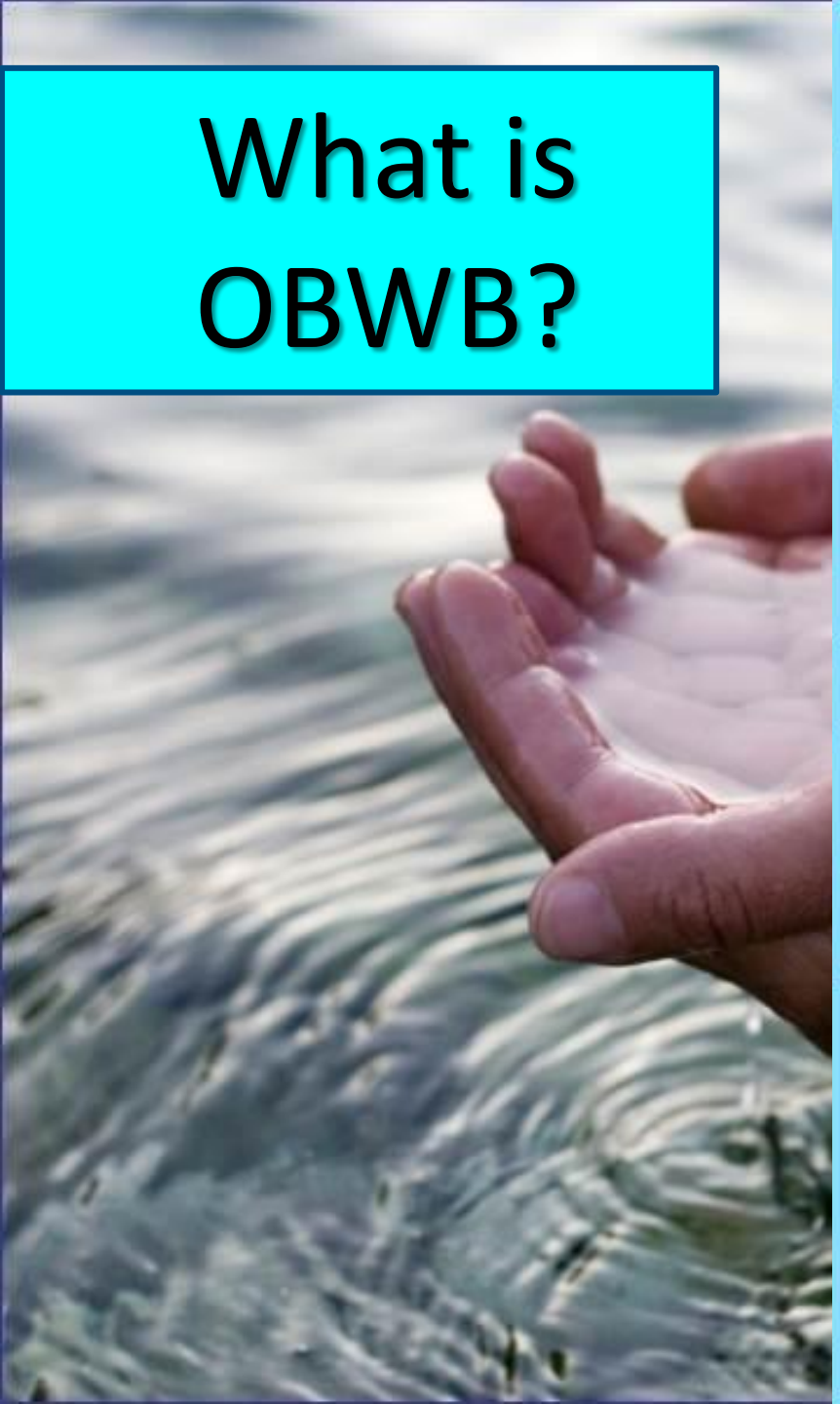
The Good, the Bad and the Ugly of Okanagan Flood Mapping

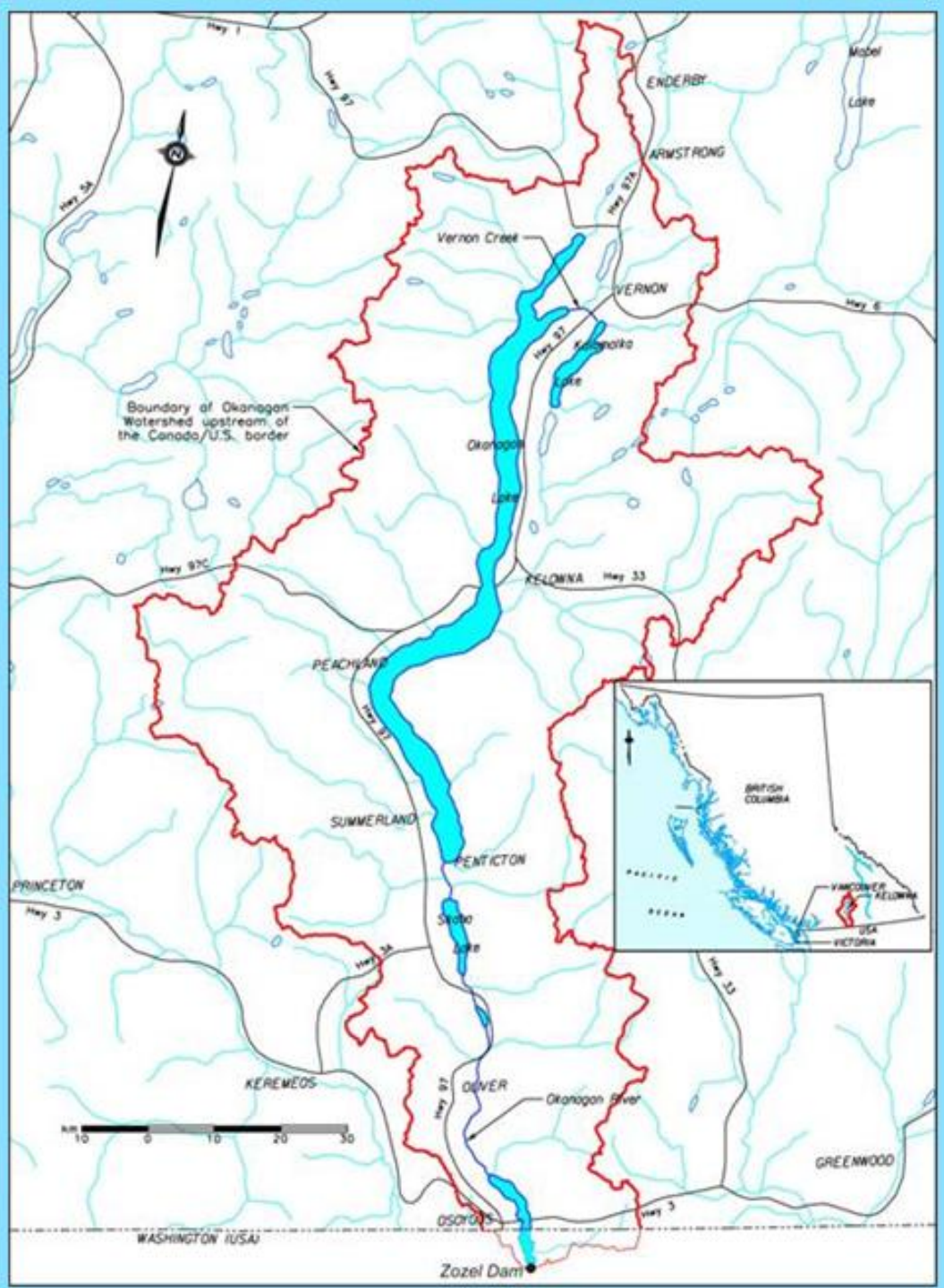
Anna Warwick Sears, Okanagan Basin Water Board

