Thompson River Watershed Geohazards Studies: Project Update

Location: Cache Creek (May 2017)

February 25, 2019

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Project Context & Milestones

2019

March
- Thompson River Watershed (TRW) Geohazard Risk Prioritization (completed)

April
- TNRD base level floodplain mapping;
  CRD flood risk & CSRD flood and steep creek risk prioritization kickoff

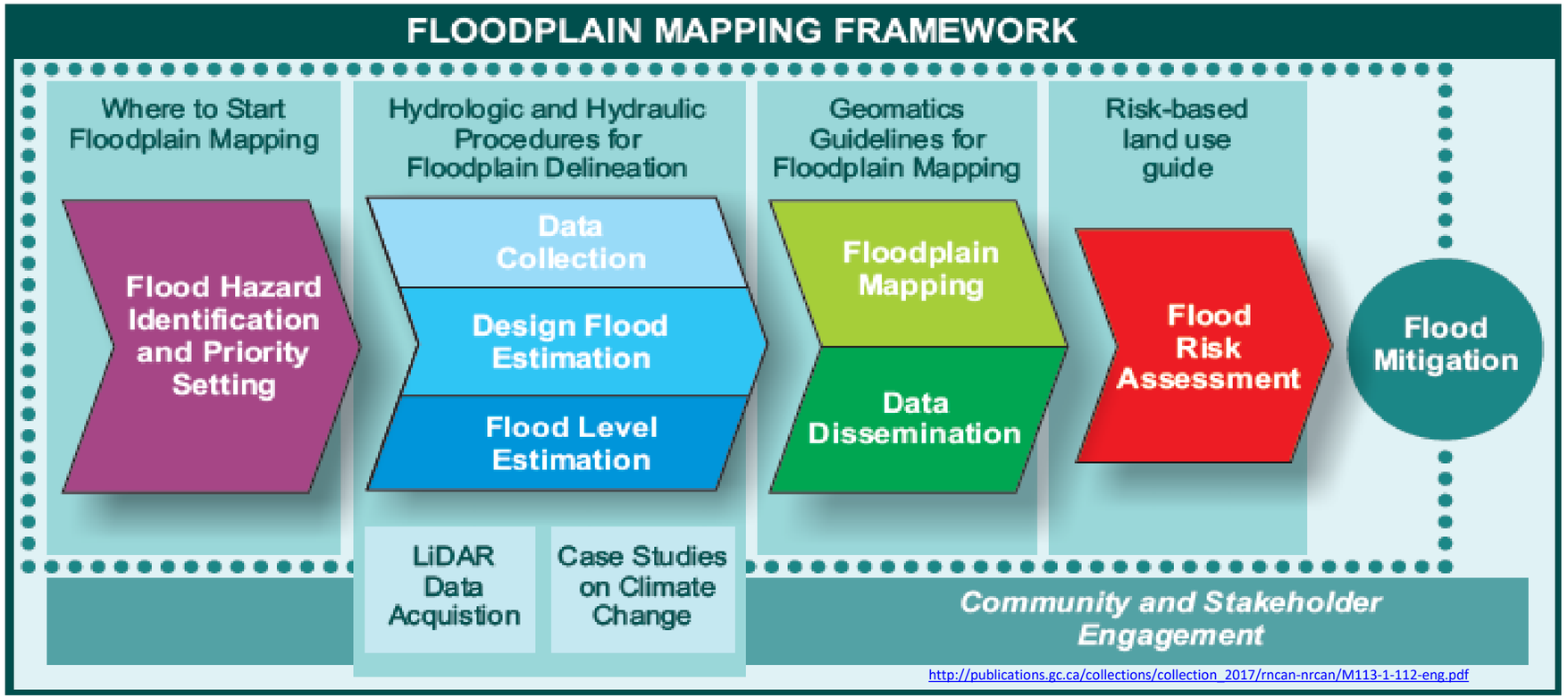
Aug.
- TRW lidar acquisition kickoff (Terra Remote Sensing)

Jan.
- UBCM CEPF funding application – flood risk assessment (proposed)

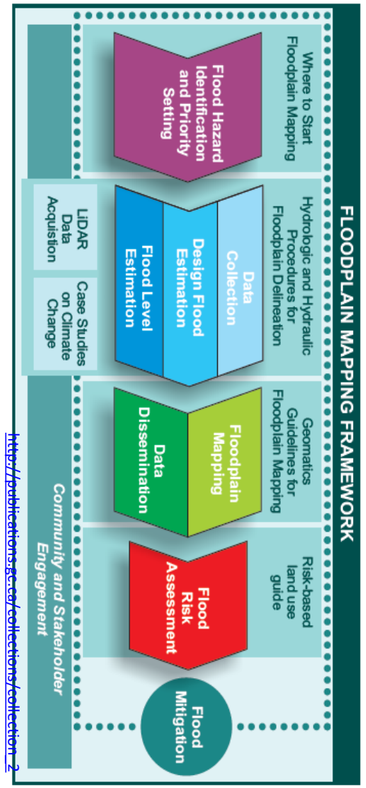
May
- CSRD risk prioritization (due March 31)
- CRD risk prioritization; TRW Flood Hazard Mapping (due May 29, 2019)

2020

The work is being completed in the context of a federal floodplain mapping framework.



The floodplain mapping framework is an example of a risk management framework.



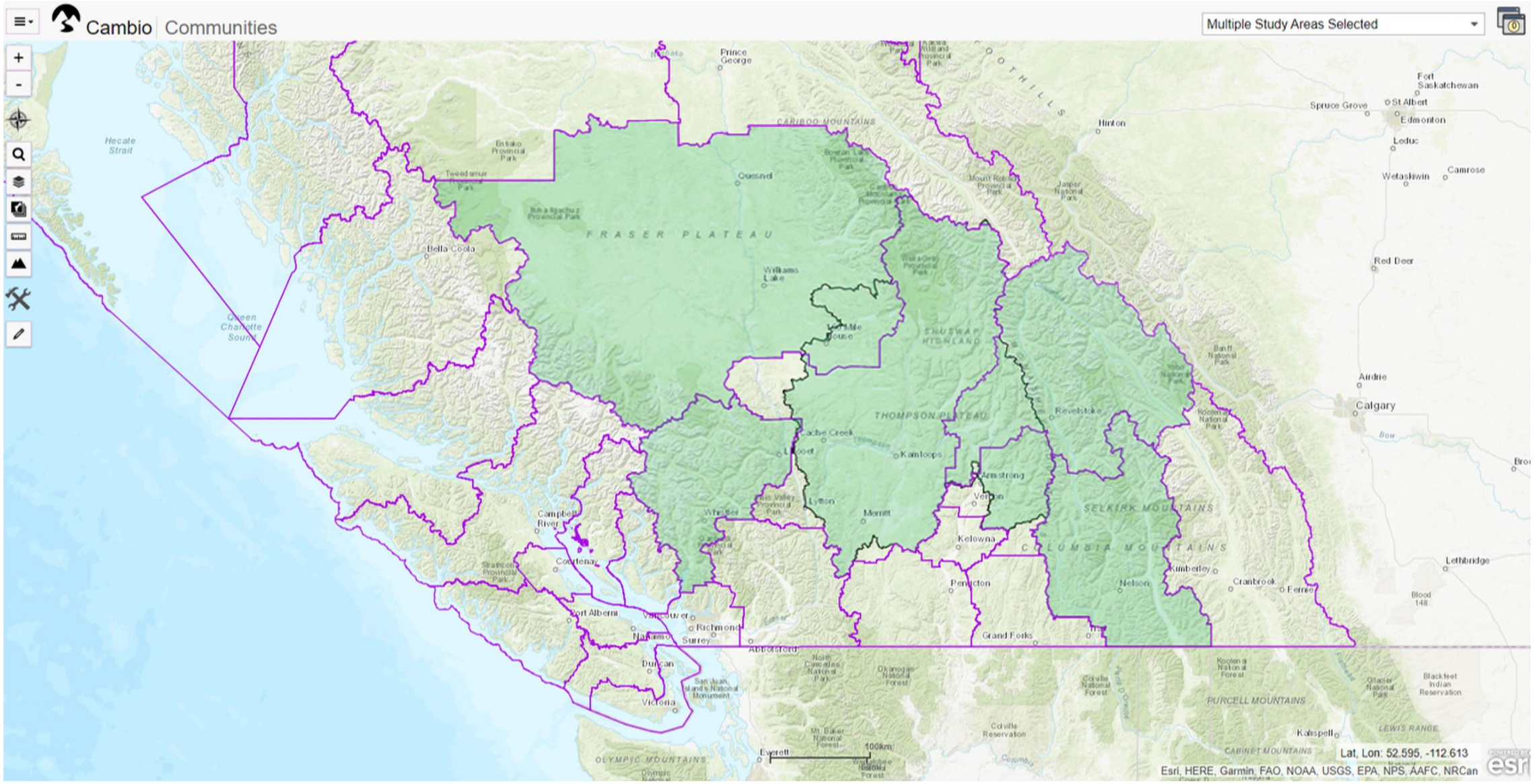
http://publications.gc.ca/collections/collection_2017/rncan-nrcan/M113-1-112-eng.pdf

1. Identify priorities.
2. Analyze hazards.
3. Analyze hazard exposure (elements at risk)
4. Estimate risks.
5. Evaluate levels of risk tolerability.
6. Develop risk reduction plans.
7. Implement and monitor risk reduction plans.

