Flow, June 2010

- Trigger: Dam breach in part due to high snowmelt
- Water travels through Very High (red) and High (yellow) class terrain
- Loose debris is entrained by water and combines to form a debris flow
- Debris flow travels downslope and onto fan
Linked Watershed Factors

- Climate Change
- Landcover Change
- Groundwater
- Wildlife

Source: Heather Murdock, Ebbwater
Linked Watershed Factors

- Climate Change
- Landcover Change
- Groundwater
- Wildlife

Source: Heather Murdock, Ebbwater
Watershed Factor: Landcover Change

Basics of Surface Runoff

a) Infiltration excess: volume of rain > than soil infiltration

b) Saturation excess (mainly winter) water holding capacity is full

Source: DIAGNOSIS Training Course
https://slideplayer.com/slide/1448184/
Aerial Forest Health Survey
Percentage of Trees Killed Recently

Legend
Percentage of Trees Impacted
Less than 10%
10 - 29%
30 - 49%
More than 50%

2001 - 2017
Aerial Forest Health Survey
Percentage of Trees Killed Recently

Legend
Percentage of Trees Impacted
- Less than 10%
- 10 - 29%
- 30 - 49%
- More than 50%

2001 - 2018
Watershed Factor: Groundwater

Basics of groundwater / surface water interactions

Watershed Factor: Groundwater

How does this translate to potential flooding?

1. More water is at the surface.
2. Water in the ground can flood low-lying/underground assets.
3. Rain or snowmelt exacerbates above conditions.
Overall Picture

• Creating a mosaic of information and building a common understanding of *tikt*.
• After lunch, we will delve deeper into considering the impacts of flood and debris flow.
• Help inform future priority-setting.
Lunchtime Fun!

- Experience the Penticton Virtual Tour
- Interact with the River Model
Lunch Break
What is Resilience?
Interactions with Flood and Debris Flows: Mapping Exercise
High-level impact categories
National Risk Profile

Mortality & Missing
Affected People
Economic
Disruption
Environment
Cultural*
Risk Assessment
A Multi-Disciplinary Task

Elements at Risk
- People
- Infrastructure
- Economy/Assets
- Environment

Direct Damages
- People
- Infrastructure
- Economy/Assets
- Environment
Flood Impacts - Direct

- Washed out/ flooded roads
- Exposed utilities
- Backed-up sewage system
- Bridge collapse
Flood Impacts - Indirect

- Lost Access to Sacred Areas
- Change in Fish Habitat
- Loss of Road Access
- Loss of Utility Service
Syilx Models

Contents from this slide removed
Fly-through tour of impact stories from the 2017-2018 floods
Flood & Debris Flow Mapping Exercise
Mapping Direct & Indirect Impacts

- What is the path of the water and earth during times of flood and debris flow? [Anything not on the maps that is important to note]

- How does flood and debris flow interact with the land, people, the built environment and all tmix\textsuperscript{w}?

- What about our past and current actions, traditions, practices, livelihoods, relationships and interactions with water and land, impact or are impacted by flood & debris flow?

*(consider positive and negative types of interactions or impacts)*
Mapping Direct & Indirect Impacts

• What else matters if we think of flood & debris flow from the perspective of water itself, and of future generations of people and all tmix\textsuperscript{w}? 

(consider positive and negative types of interactions or impacts)
1. One positive interaction with flood and debris flow

2. One challenging interaction with flood and debris flow

3. One consideration from the perspective of water and/or future generations
What stood out?

What matters the most?

What do we (consultants) need to know?

Source: maxpixel.net
Closing
Next Steps...

- Compile information gathered today
- Okanagan Watershed Tour: Friday, February 22nd.
- Similkameen Watershed Tour: Early March (Date TBD soon)
- Collect exposure / vulnerability data
Looking ahead....we’ll be back to make sure we heard you right.

Dec 2018
- Confirm team, deliverables, responsibilities
- Project Kick-off and First Steering Committee meeting
- Data collection

January 2019
- Hazard Mapping
  - Develop, Coordinate Watershed Tour / Workshop 1
- Workshop 1
  - Okanagan Watershed Tour
  - Collect exposure / vulnerability data

February 2019
- Workshop 1
  - Okanagan Watershed Tour
  - Collect exposure / vulnerability data

March 2019
- Risk Assessment
  - Rescheduled
  - Similkameen Watershed Tour
  - Develop, coordinate Workshop 2

Apr-May 2019
- Ground truthing with stakeholders
  - (Workshop 2 and Watershed Tour)
  - Prepare risk assessment report

June 30, 2019
- Final Report
  - Presentation to Steering Committee
THANK YOU
Syilx Okanagan Flood and Debris Flow Risk Assessment