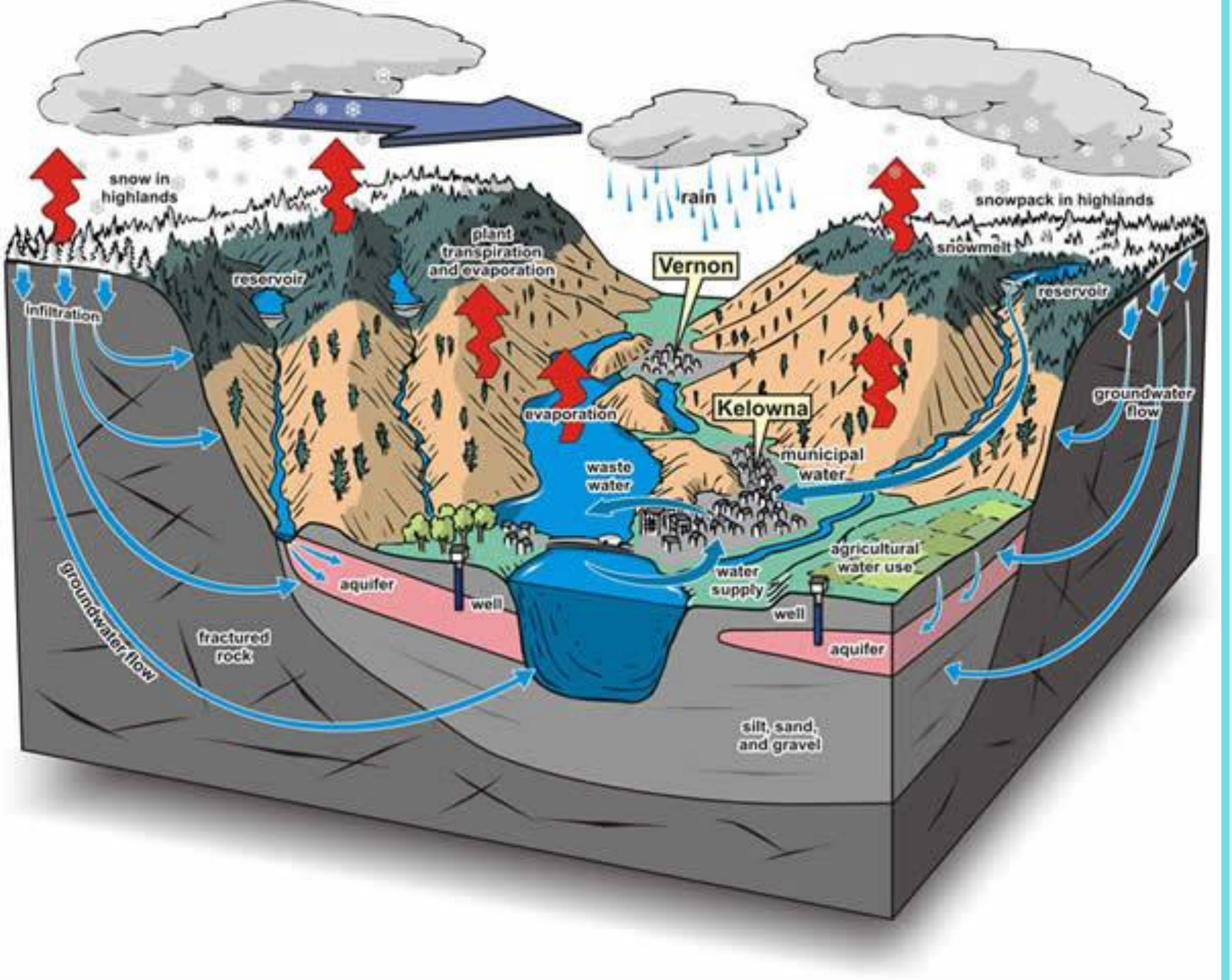
Or, How local communities came together with great government help to do a game-changing project, which still has a number of challenges and isn't completely finished.

We hope other people will learn from our experiences

What is OBWB?

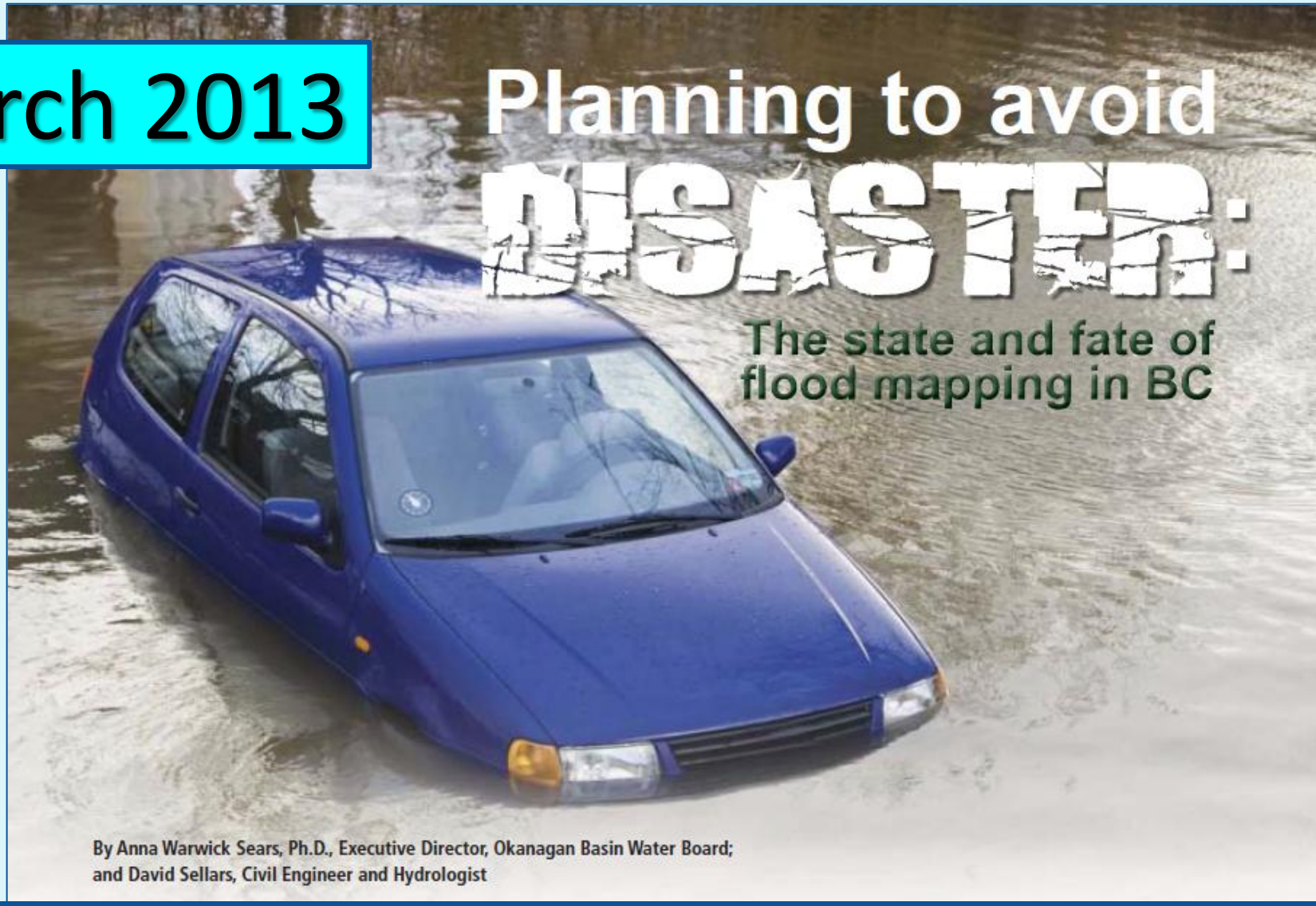



ENDERBY
ARMSTRONG
Vernon Creek
VERNON
Kalamalka Lake
Okanagan Lake
Boundary of Okanagan Watershed upstream of the Canada/U.S. border
KELOWNA
PEACHLAND
SUMMERLAND
PENTICTON
PRINCETON
Skaha Lake
KEREMEOS
OLIVER
Okanogan River
OSOYOOS
GREENWOOD
WASHINGTON (USA)
Zozel Dam
BRITISH COLUMBIA
VANCOUVER
KELOWNA
USA
VICTORIA


snow in highlands
rain
snowpack in highlands
snowmelt
plant transpiration and evaporation
Vernon
reservoir
reservoir
infiltration
groundwater flow
evaporation
Kelowna
municipal water
waste water
agricultural water use
water supply
aquifer
well
well
aquifer
groundwater flow
fractured rock
silt, sand, and gravel

Historical context

March 2013



Planning to avoid DISASTER:

The state and fate of flood mapping in BC

By Anna Warwick Sears, Ph.D., Executive Director, Okanagan Basin Water Board;
and David Sellars, Civil Engineer and Hydrologist