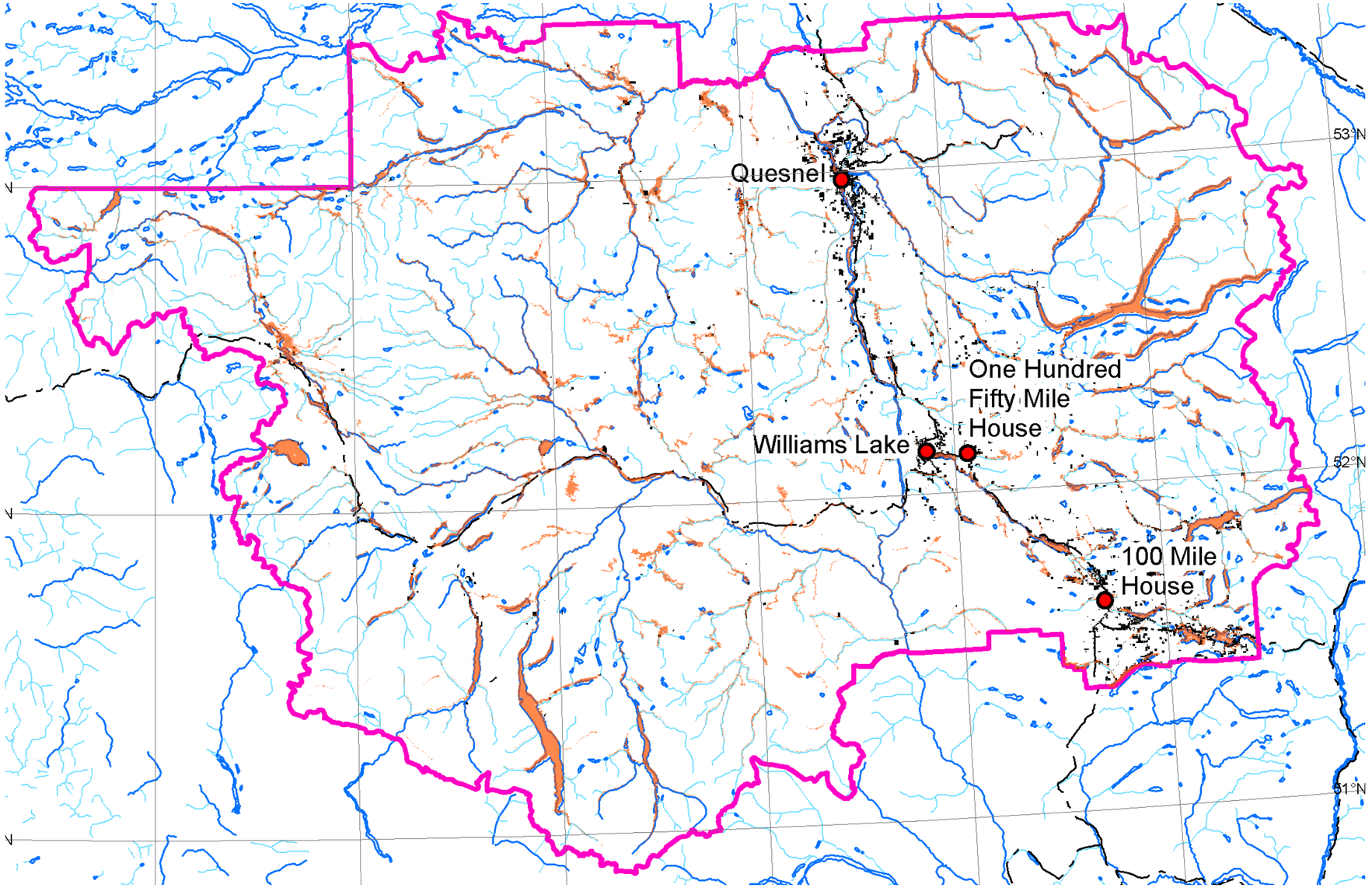
The TRW Geohazard Risk Prioritization (March 31, 2019) was foundational to the current work.

- Geohazard characterization (clear-water floods, landslide-dam floods & steep creeks)
- Exposure characterization (elements at risk)
- Risk prioritization
- Risk communication (via web map)
- Gap identification & recommendations for further assessment.

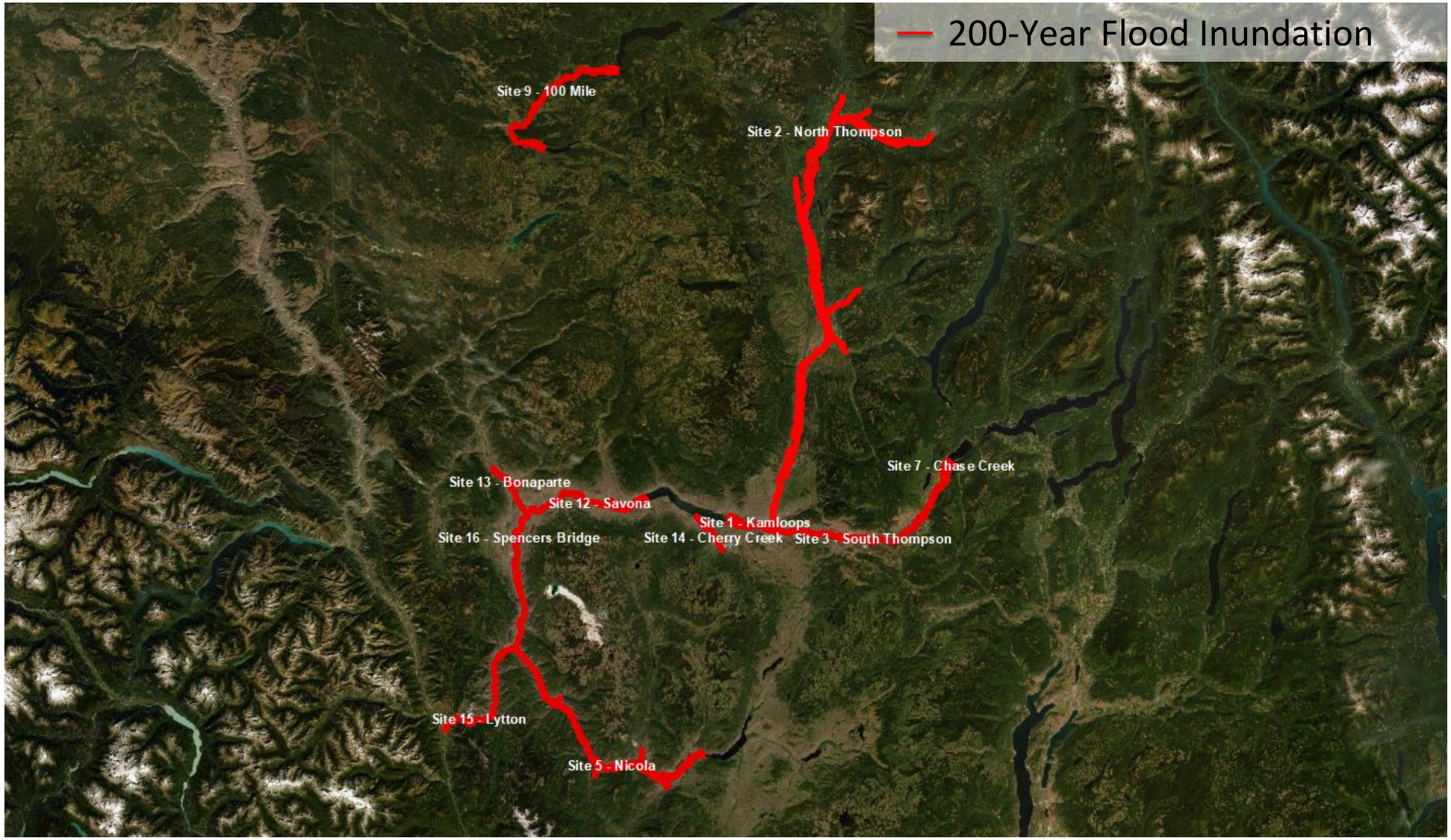
Cariboo RD and Columbia Shuswap RD Geohazard Risk Prioritization studies extend the March 31, TRW study across the remainder of the CRD & CSRD.



Floodplain identification and exposure (elements at risk) assessment has been completed across the CRD.



The TRW “Base level” floodplain mapping project fills an identified gap: the lack of floodplain mapping across most of the TRW.



Three levels of detail of floodplain mapping will build on each other.