Report 3 of 4 – Qualitative Study

Appendix G: Workshop 2 Presentation Slides
Ground Truthing: Moving from tikt (flood) Risk to Adaptation on Syilx (Okanagan) Territory

Workshop 2, April 25, 2019
## Agenda

<table>
<thead>
<tr>
<th>Time</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Morning</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Welcome</td>
</tr>
<tr>
<td></td>
<td>Framing our work together</td>
</tr>
<tr>
<td></td>
<td>Reflect on watershed tours and first workshop</td>
</tr>
<tr>
<td></td>
<td>Review of impact information gathered in earlier engagement</td>
</tr>
<tr>
<td></td>
<td>Break</td>
</tr>
<tr>
<td></td>
<td>Share preliminary risk assessment information and identify gaps</td>
</tr>
<tr>
<td><strong>Lunch Break</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Afternoon</strong></td>
<td>Exploring opportunities for building resilience</td>
</tr>
<tr>
<td></td>
<td>Visioning with the four Food Chiefs</td>
</tr>
<tr>
<td></td>
<td>Reflections and closing</td>
</tr>
</tbody>
</table>
Goals and Agreements

1. Learn about the Syilx perspectives on flood, including positive and negative implications
2. Review qualitative information that has been gathered and mapped to date
3. Review preliminary quantitative findings to refine the process and obtain meaningful results
4. Strengthen relationships and prepare for next phase of work related to adaptation and resilience
5. Have fun together!
Setting the Stage: Reflecting on Early Engagement Activities

Rob Larson
Tessa Terbasket
Project Objective

Understand risk due to flood and debris flows within the Okanagan-Similkameen region, to support priority-setting of future work

Source: Heather Murdock
Study Area
15,519 km²
## Project Timeline

<table>
<thead>
<tr>
<th>Month</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec 2018</td>
<td>Confirm team, deliverables, responsibilities</td>
</tr>
<tr>
<td></td>
<td>Project Kick-off and First Steering Committee meeting</td>
</tr>
<tr>
<td></td>
<td>Data collection</td>
</tr>
<tr>
<td>Jan 2019</td>
<td>Hazard Mapping</td>
</tr>
<tr>
<td></td>
<td>Develop, Coordinate Watershed Tours / Workshop 1</td>
</tr>
<tr>
<td>Feb 2019</td>
<td>Setting the Stage: Workshop 1</td>
</tr>
<tr>
<td></td>
<td>Okanagan Watershed Tour (Penticton)</td>
</tr>
<tr>
<td></td>
<td>Collect exposure / vulnerability data</td>
</tr>
<tr>
<td>Mar 2019</td>
<td>Similkameen Watershed Tour</td>
</tr>
<tr>
<td></td>
<td>Refine hazard layer</td>
</tr>
<tr>
<td></td>
<td>Start risk assessment</td>
</tr>
<tr>
<td></td>
<td>Develop, coordinate Workshop 2</td>
</tr>
<tr>
<td>Apr-May 2019</td>
<td>Ground Truthing: Workshop 2</td>
</tr>
<tr>
<td></td>
<td>Prepare risk assessment report</td>
</tr>
<tr>
<td></td>
<td>Watershed Tour 3 (TBD)</td>
</tr>
<tr>
<td>June 30, 2019</td>
<td>Final Report</td>
</tr>
<tr>
<td></td>
<td>Presentation to Steering Committee</td>
</tr>
</tbody>
</table>
Water is life.

Water is our relation.

Water bonds us to our ancestry, our descendants and our land.

siwɬkw will always take the lowest path in its humility, yet of all the elements, it is the most powerful.

siwɬkw will always find a way around obstructions: under, over and through.
1. Plan for exceedance
2. Promote flooding
3. Understand risk and uncertainty
4. Acknowledge future change
5. Implement a portfolio of options
6. Utilize resources efficiently and fairly
7. Establish governance responsibilities
8. Communicate risk and uncertainty
9. Promote participation
10. Reflect local context
Sharing with various tools

Workshop 1
River Model
Penticton Virtual Tour
Watershed Tours
Sharing and listening
(Workshop 1)
Stop 1: Upper Shingle Creek near Shingle Creek Rd.

Stop 2: Mouth of Shingle Creek at the Penticton Channel

Stop 3: En’owkin Centre

Stop 4: Former location of oxbow lakes on locatee lands

Flood Prone Areas

Debris Flow Prone Areas

Notes:
1. Map produced by Ebbwater Consulting Inc. on March 22, 2019, and DMAF.
2. Flood Prone Areas are from three studies/methods.
3. Debris Flow Prone Areas are a subset of debris flow initiation zones in relatively steep valleys and drainages.

Data Sources:
1. Flood Prone Areas are based on data from the Federal Disaster Reduction Program (FDRP), flood mapping for Penticton (Tetra Tech, 2019), and a screening-awake method based on geology and soils mapping (ME, 2016).
2. Debris Flow Prone Areas are based on data provided by Palmer Environmental Consulting Group Inc.
3. Highway and watercourse data is based on provincial datasets.