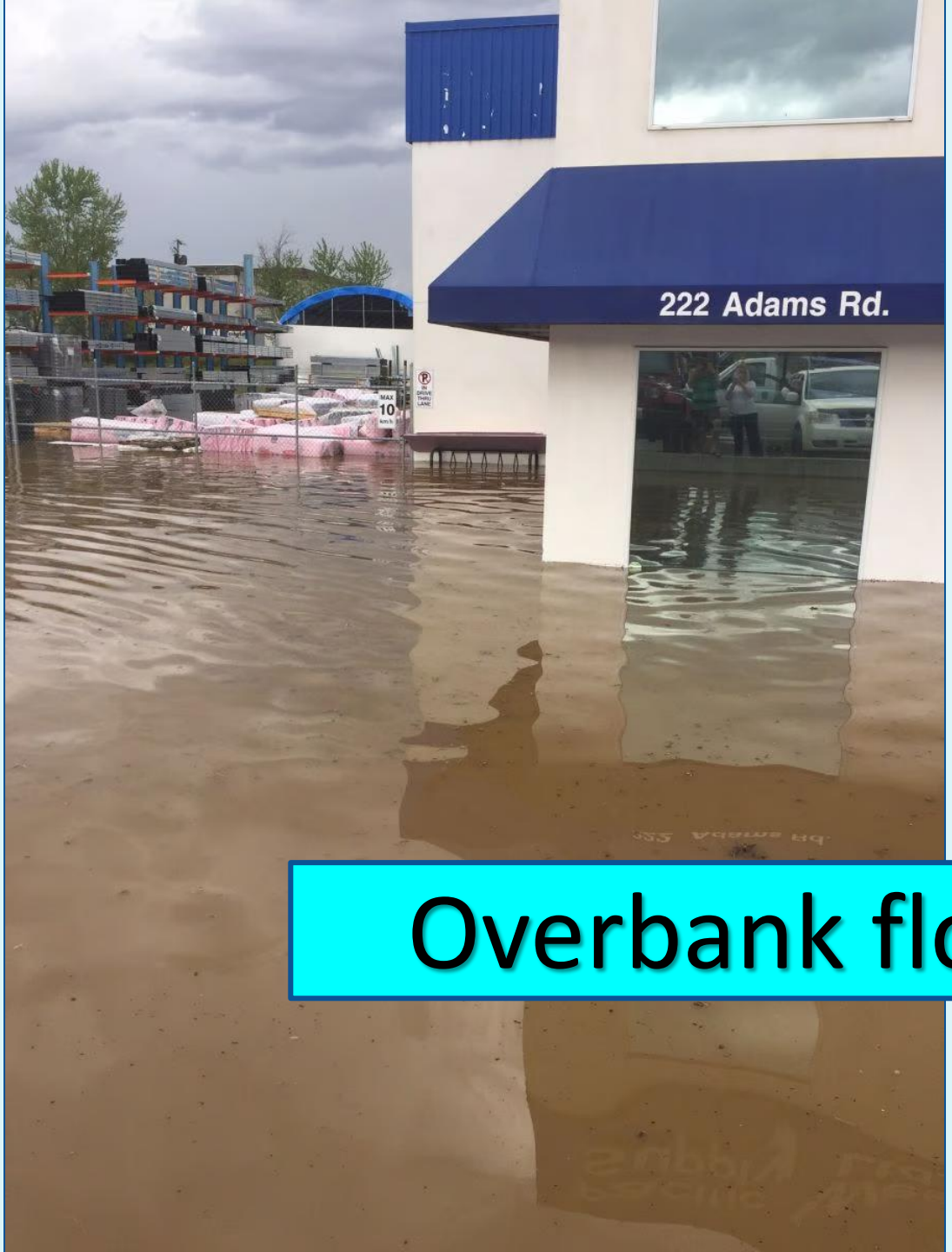
BC Floodplain mapping working group

2014

Meetings and workshops built a network


When floods arrived, we were slightly more prepared
2017

Millions in damages



Overbank flooding

Golf courses on the floodplain…

Government support for mapping

- *"Although flood mapping, planning, and zoning are within local government jurisdiction,* ***senior governments do not want to fund protection of new development within flood plains or at risk of flooding****. [It] would be practical for everyone to have the same, updated flood construction levels around the lake, common criteria for mapping, and similar land use management guidelines."* – Lotte Flint-Petersen, EMBC, January, 2018