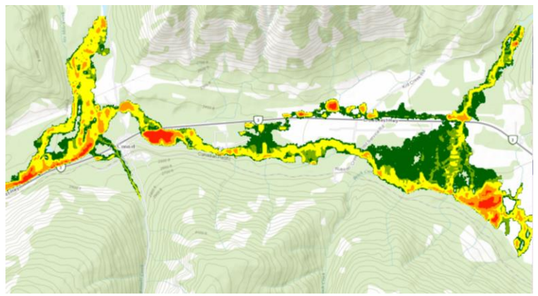
Low → High

Flood Hazard Identification (March 31 2019 study)

Limited hydrology
Topography-based

$

Base Level Floodplain Mapping (current study)



Desktop study
Detailed hydrology
Coarse DEM + limited lidar
No river bathymetry
Screening level hydraulic model

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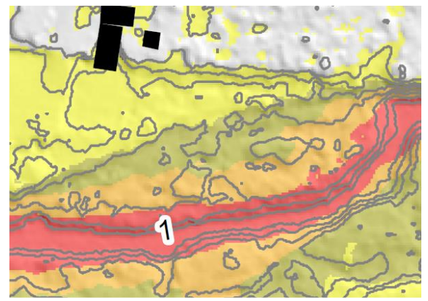
Detailed Floodplain Mapping (Proposed)



Desktop & field study
Detailed hydrology
Detailed topography (lidar)
Detailed bathymetry
Detailed hydraulic model

$$$$

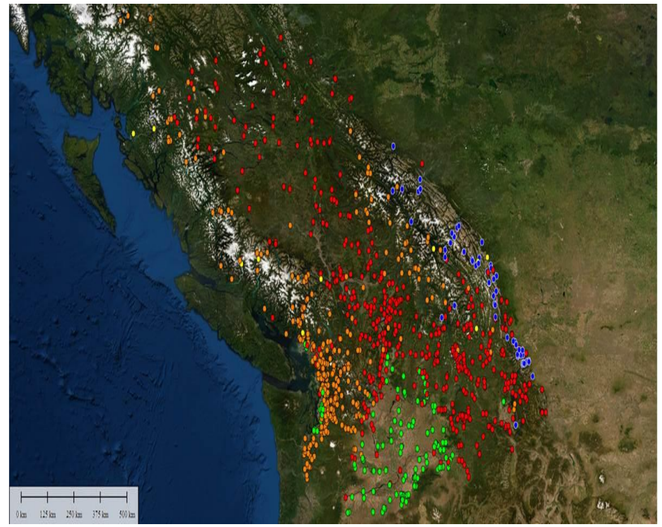
Location: Goldpan Provincial Park / Spence‘s Bridge area.
Credit: Matthew Lato (BGC)

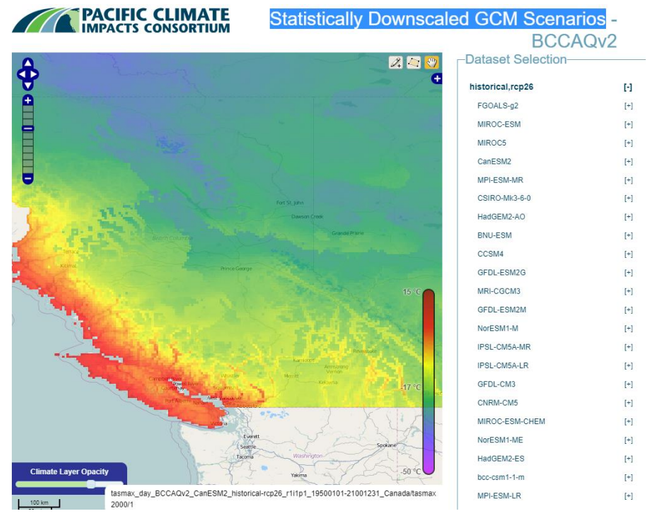
TRW Base Level Flood Hazard Mapping – progress highlights

Hydrologic inputs to flood modelling are based on Regional Flood Frequency Analysis (RFFA) for southern BC.

Hydrologic inputs to flood modelling were based on a RFFA using an index-flood approach that considered climate change:

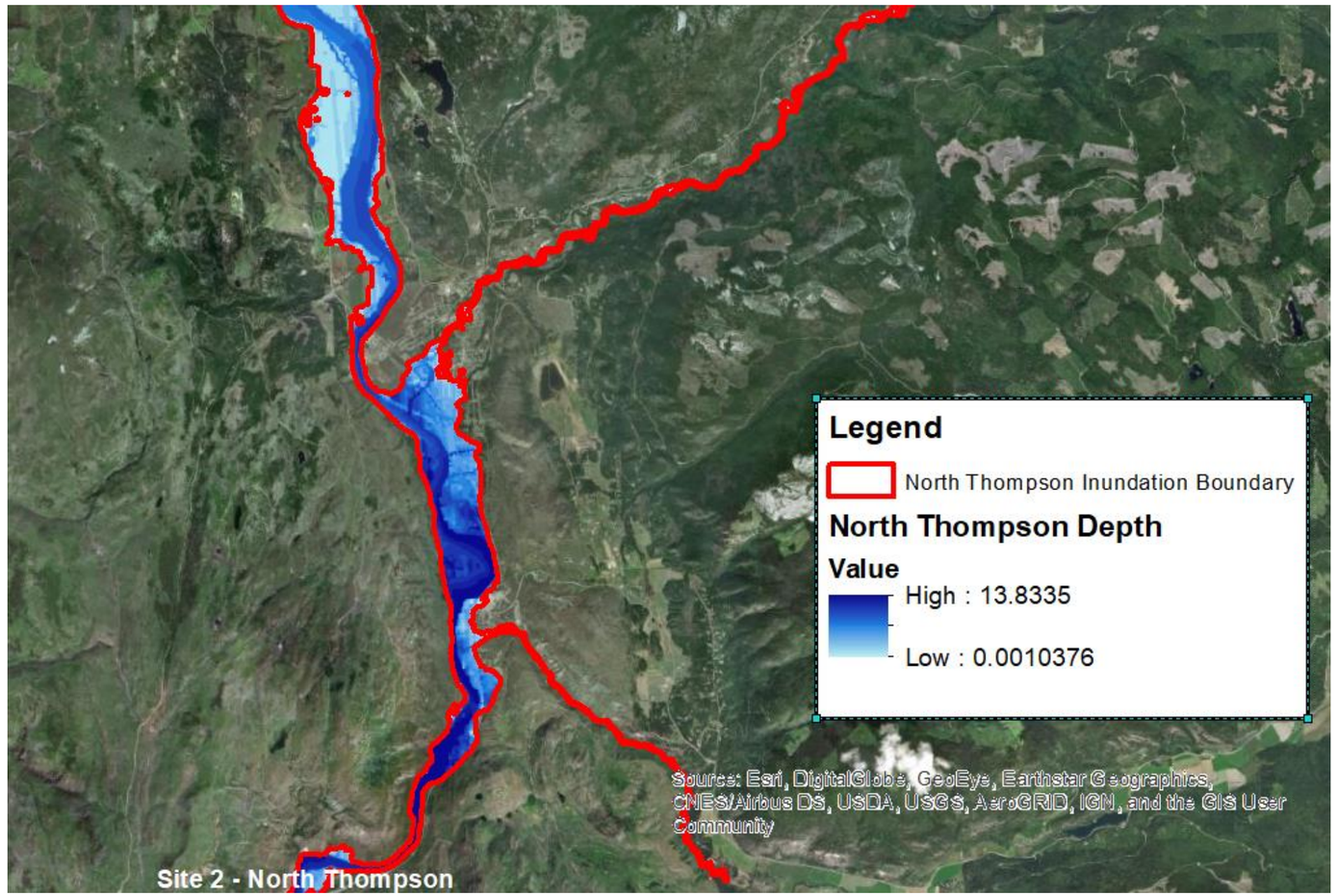
- Considered EGBC guidelines
  - Percent adjustment at all return periods (no specific RCP)
- Applied Statistical approaches:
  - Historical streamflow trend analysis;
  - Climate-adjusted variables into the RFFA (RCP8.5; 2050's)
- Applied process-based approaches(RCP8.5 for the 2050's):
  - From climate-adjusted streamflow trend analysis (PCIC)
  - From downscaled Global Climate Model data





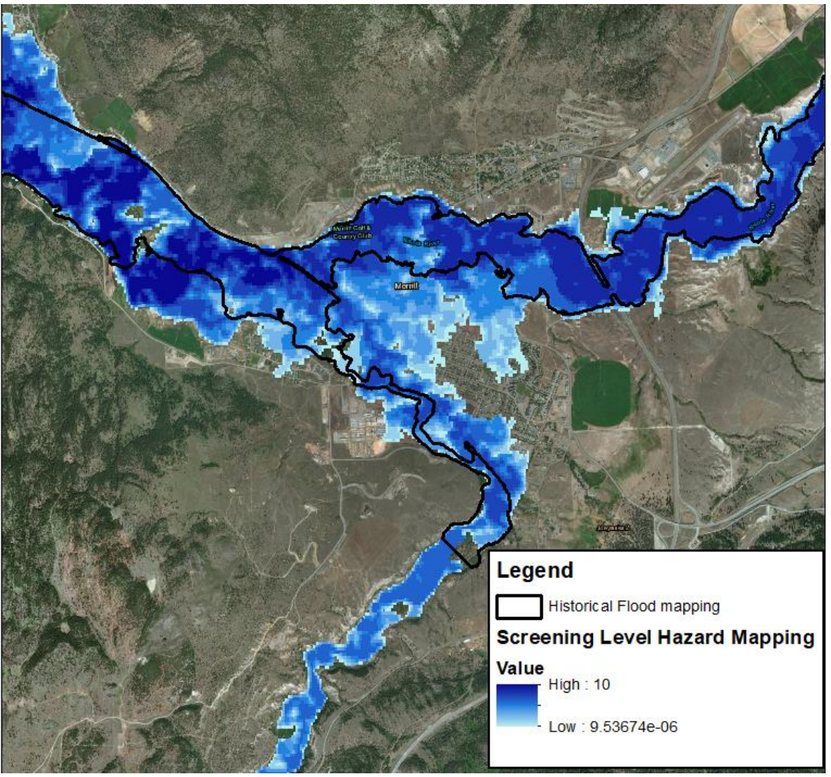
The primary mapping deliverable of current work is an improved 200-year flood inundation boundary compared to the March 31, 2019 study

- 200-year boundary
- Based on hydraulic modelling at relative flood grid elevation = 0
- Assumes climate change inputs
- Does not consider flood mitigation
- Uses lidar if existing (Nicola R.)
- Defers to detailed mapping if existing (e.g. Kamloops)