References:
1. FDRP Floodplain Maps, GOBC.
2. Tetra Tech, 2019, Penticton Flood Risk Assessment.

Date: March 22, 2019
Produced by: Ebbwater Consulting Inc.
Qualitative

ONA community Learning sessions
TEKK stories
Conversations with syilx

Quantitative

Workshop 1
Watershed tours
Impacts mapping
Workshop 2
Preliminary hazards
Refined hazards
Risk mapping
Exposure datasets

Risk results discussion
Gaps discussion
Risk scoring
Syilx perspective
Risk matrix

Priority-setting
Mapped vs. Unmapped Information

Maps are static tools

Flood and debris flow are dynamic

Impacts mapping is a ‘bridge’
Review of Qualitative Impacts

Tamsin Lyle
Rob Larson
Mapping Qualitative Impacts
High-level impact categories
National Risk Profile

- Mortality & Missing
- Affected People
- Economic
- Disruption
- Environment
- Cultural
<table>
<thead>
<tr>
<th>Impact Category</th>
<th>What Is Described</th>
</tr>
</thead>
<tbody>
<tr>
<td>People that go missing or die as a result of the event. <em>Not used in the qualitative analysis.</em></td>
<td></td>
</tr>
<tr>
<td>People impacted because they have had their homes, schools, businesses, and/or other services lost (e.g. from a damaged public amenity).</td>
<td></td>
</tr>
<tr>
<td>Direct losses, which primarily includes damage and reconstruction costs to public and private structures. This also can include the cost of response.</td>
<td></td>
</tr>
<tr>
<td>Describes the potentially more widely spread impacts that can result from an event (e.g., when a transportation network such as a road is cut off).</td>
<td></td>
</tr>
<tr>
<td>Impacts to environmentally sensitive areas that are directly exposed, and the effects of contaminants that are released into the area when hazardous sites are affected.</td>
<td></td>
</tr>
<tr>
<td>Impacts to sites of cultural significance including harvesting, sacred, and recreational areas.</td>
<td></td>
</tr>
</tbody>
</table>
Human-Induced Stressors

- Climate change
- Wildfire
- Ecological Disturbances
- Structures
- Development
Undesirable vs. Desirable Consequences

- Some flooding is good for fish
- Flood infrastructure is problematic
- Seek opportunity gains
Preliminary Qualitative Results:

- Not all areas equally represented
- Some overlap between categories
Preliminary Qualitative Results:
- Impacts are distributed but close to water
- Some overlap between categories
Exercise (15 min): Impacts Mapping Review

- 2 Watersheds, 5 Impact categories
- Did we miss specific areas?
Break
Complementary Qualitative and Quantitative Datasets

- Disruptions as indicated by you (orange)
- Events recorded by MOTI (pink)
Preliminary Quantitative Results

Tamsin Lyle
Rob Larson
Process of Risk Assessment

- Understand and map components of risk
- Overlay the elements to see where they intersect
### Impact Categories

<table>
<thead>
<tr>
<th>Impact Category</th>
<th>Data Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>People</td>
<td>Building footprints</td>
</tr>
<tr>
<td>Family</td>
<td>Census dissemination areas</td>
</tr>
<tr>
<td>Property</td>
<td>Property assessments, Building footprints as proxy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Impact Category</th>
<th>Data Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roads</td>
<td>Major and minor roads</td>
</tr>
<tr>
<td>Contamination</td>
<td>Contamination Sources, Fish observations, drinking water wells, and high biodiversity areas</td>
</tr>
<tr>
<td>Cultural</td>
<td>Cultural buildings</td>
</tr>
</tbody>
</table>

**Quantitative**
Flood vs. Debris Flow

- Modelling and data analysis
- Spatial distribution
- Consequences
Preliminary Quantitative Finding:

- Potential for source / receptor contact
Preliminary Quantitative Finding:

- More intense hazard areas
Preliminary Quantitative Results:

- More and different areas affected, but few with high likelihood
Preliminary Quantitative Results:

- Significant population centres in high hazard areas
Preliminary Quantitative Results:

- Numerous areas affected
- $19.5bn
Preliminary Quantitative Results:

- Areas affected are less widespread
- $13.1$ bn
Exercise (15 min): Preliminary Risk Map Review

- Which regions do we want to show close-up, if any others?
- Are there any gaps? What is missing?
- Are there any errors that you notice, from your direct experience/knowledge of the area?
- Are we representing the right information? (would other data sets be more relevant?)
Syilx Okanagan Flood and Debris Flow Risk Assessment
Report 3 of 4 – Qualitative Study
Appendix H: Workshop 2 Feedback
Report for Syilx (Okanagan) Flood & Debris Flow Workshop #2 Feedback