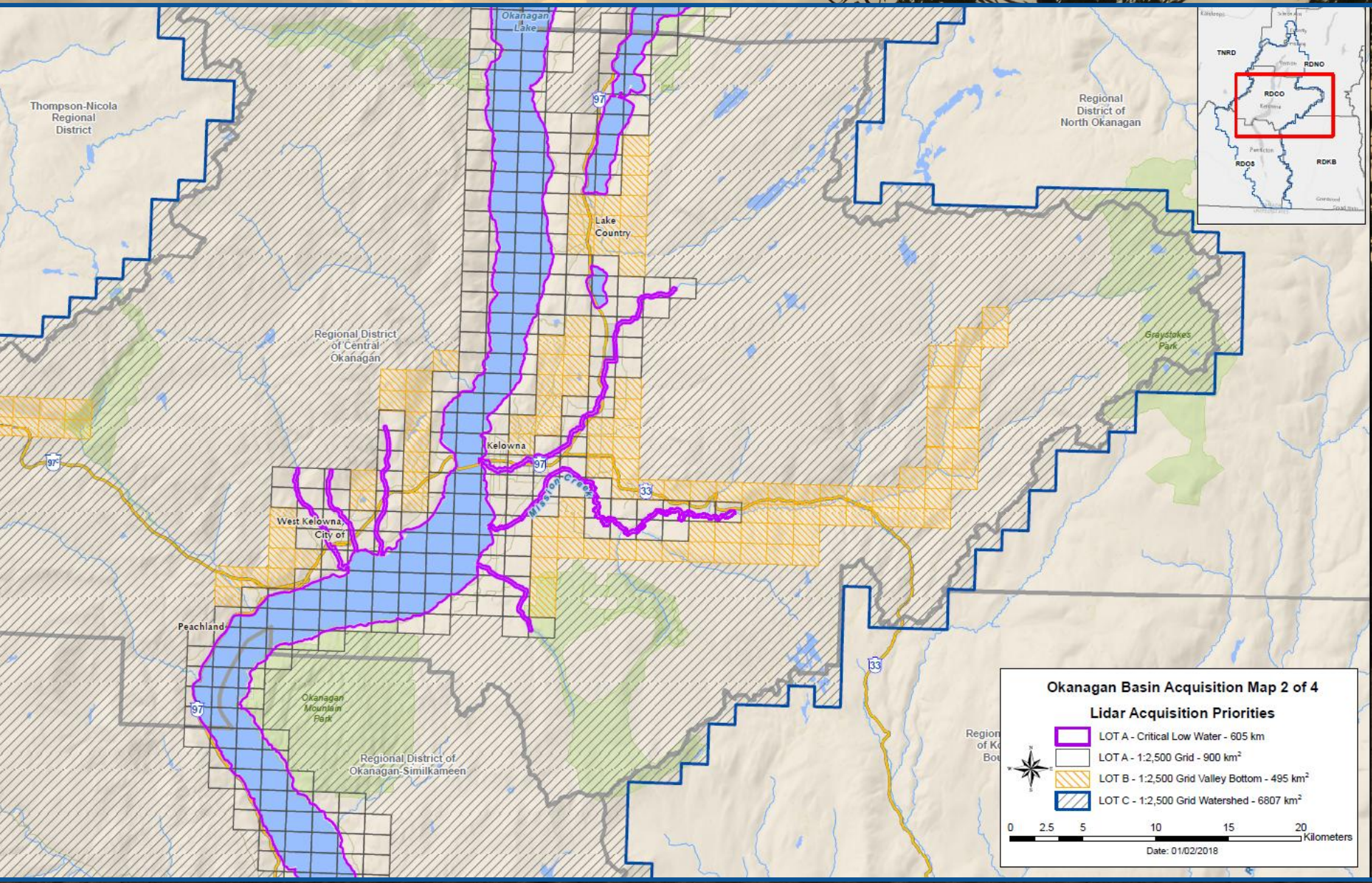
Flood mapping partnerships

OBWB coordinated applications

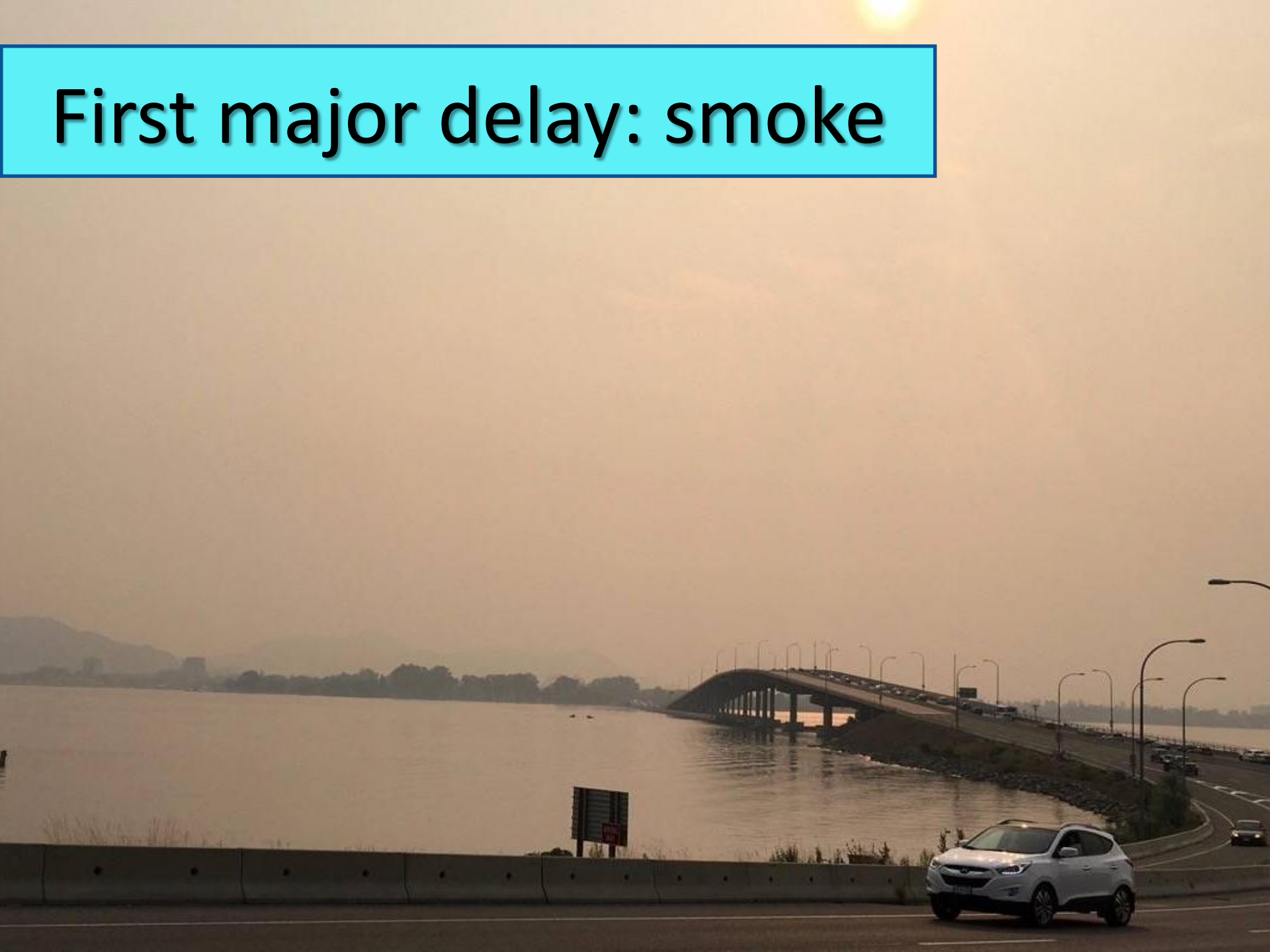
- NDMP
  - RDOS, RDCO, ONA, Kelowna, Armstrong
- CEPF
  - RDCO, RDNO, Kelowna, Armstrong, Penticton

2018 EMBC LiDAR funding

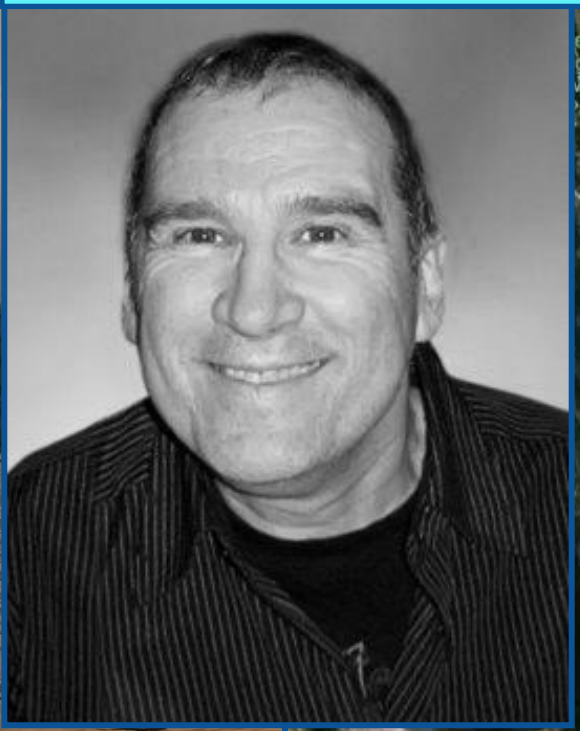
- Collaboration pays!
- First step before mapping
- All LiDAR/orthophotos done as one giant project, including upper watersheds
- Most widely used of all flood mapping products

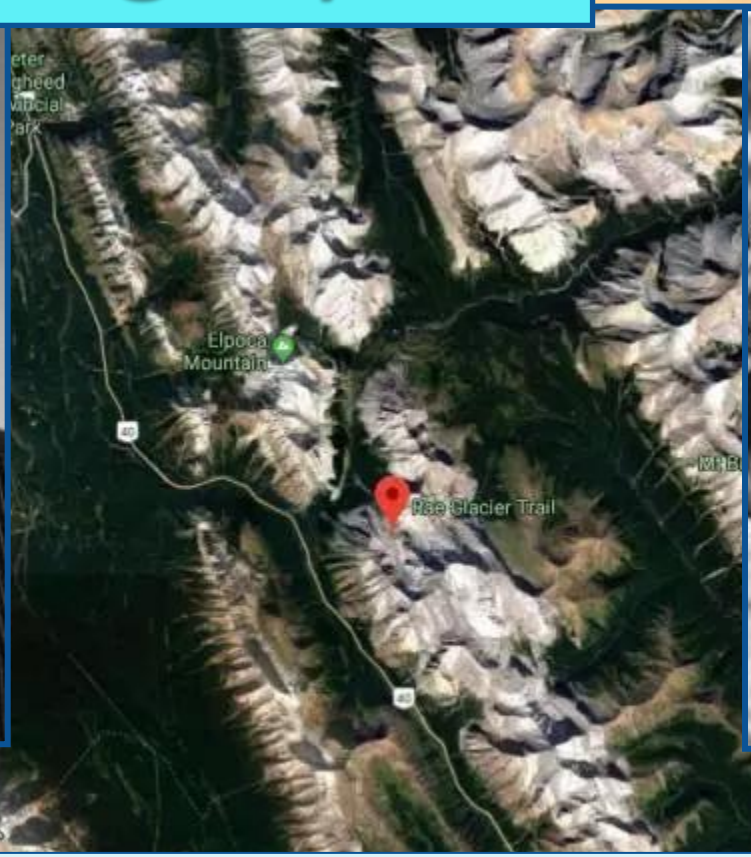

Okanagan Lake
Thompson-Nicola Regional District
Regional District of North Okanagan
Lake Country
Regional District of Central Okanagan
Graystokes Park
Kelowna
Mission Creek
West Kelowna, City of
Peachland
Okanagan Mountain Park
Regional District of Okanagan-Similkameen
97
33
TNRD
RDNO
RDCO
RDOS
RDKB
Okanagan Basin Acquisition Map 2 of 4
Lidar Acquisition Priorities
LOT A - Critical Low Water - 605 km
LOT A - 1:2,500 Grid - 900 km²
LOT B - 1:2,500 Grid Valley Bottom - 495 km²
LOT C - 1:2,500 Grid Watershed - 6807 km²
0 2.5 5 10 15 20
Kilometers
Date: 01/02/2018