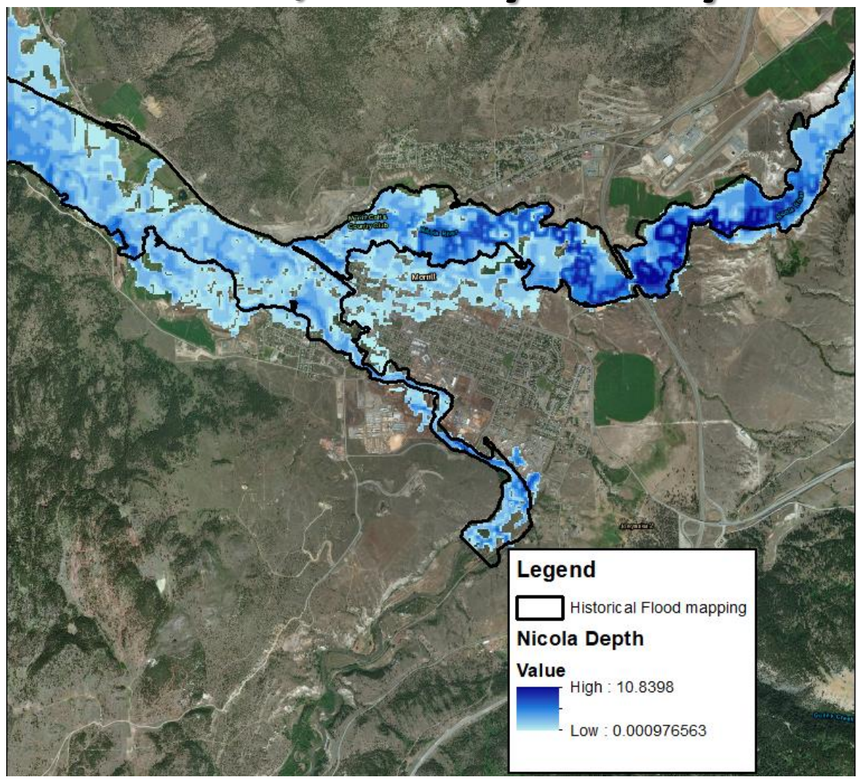


How do different flood modelling approaches compare in terms of inundation boundaries?

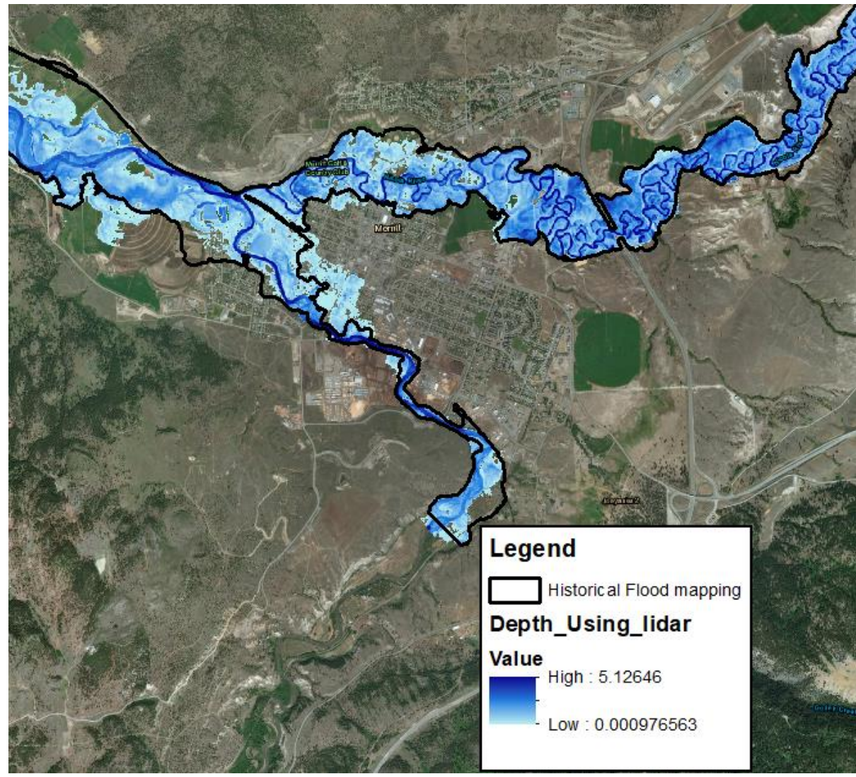
Nicola River, vicinity of City of Merritt



Topographic –based floodplain identification ($)

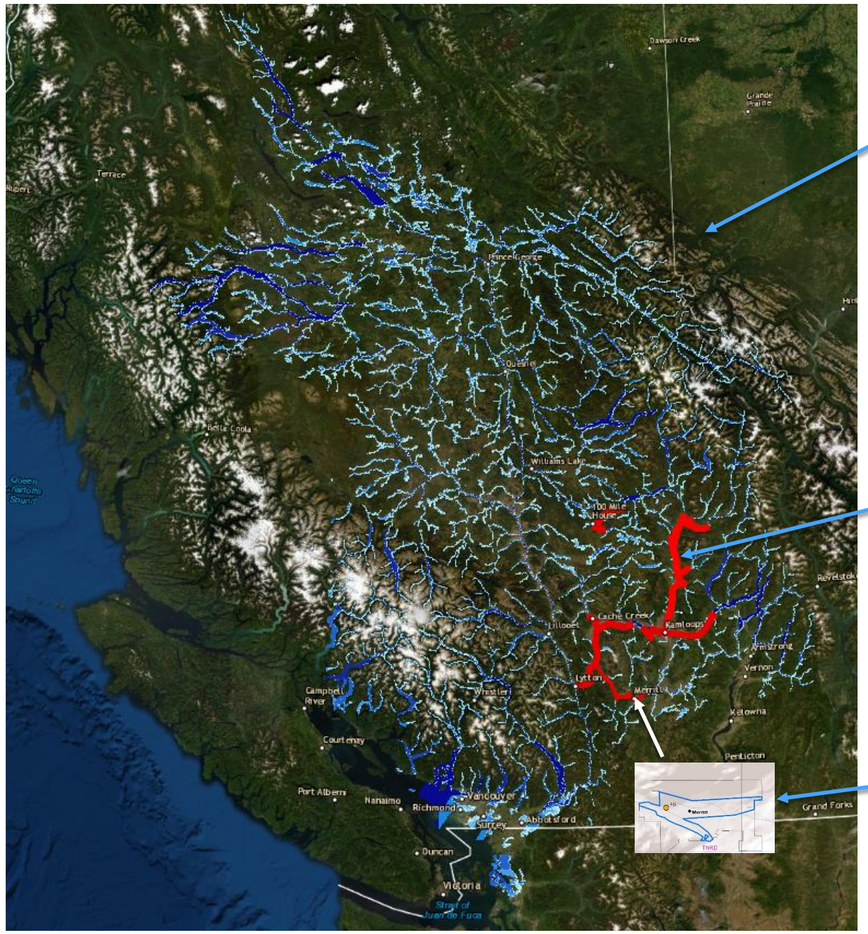


Base level mapping (coarse DEM) ($$)



Base level mapping (Lidar DEM) ($$)

Increased resolution of hazard mapping requires exponentially greater effort in relation to the coverage area.



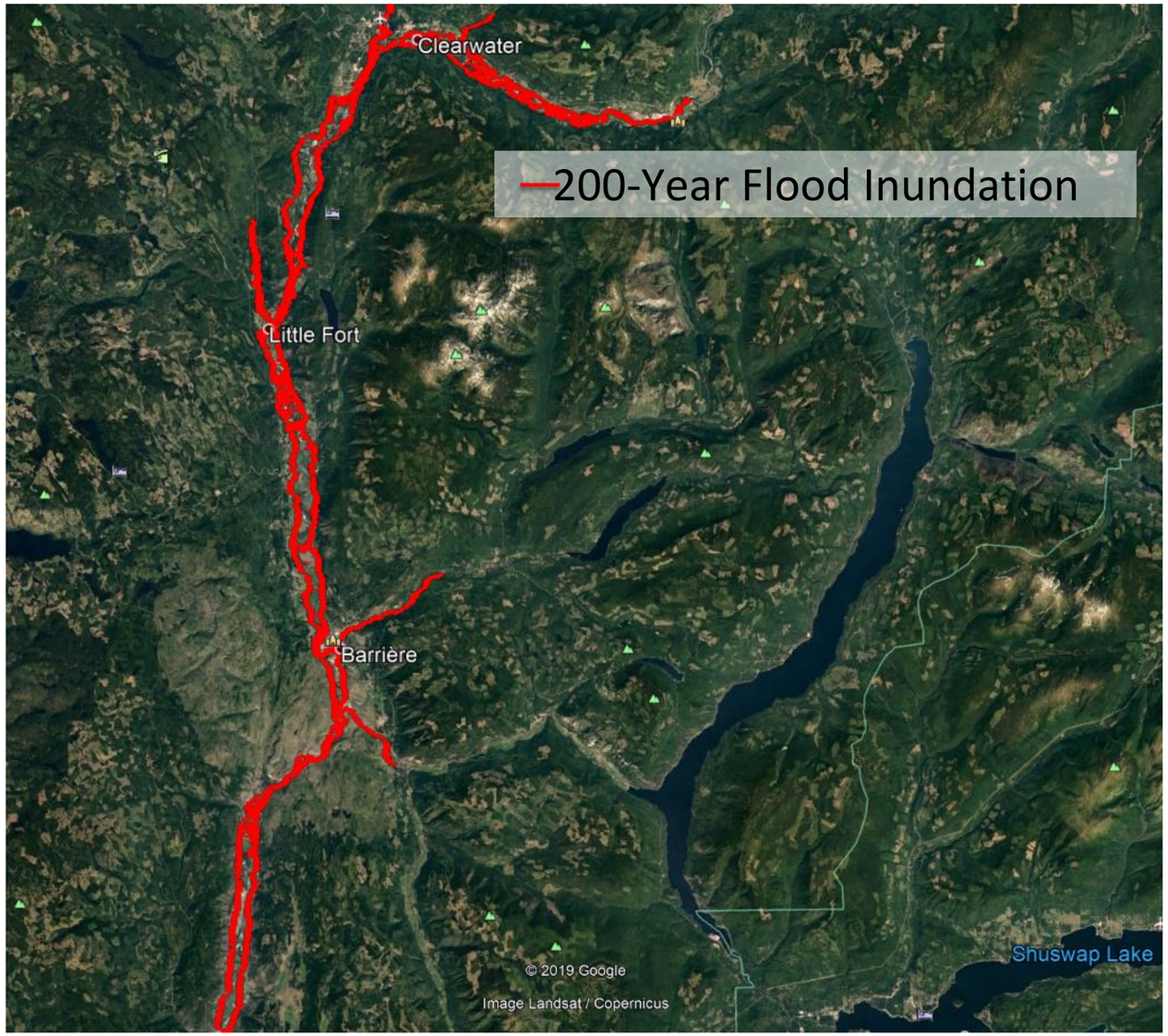
Screening Level Floodplain Identification, entire Fraser and Columbia River Watersheds