Response Counts

<table>
<thead>
<tr>
<th>Completion Rate:</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete</td>
<td>13</td>
</tr>
</tbody>
</table>

Totals: 13

1. On a scale of 1-5 (1 = Not at all; 5 = Very much), please rate the following statements:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Not at all</th>
<th>-</th>
<th>Somewhat</th>
<th>-</th>
<th>Very much</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>I improved my understanding of flood and debris flow risk in the Okanagan and Similkameen watersheds (Syilx traditional territory)</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>Count</td>
<td>7.7%</td>
<td>7.7%</td>
<td>23.1%</td>
<td>46.2%</td>
<td>15.4%</td>
<td></td>
</tr>
<tr>
<td>Row %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I learned about the Syilx perspective on flood and debris flow phenomena</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>Count</td>
<td>0.0%</td>
<td>7.7%</td>
<td>15.4%</td>
<td>46.2%</td>
<td>30.8%</td>
<td></td>
</tr>
<tr>
<td>Row %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I strengthened relationships with other stakeholders in the region</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>6</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>Count</td>
<td>0.0%</td>
<td>0.0%</td>
<td>15.4%</td>
<td>46.2%</td>
<td>38.5%</td>
<td></td>
</tr>
<tr>
<td>Row %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I improved my understanding of how to work together to adapt to flood and debris flow phenomena in this region</td>
<td>0</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>Count</td>
<td>0.0%</td>
<td>7.7%</td>
<td>38.5%</td>
<td>30.8%</td>
<td>23.1%</td>
<td></td>
</tr>
<tr>
<td>Row %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Totals

Total Responses 13
2. What was one key insight or take-away for you, from this session?
<table>
<thead>
<tr>
<th>ResponseID</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Ask First Nations communities to provide information on impacts to their members, culture and heritage. Acknowledge and respect the thousands of years of experience First Nations peoples are able to contribute.</td>
</tr>
<tr>
<td>3</td>
<td>A key insight was the understanding that the entire Syilx watershed is connected (through rivers and now through dams, and spillway etc), and that changes made to a singular drainage can affect the entire watershed below. Having all the stakeholders be a part of decision making processes is vital to the health of our region.</td>
</tr>
<tr>
<td>5</td>
<td>There is definitely a human impact to a lot of flooding problems.</td>
</tr>
<tr>
<td>6</td>
<td>There is opportunity to combine our efforts and work together. There needs to be a bit of flexibility to meet each other's goals. I see it as possible.</td>
</tr>
<tr>
<td>7</td>
<td>The value of listening.</td>
</tr>
<tr>
<td>8</td>
<td>I think the focus on letting areas flood and the importance of flooding rather than the focus on limiting and control of floodwater.</td>
</tr>
<tr>
<td>9</td>
<td>The value of in person meetings</td>
</tr>
<tr>
<td>10</td>
<td>I learned about the Syilx perspective on flood and debris flow phenomena.</td>
</tr>
<tr>
<td>12</td>
<td>That we as a people living in the Okanagan and the Similkameen are connected by water.</td>
</tr>
<tr>
<td>13</td>
<td>Further collaboration is needed and we are on our way.</td>
</tr>
<tr>
<td>14</td>
<td>Key people are relatively uninformed about threats to the water and people.</td>
</tr>
</tbody>
</table>

3. What is an example of how this session may impact your work or practice in the near future?
<table>
<thead>
<tr>
<th>ResponseID</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Invite First Nations representatives to our local government table.</td>
</tr>
<tr>
<td>3</td>
<td>Studies are inherently data-centric in nature and are typically not based enough on historical information. This session struck home to me that modeling natural environments is very complex and land based knowledge (such as that provided by elders) is not being considered thoroughly enough.</td>
</tr>
<tr>
<td>5</td>
<td>To be aware of building in potential flood areas and changes on land can affect or contribute flooding.</td>
</tr>
<tr>
<td>6</td>
<td>If we can come out of this process with a mechanism for moving forward, and not always repeating it, then I believe this will have a huge impact as we move forward. There is opportunity to incorporate some of the Syilx traditions into our processes.</td>
</tr>
<tr>
<td>7</td>
<td>At each of the workshops and site visits I gained a better understanding of community member’s perspective of how floods impact their lives.</td>
</tr>
<tr>
<td>9</td>
<td>How to develop working tools to encourage open communication between in office teams</td>
</tr>
<tr>
<td>10</td>
<td>Honestly not sure how to bring this into my current job.</td>
</tr>
<tr>
<td>12</td>
<td>Look more into traditional mitigation</td>
</tr>
<tr>
<td>13</td>
<td>Relationship building and moving forward on other regional projects</td>
</tr>
</tbody>
</table>