First major delay: smoke



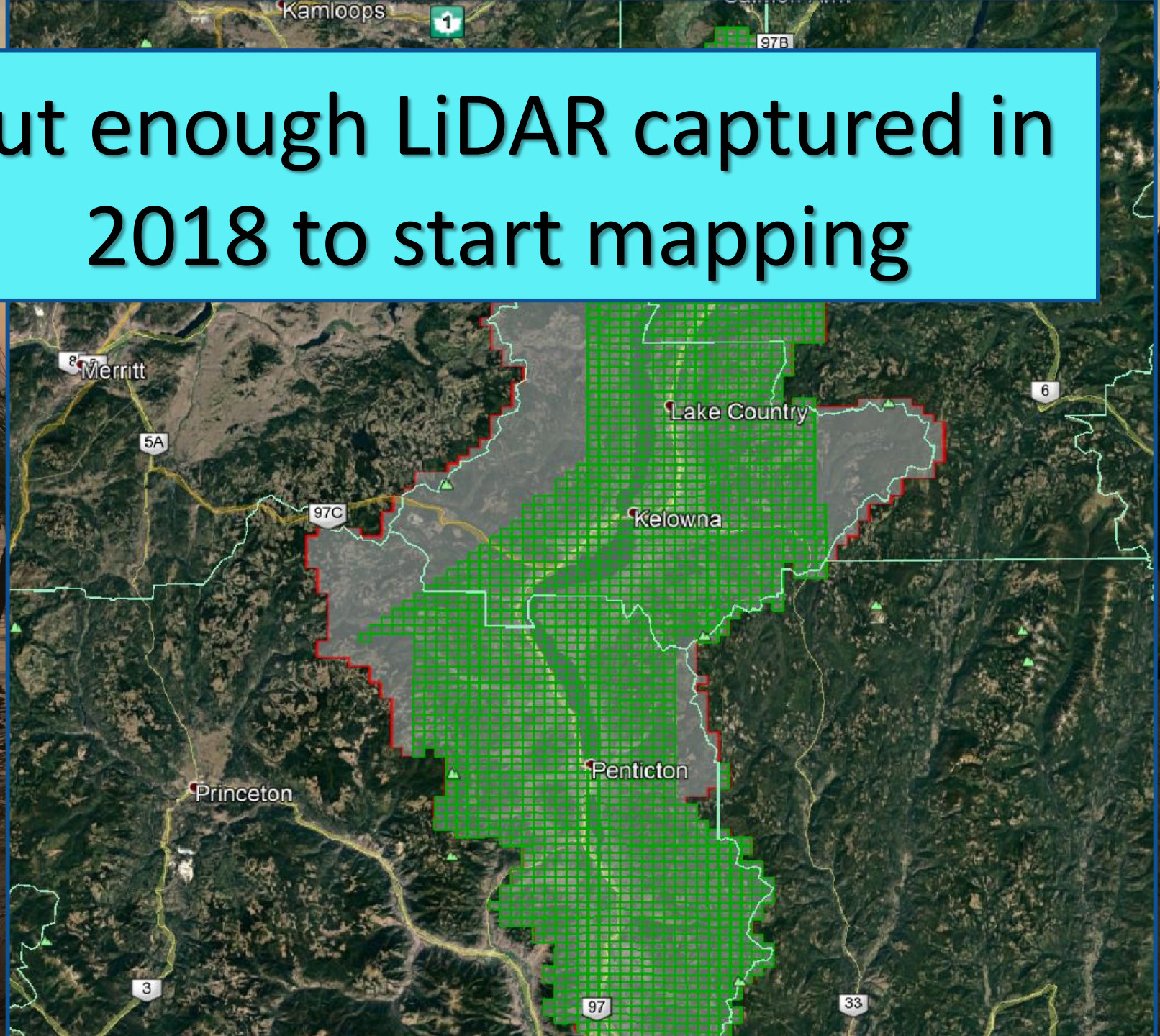
Then a tragedy…





Daniel Thibault and Levi Vandenbrink, Kananaskis, August 1, 2018

But enough LiDAR captured in 2018 to start mapping

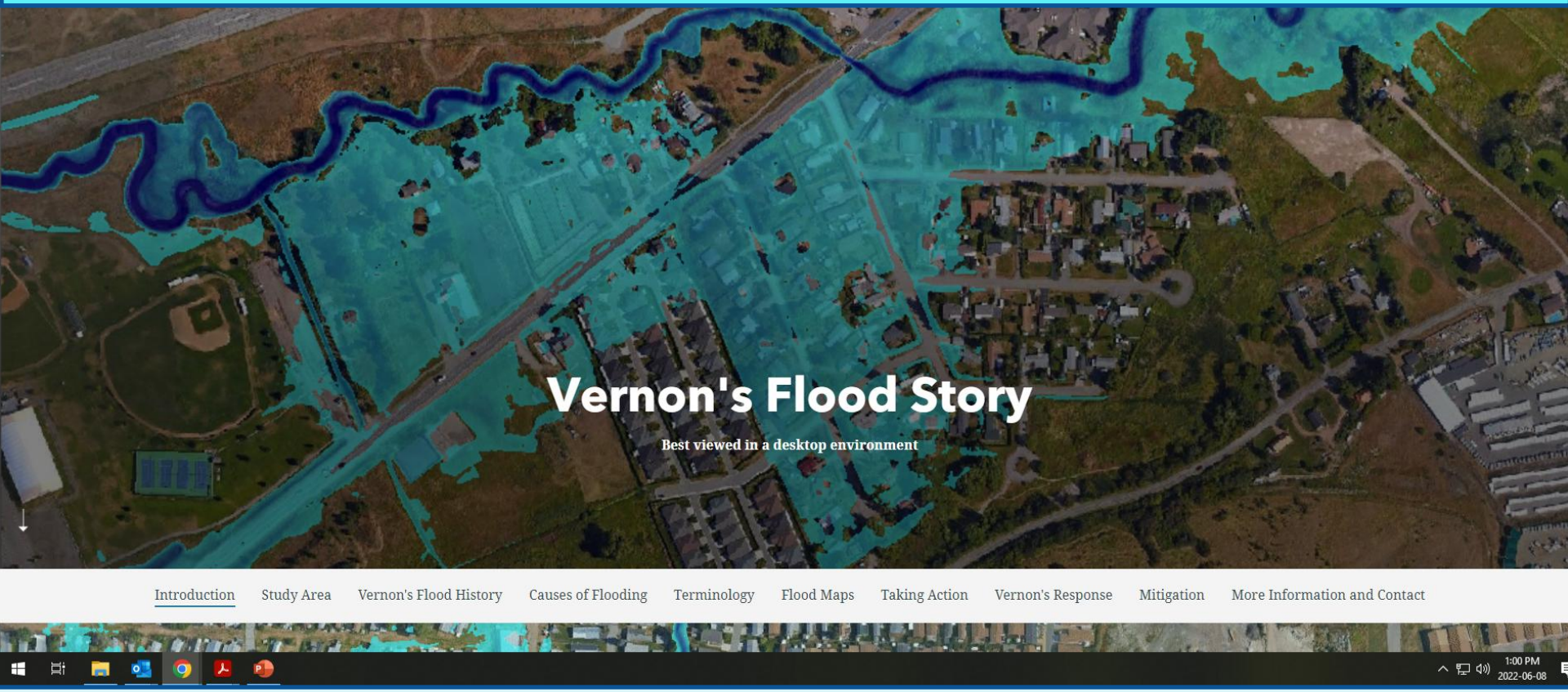


March 2020: State of the art floodplain maps, with climate considerations

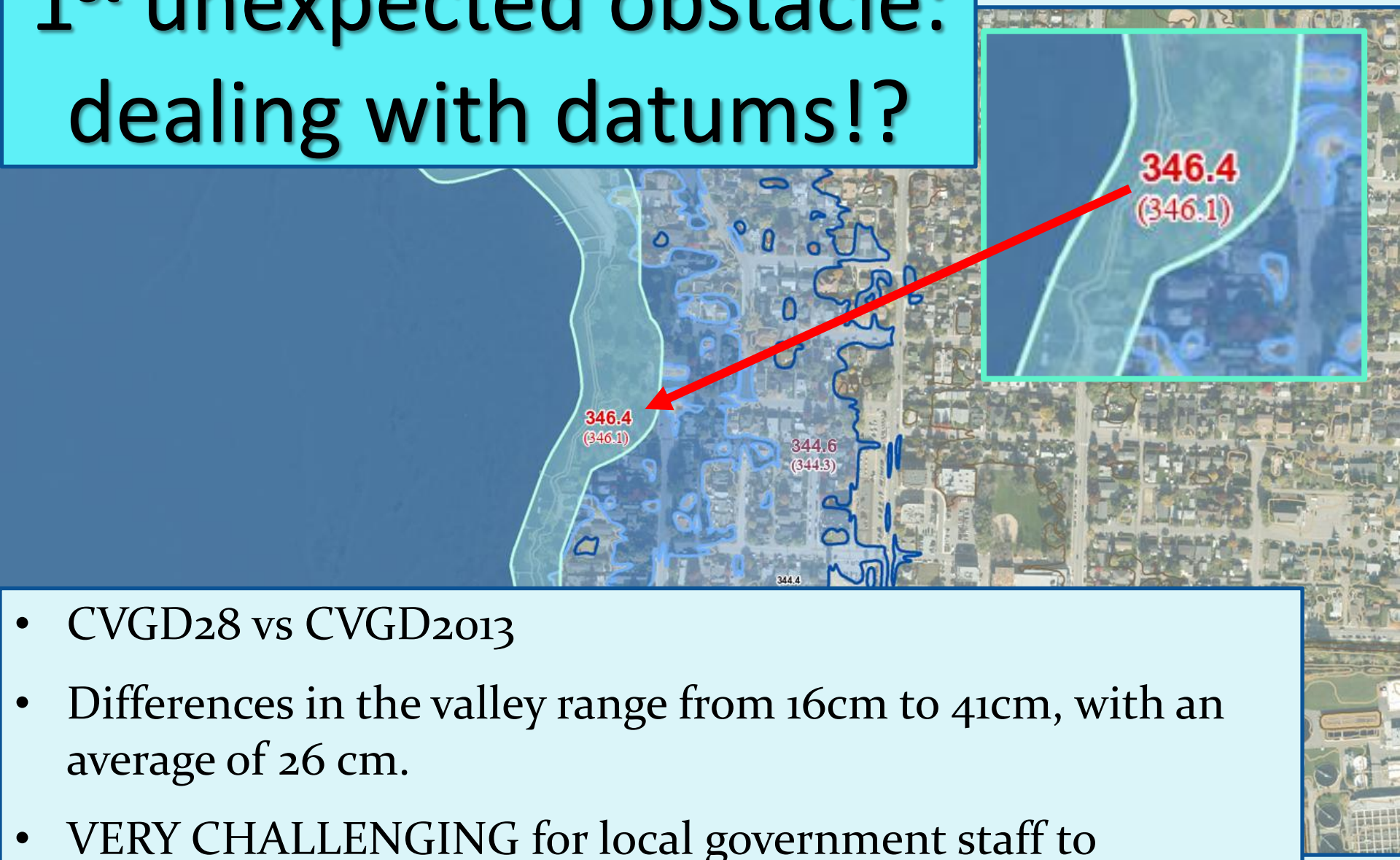
Excited to get on to implementation!