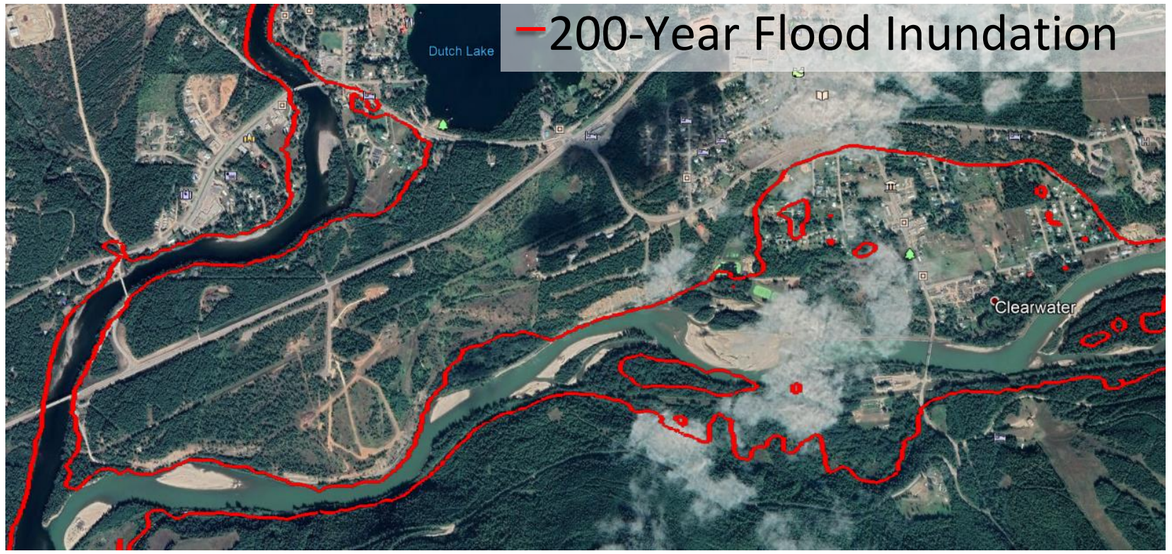
Base Level Flood Hazard Mapping (TRW, ongoing)

Detailed Flood Hazard Mapping, City of Merritt (proposed)

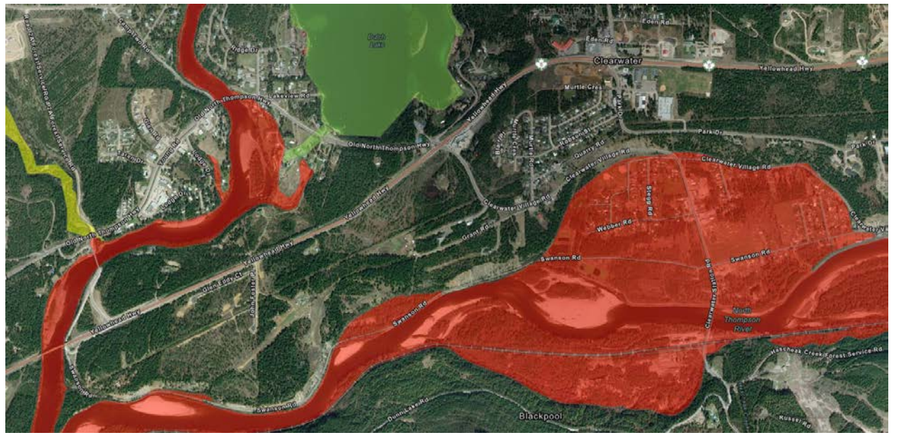
Screening, Base Level, and Detailed studies requiring similar levels of effort.

North Thompson River; Clearwater (Base Level Mapping, Geobase DEM)



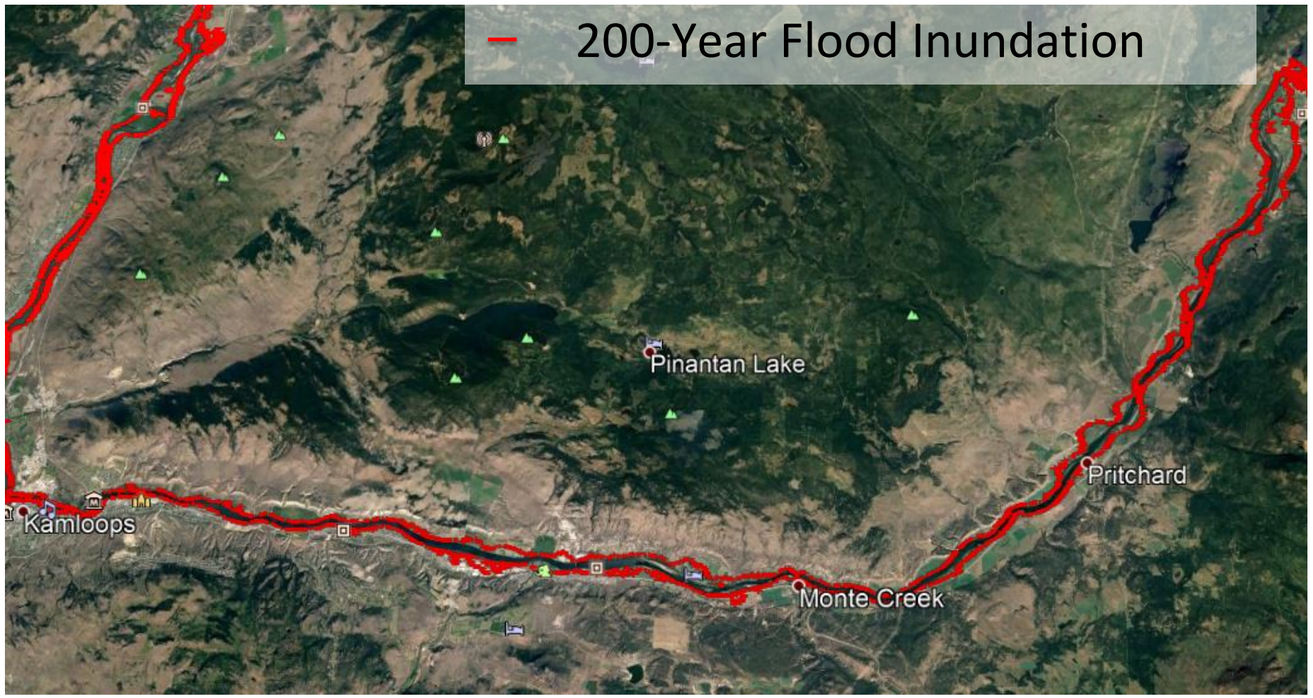


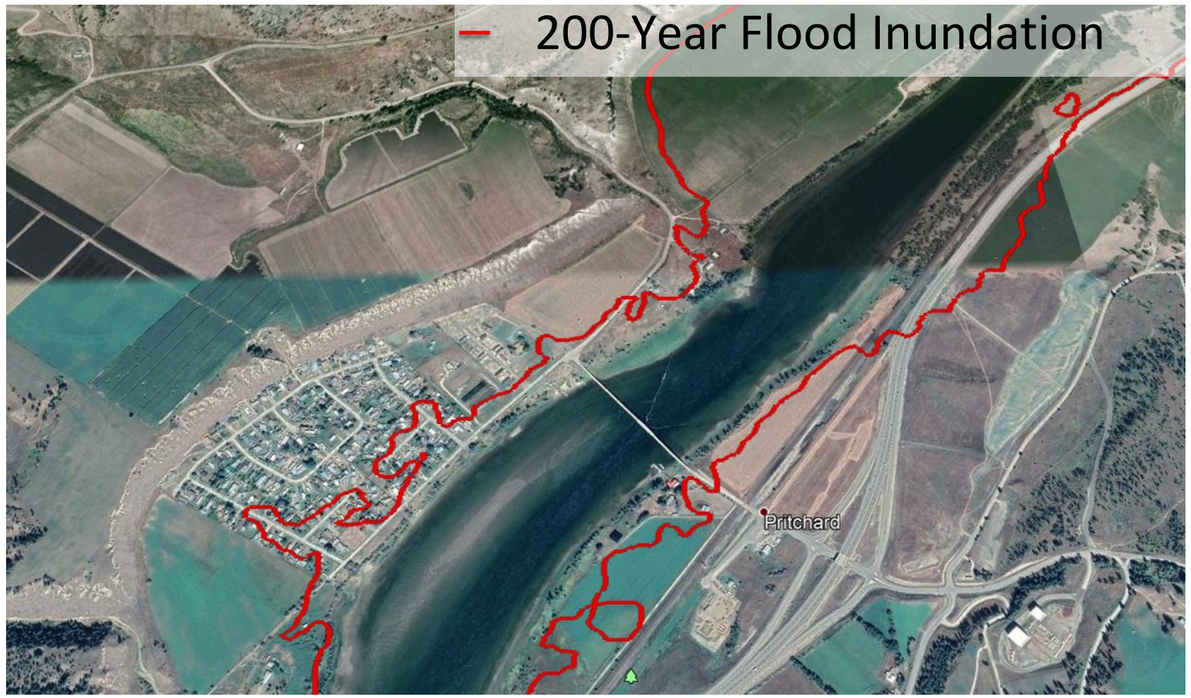
Clearwater, BC



March 31, 2019 boundary

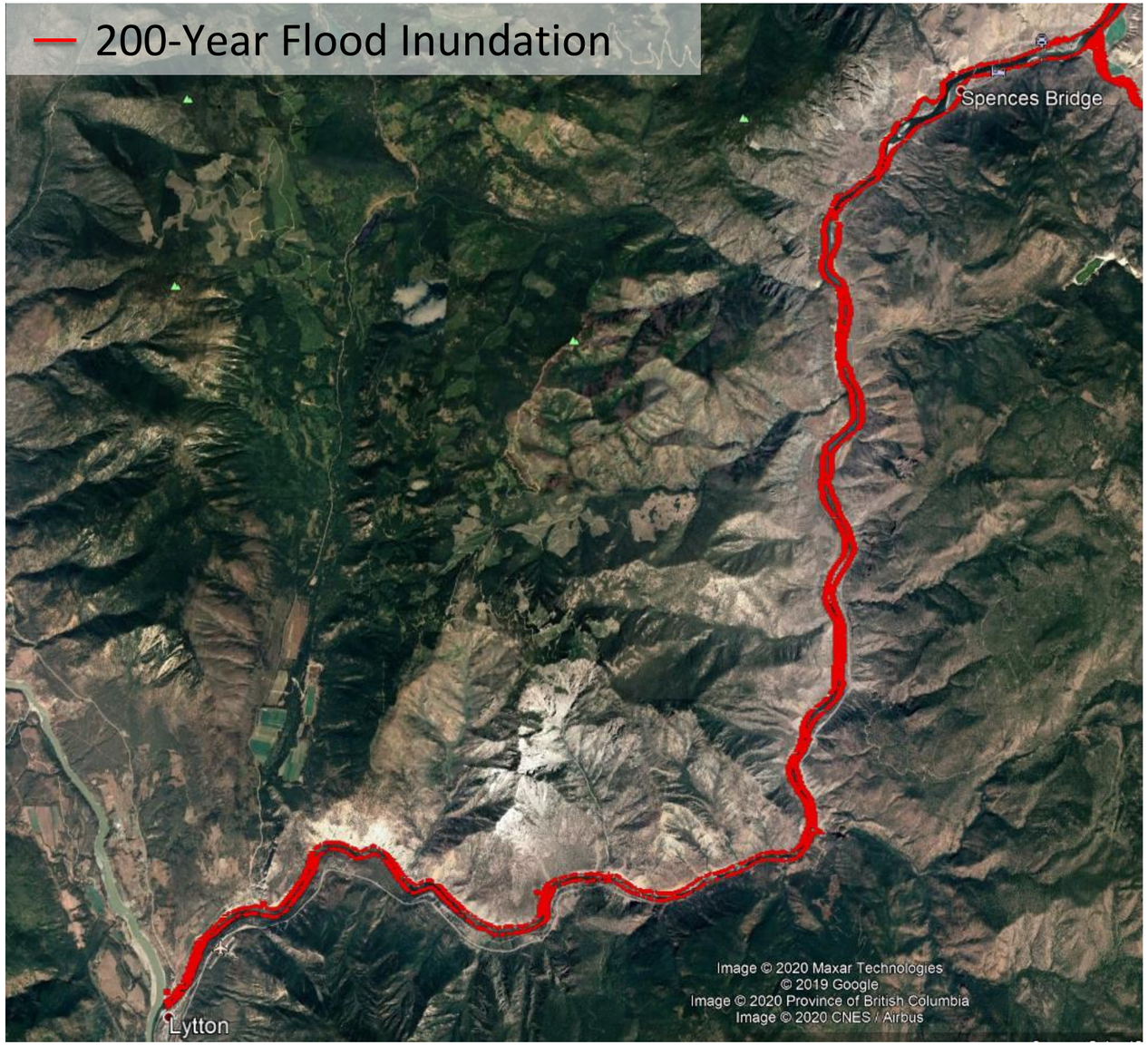
South Thompson River
(Base Level Mapping, Geobase DEM)