Great flood maps, provided to every community

Yet 5 years later, only one community has fully incorporated them?



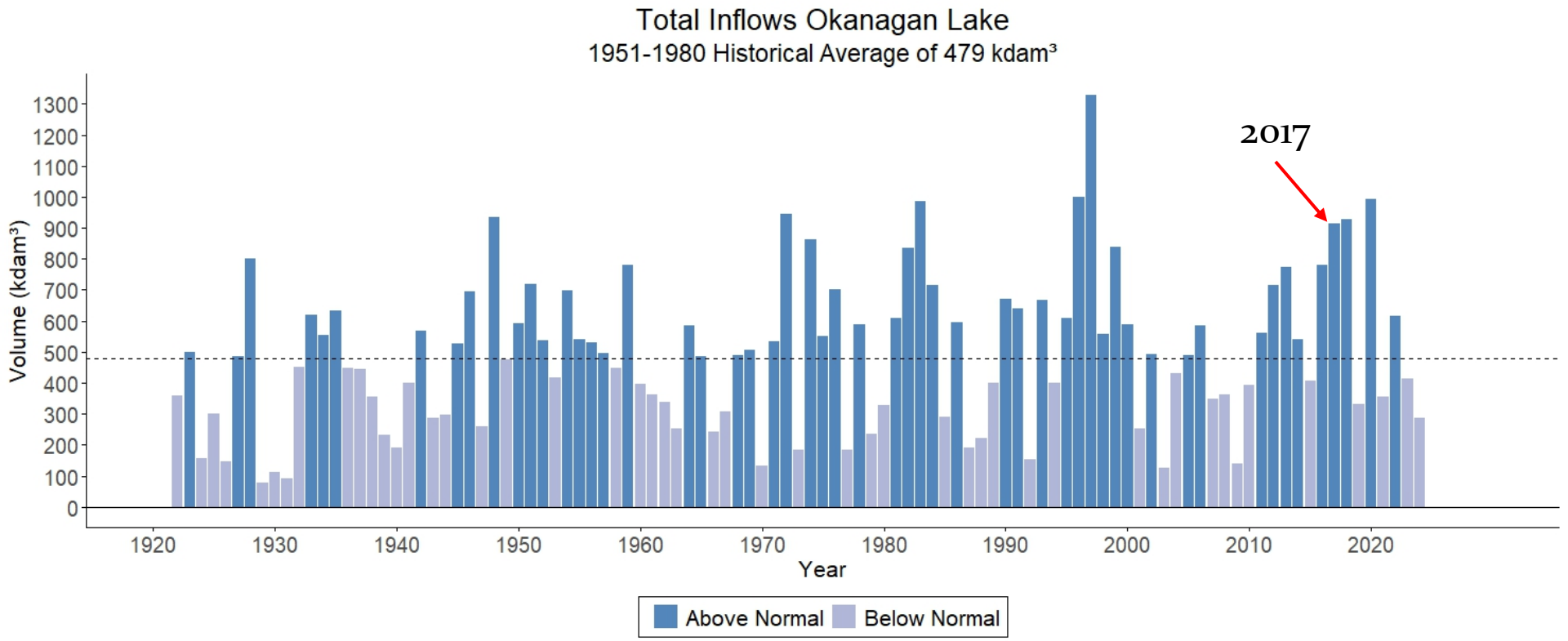
1st unexpected obstacle: dealing with datums!?



- CVGD28 vs CVGD2013
- Differences in the valley range from 16cm to 41cm, with an average of 26 cm.
- VERY CHALLENGING for local government staff to understand and work with

Next issue: flood maps don't reflect current dam operations…

2017 not abnormally wet year…



…but became the “flood of record”

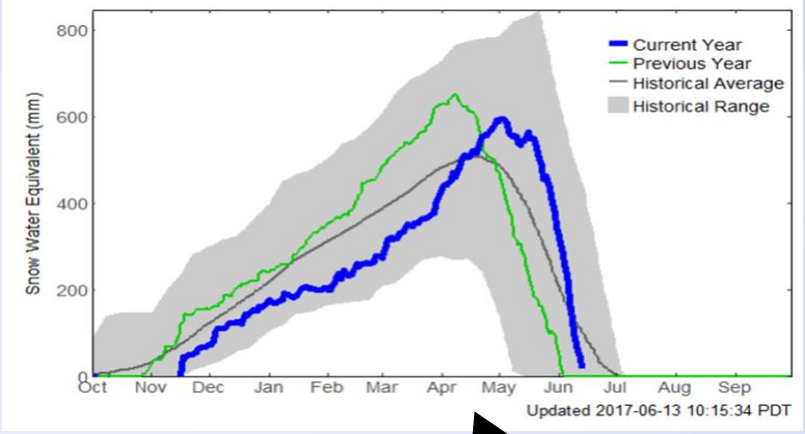
Low snowpack in early winter, meant extra water was stored in the lake

Ministry of Forests, Lands and Natural Resource Operations

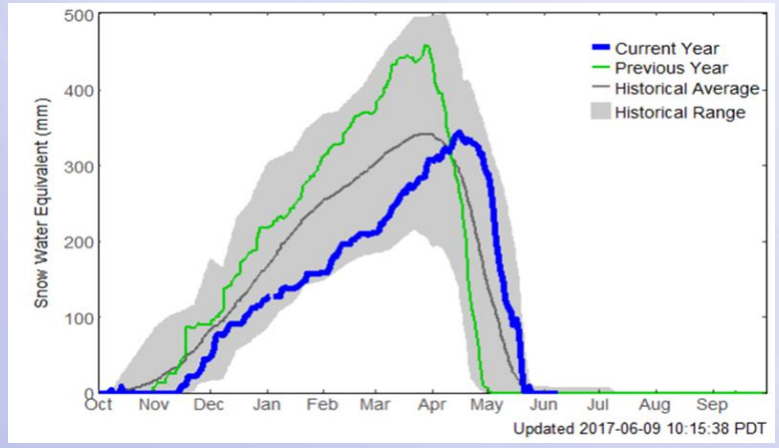
Okanagan Snow Basin Indices		
	2017	2016
01-Jan	79%	125%
01-Feb	79%	122%
01-Mar	86%	123%
01-Apr	105%	131%
01-May	147%	75%

The Snow Basin Index represents snow monthly snow measurements taken at approximately 20 snow stations spread throughout the valley. The table above shows how this year compared to last year.