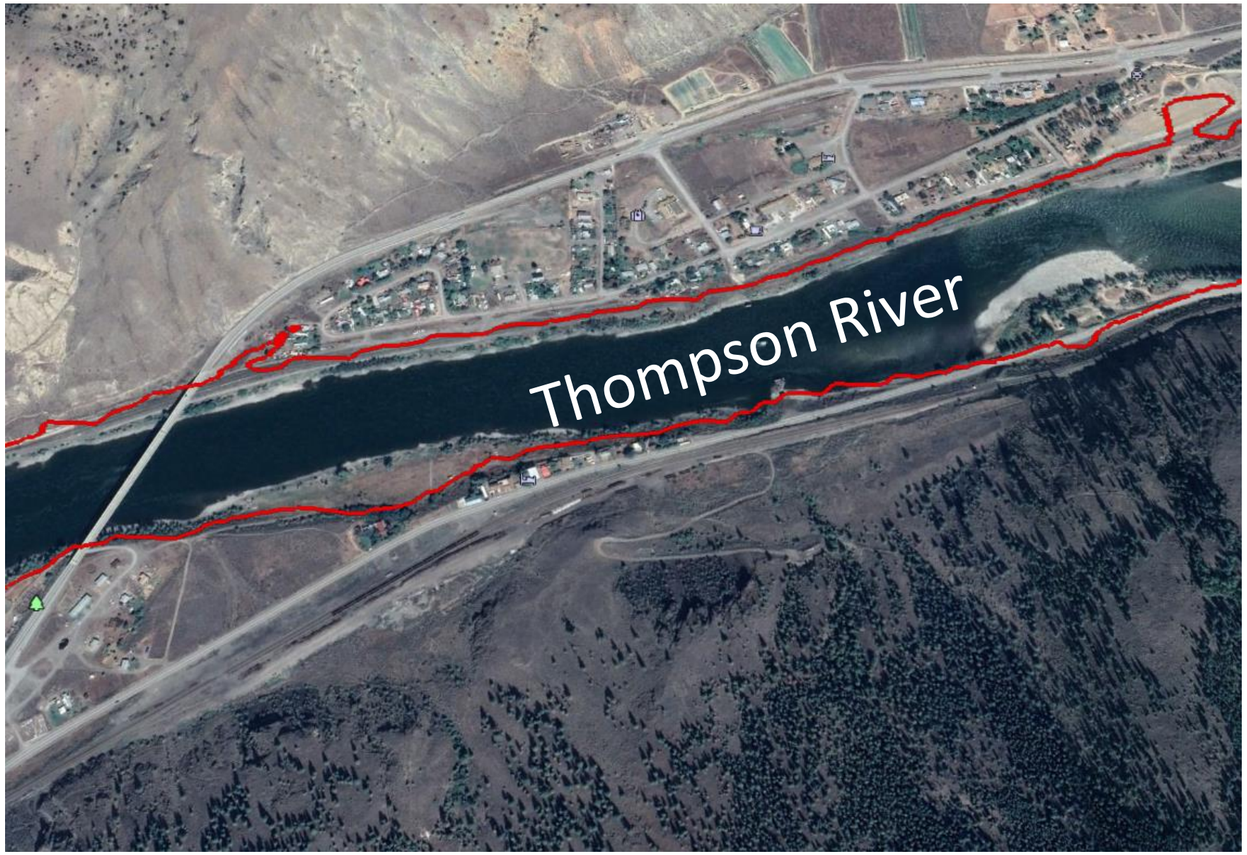




Pritchard, BC

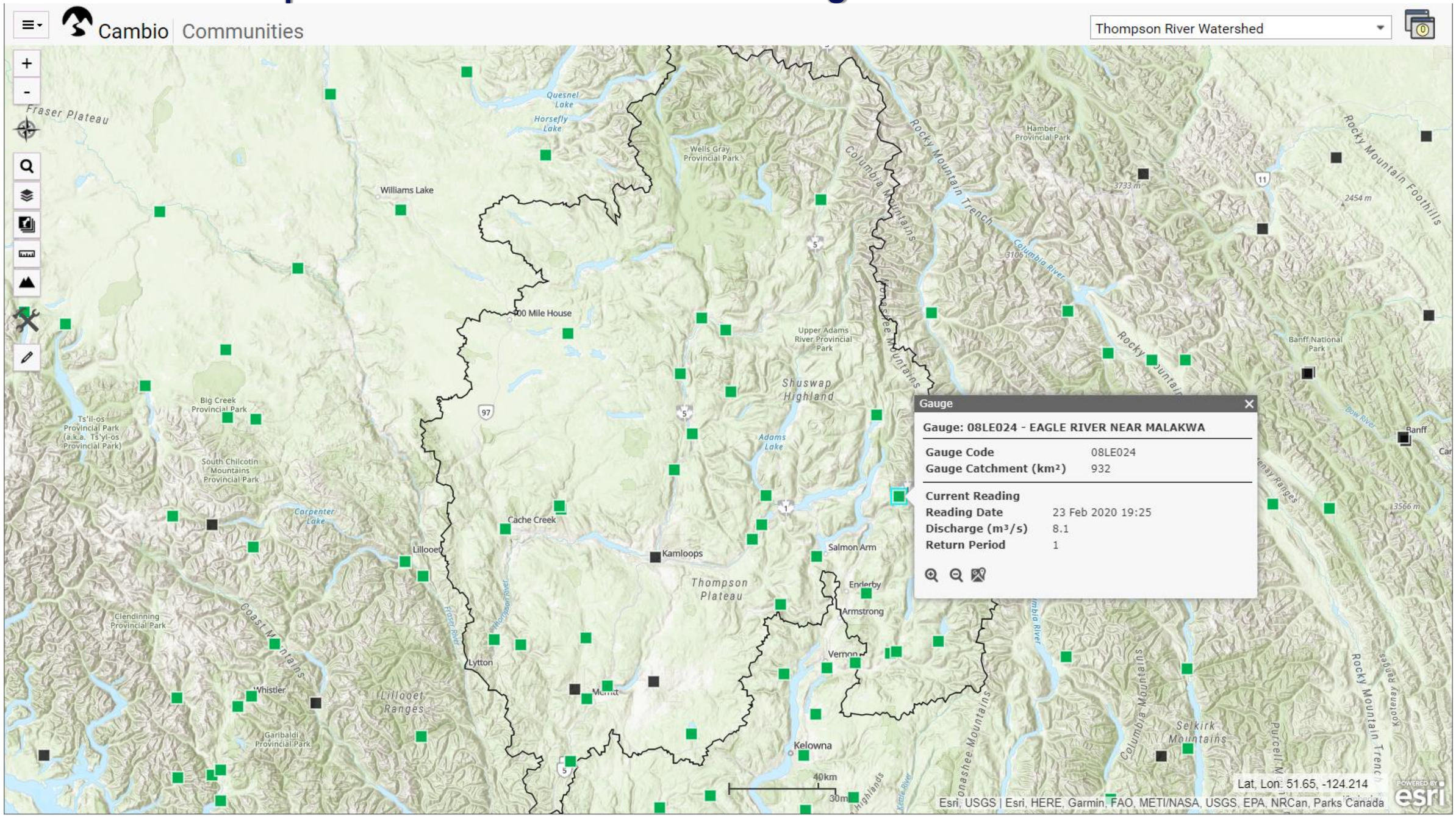
Spences Bridge to Lytton
(Base Level Mapping, Geobase DEM)





Spences Bridge

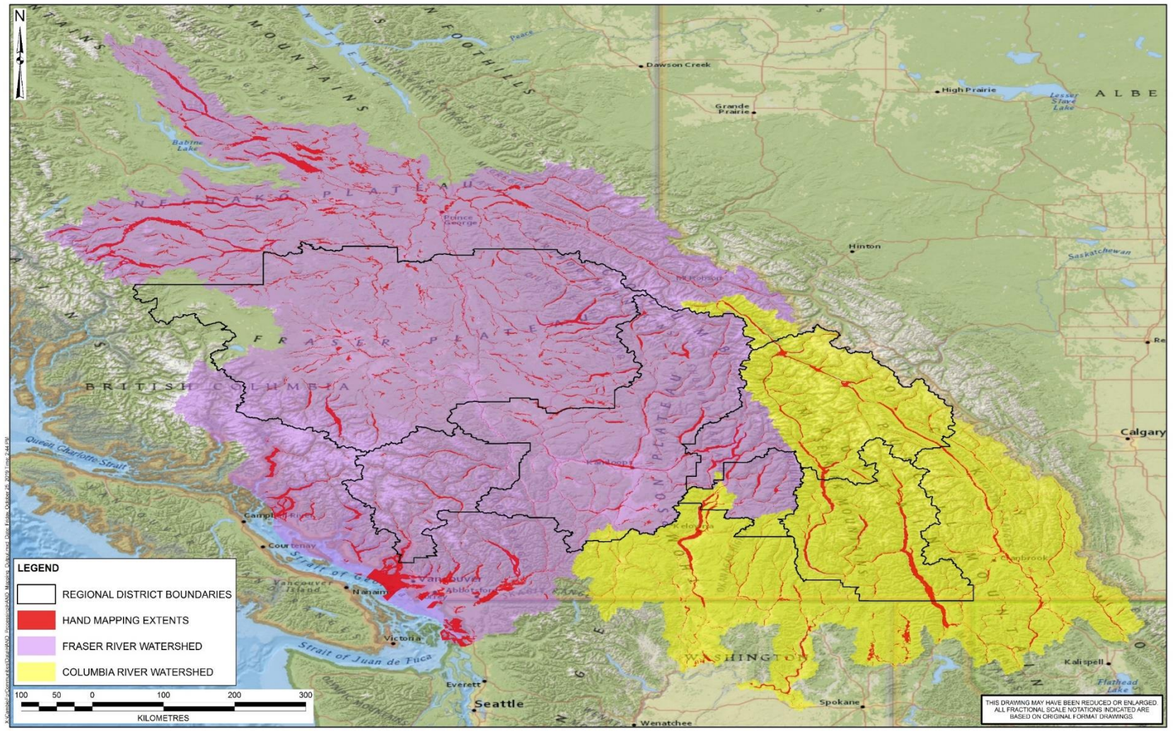
Update: Real-Time Flow Gauges now in Cambio

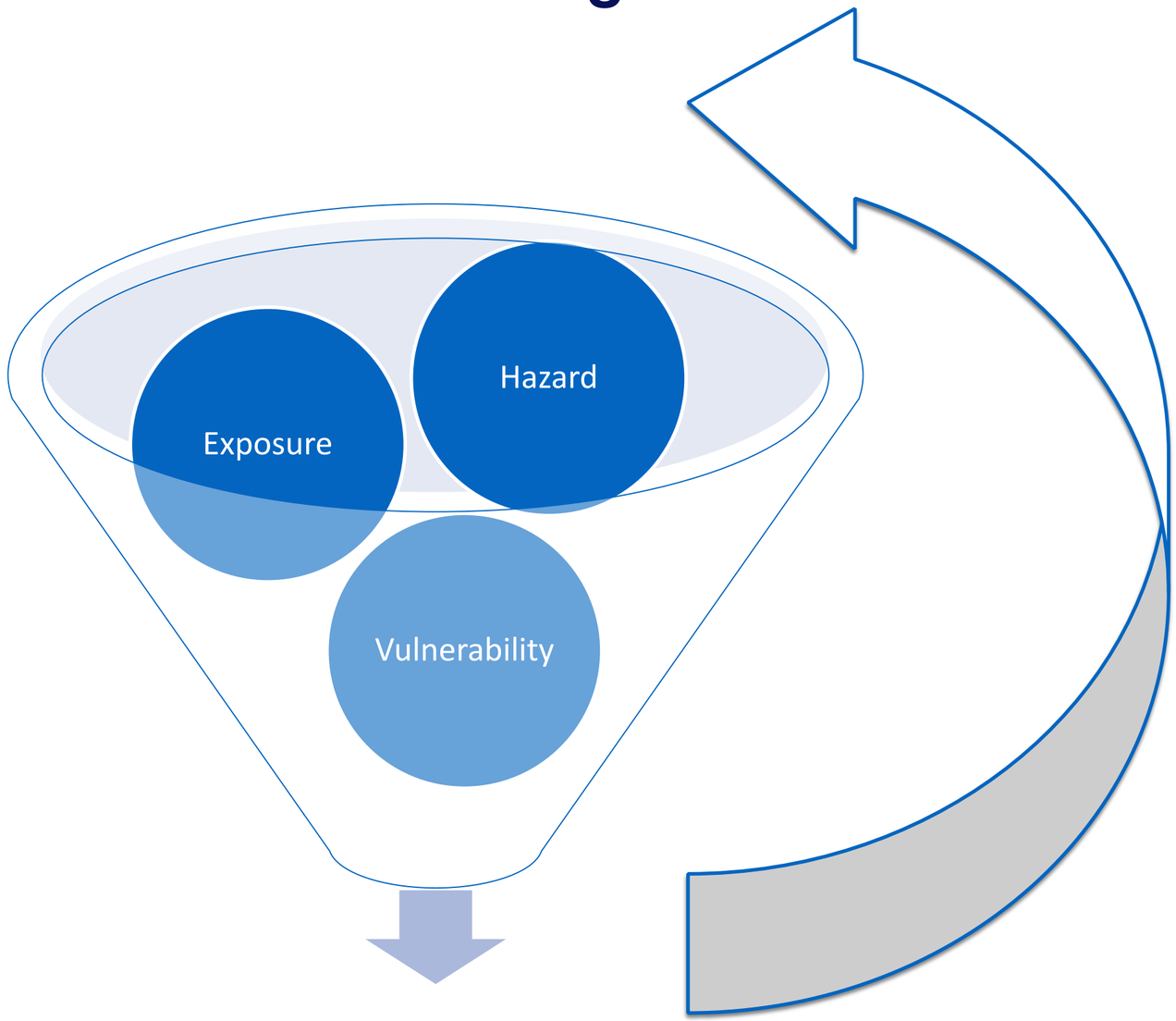


Location: Goldpan Provincial Park / Spence‘s Bridge area.
Credit: Matthew Lato (BGC)