Automated Snow Station: Mission Creek 2F05P



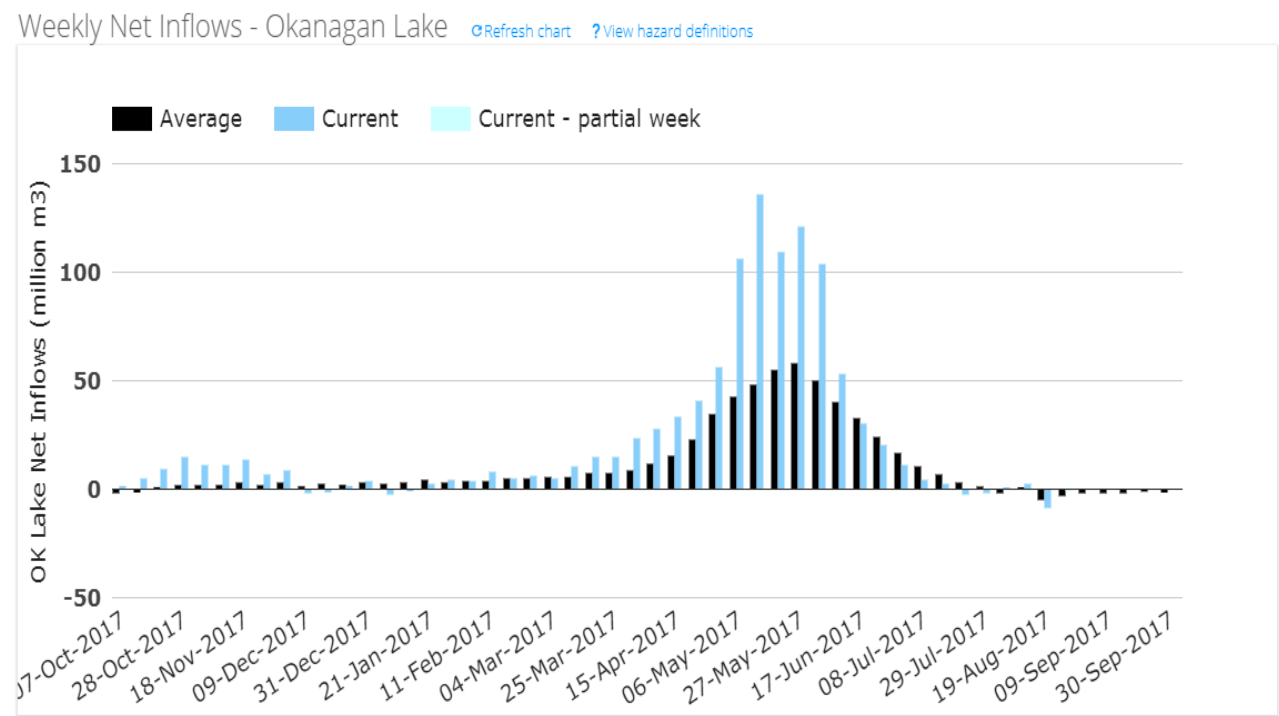
Early Decisions regarding lake levels reflected the snow conditions at the time. The graphs of two Automated Snow Stations show this year's snow water equivalent (shown in blue) and show the progression through the early spring this year. Note that it remained just above normal (black line) and even below last year (green line).



Freshet was faster and higher than could be released

Ministry of **Forests, Lands and Natural Resource Operations**

2017 Okanagan Lake Inflows



- **Every 3.46 Million m^3 = 1 centimetre on Lake**
- **Week ending May 13th was 39 cm on Lake**
- **No previous record of 5 weeks of inflow > 100 M m^3**
- **Lake outlfows maximized at 11 to 12 cm per week.**

“Current operations” = very frequent flooding starting very soon

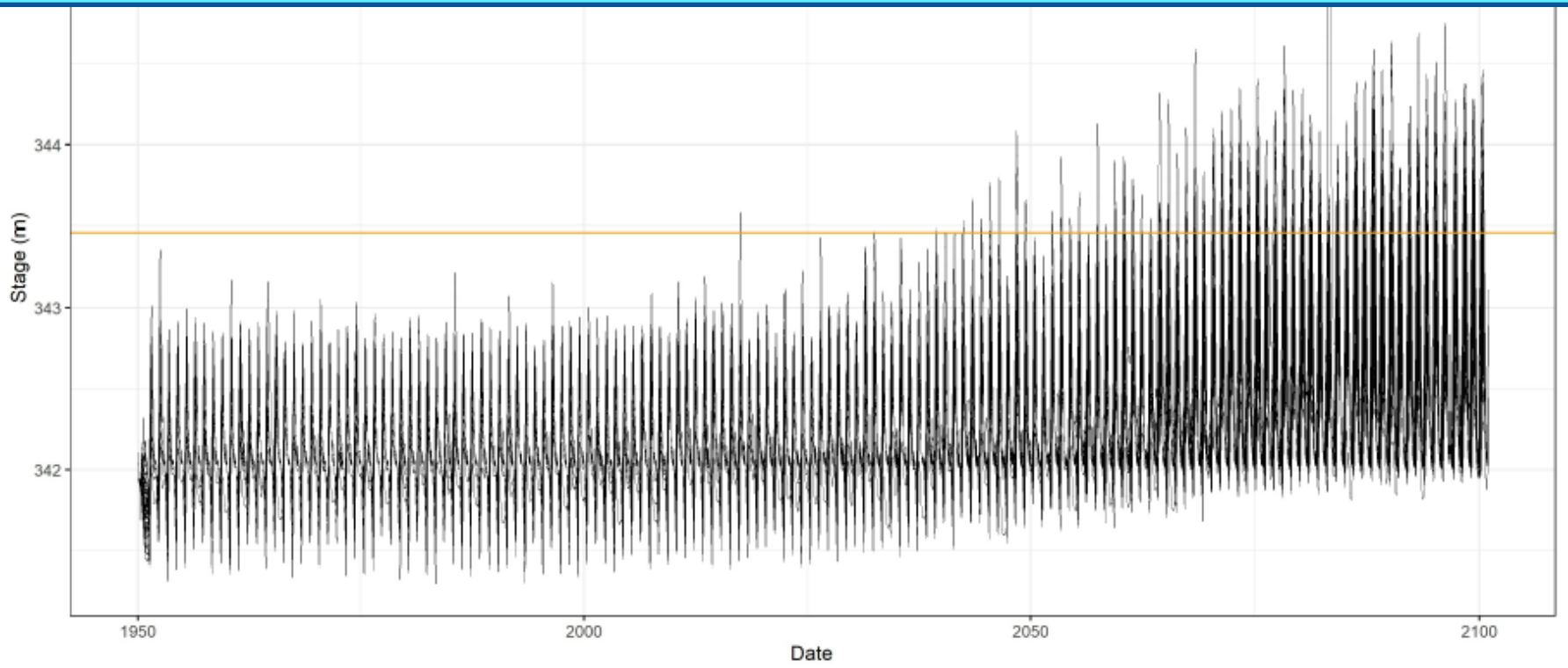


Figure 3-28 Lake levels at Okanagan Lake from 1950 to 2100 for the present regulation scenario; orange line indicates 2017 maximum lake level.

Instead, mapped “Modified operations”

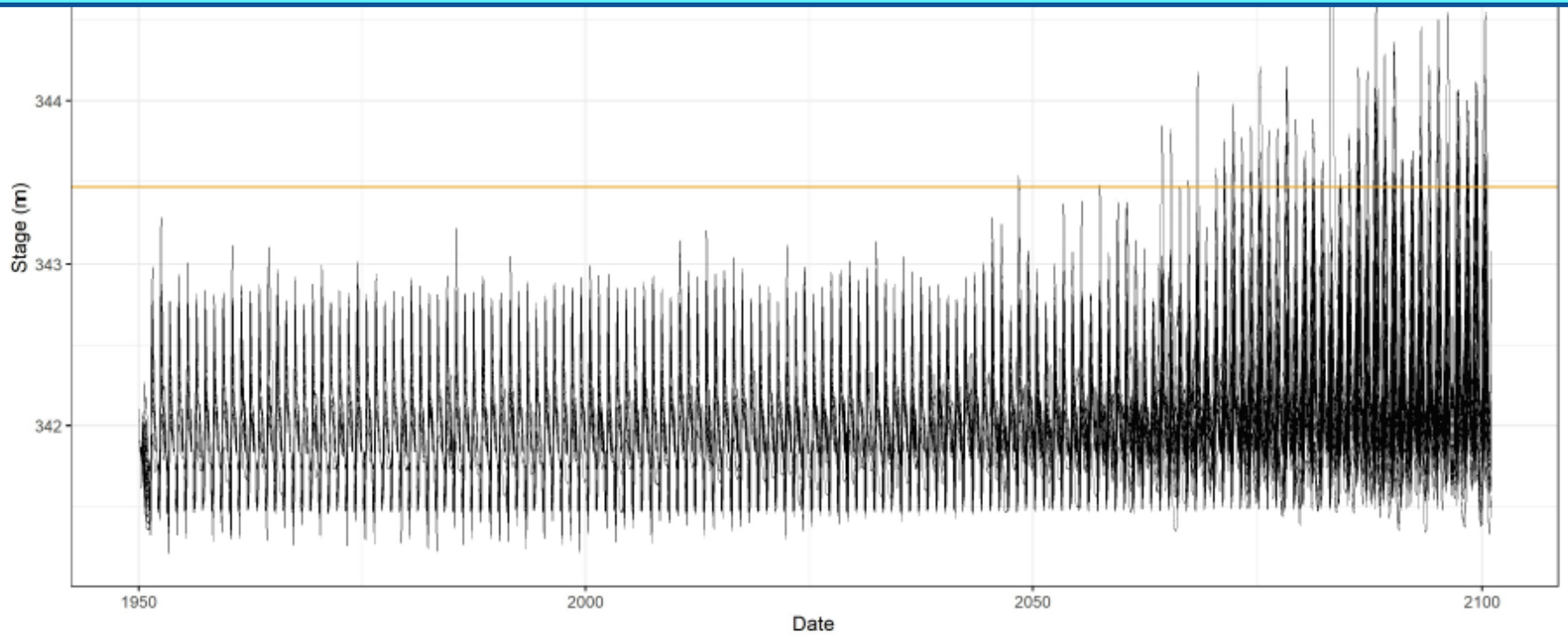


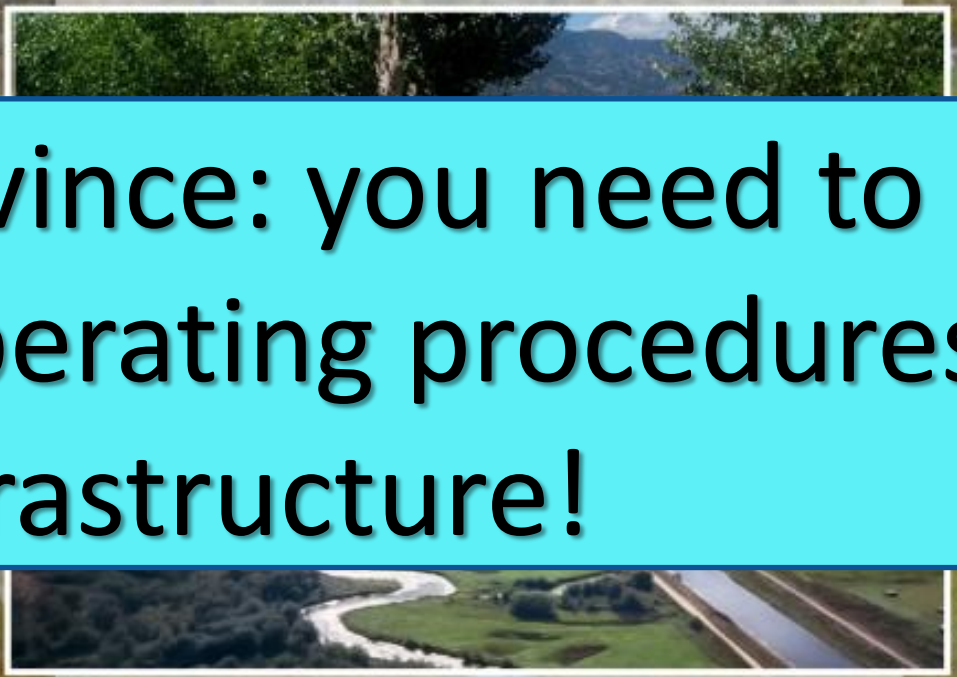
Figure 3-29 **Lake levels at Okanagan Lake for the future regulation scenario from 1950 to 2100; orange line indicates 2017 maximum lake level.**

“Modified operations” – original maps

“Current operations” – new maps

Advice to communities: use “modified” FCLs as minimum elevations

Plan of Study for Modernizing the Okanagan Lake Regulation System: Final Report



Advice to Province: you need to change dam operating procedures and infrastructure!

Other flood projects along the way

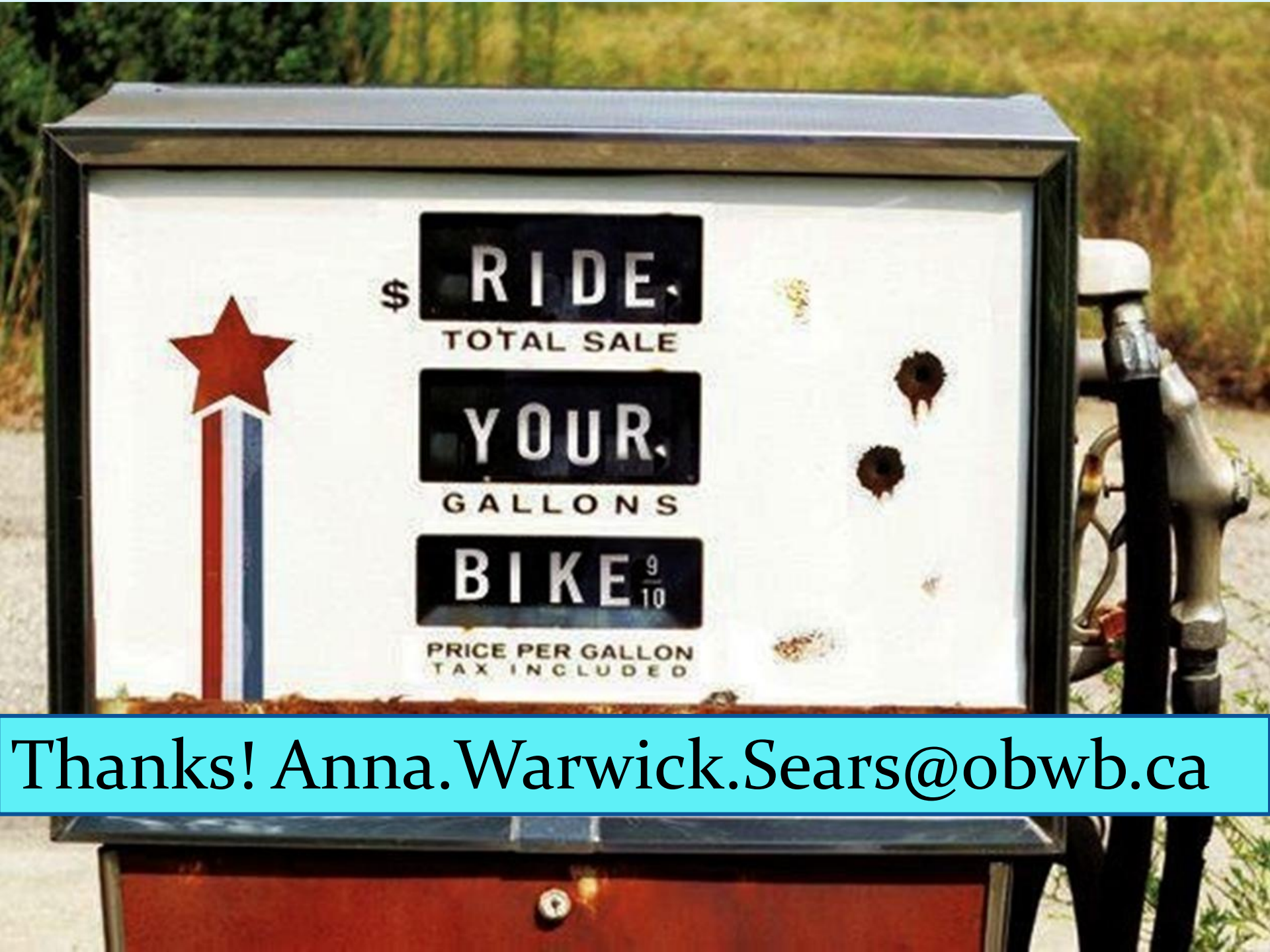
- Non-structural flood mitigation guide (RDCO)
- Near-shore bathymetric LiDAR (includes US portion of watershed)
- Valley-wide flood risk mapping (not enough data/resolution)
- Comprehensive review of Okanagan flood-related bylaws (so far very slow to change)
- Climate modeling and hydrology modeling to support further mapping – including IJC work
- *Keeping up the momentum for the Okanagan Lake Regulation System review and update*

Other ongoing obstacles

- One community did their own low-budget flood maps and EMBC had to do an intervention
- Public-facing website was too detailed, and we had to build a simple ‘public website’, in addition to ‘expert user’ website
- GeoBC couldn’t host our LiDAR on their portal (unexplained reasons) - instead, we share around physical hard drive
- No public place to store transboundary data (same hard drive hack as above)
- Communities not prioritizing FCL updates
- BC not prioritizing Okanagan Lake Regulation System review and infrastructure upgrades

What can you do to help?

- Keep funding flowing for flood mapping
- Require updated FCLs as a condition for infrastructure funding (where maps are in place)
- Encourage regional flood mapping/planning groups
- Require open-source hydrology modeling
- Get on with the Datum conversion (!)
- Improve data collection methods and mapping standards



Thanks! Anna.Warwick.Sears@obwb.ca