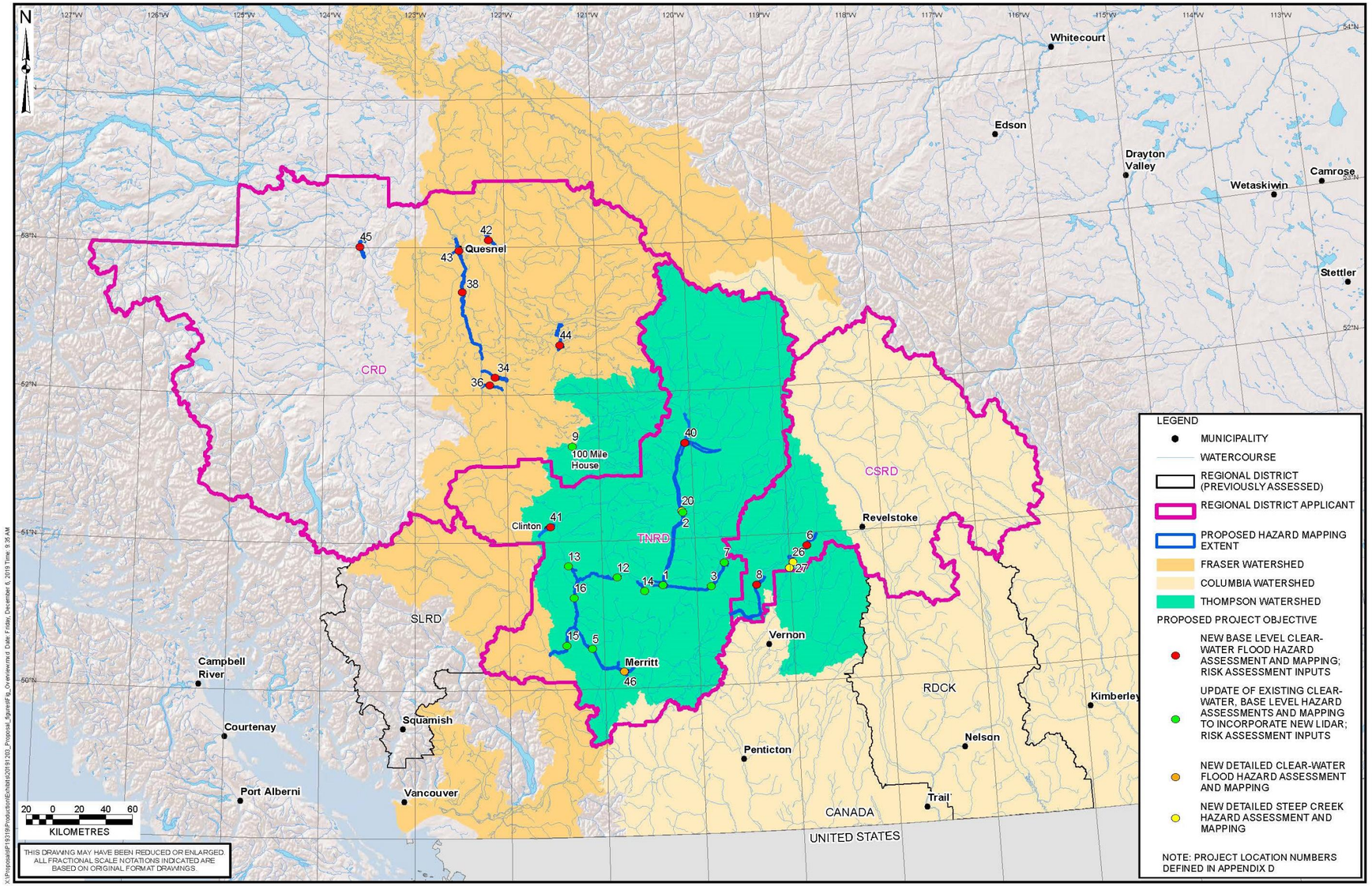
Next Steps

Assess “everywhere”, iterate and refine in a path to provincial scale geohazard risk management.





Eight local governments have participated in a coordinated $1M UBCM CEPF Funding Application



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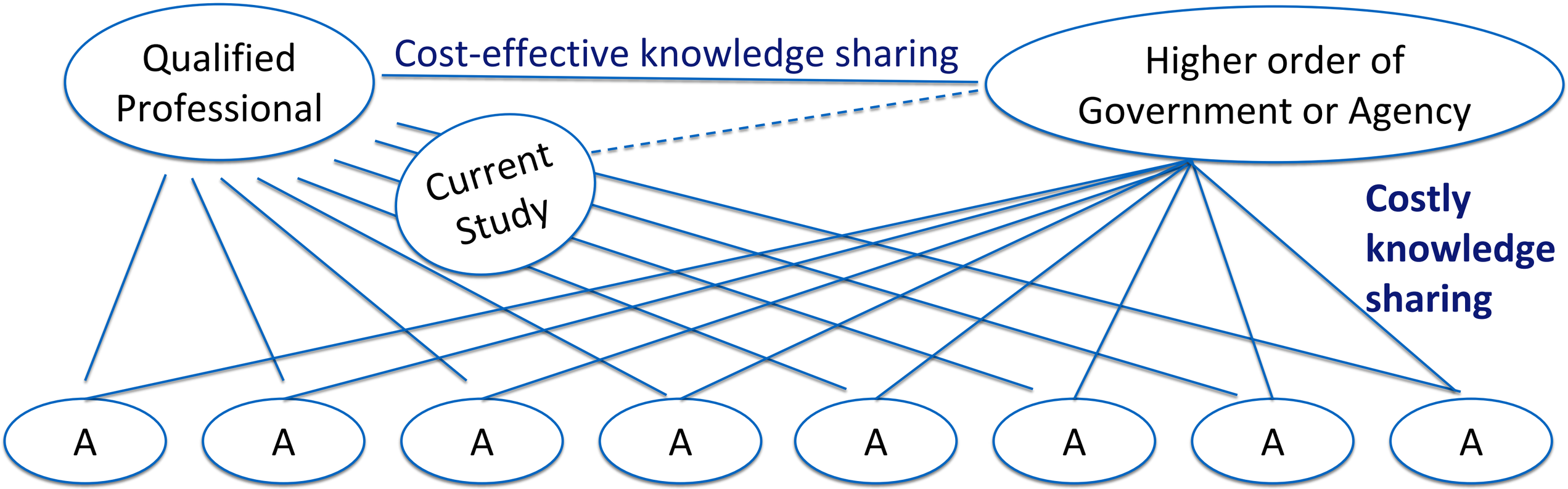
Study Areas	Site Classification		
	Current Stage	Proposed Project Objective	
Watercourse hazard areas prioritized by BGC (2019)	Hazard identification & priority setting completed	1	**Update** of clear-water flood hazard identification
		2	**New** base level clear-water flood hazard assessment and mapping Risk assessment inputs
TRW study areas with base level floodplain mapping completed by BGC (2020a)	Base level floodplain mapping completed	3	**Update** of existing clear-water, base level hazard assessments and mapping to incorporate new lidar. Risk assessment inputs
		4	**New** detailed clear-water flood hazard assessment and mapping.
Selected steep creek hazard areas (fans)	Hazard identification & priority setting ongoing (CSRD)	5	**New** detailed steep creek hazard assessment and mapping

Leveraging a growing geohazards knowledge base: points for further assessment (for discussion)

- **Road transportation**: systems-wide, transportation service disruption risk prioritization
- **Multi-geohazard:** landslide risk prioritization and monitoring [leverage new lidar]
- **Monitoring:** towards monitoring & warning: precipitation-triggered landslides
- **Policy**: risk evaluation framework & land use zoning

Towards more cost-effective knowledge sharing.



Local Government; Branch of Government; Private Sector

	Hazard Identification Mapping	Base-Level Hazard Mapping	Detailed Hazard Mapping
Objective	*Identify areas potentially prone to the hazard.*	*Map hazard extents by considering specific event scenario(s) (e.g. 1:200 year event)*	*Map hazard extents by considering specific event scenario(s) and site factors (e.g. hydraulic infrastructure).*
Detail	• Boundaries based on topographic analysis (e.g. terrain mapping) • Hazard boundaries are conservative.	• Boundaries consider hazard mechanisms, but does not account for all site factors. • Improves hazard identification boundaries.	• Boundaries consider hazard mechanisms and site factors. • Supports development of engineering prescriptions. • Mapping of a range of scenarios and their accompanying intensities within the hazard boundary.

Application in Policy

Steep Creek	• Basis for defining Steep Creek DPA, represented by the alluvial fan boundary.	• Currently no established techniques for base-level steep creek mapping.	• Basis for defining DPAs within the fan boundary. • Could be used to establish bylaws for specific hazard areas within a fan (to be discussed).
Clearwater	• Basis for defining the floodplain DPA based on topographic analysis.	• Basis for defining the floodplain DPA in better detail then hazard identification mapping. • Defines areas where existing FCL's need review.	• Basis for defining the floodplain DPA and associated FCLs. • Provides basis to consider a broader range of scenarios in cases where standards-based approaches may not be sufficient.

Policy Integration

Relative Effort / Cost

Work Phase


BGC