



The WaterSHED Monitoring Program

SHED: Saskatchewan headwaters Edmonton downstream

A multi-stakeholder
monitoring initiative

Cristina Buendia (AEP)

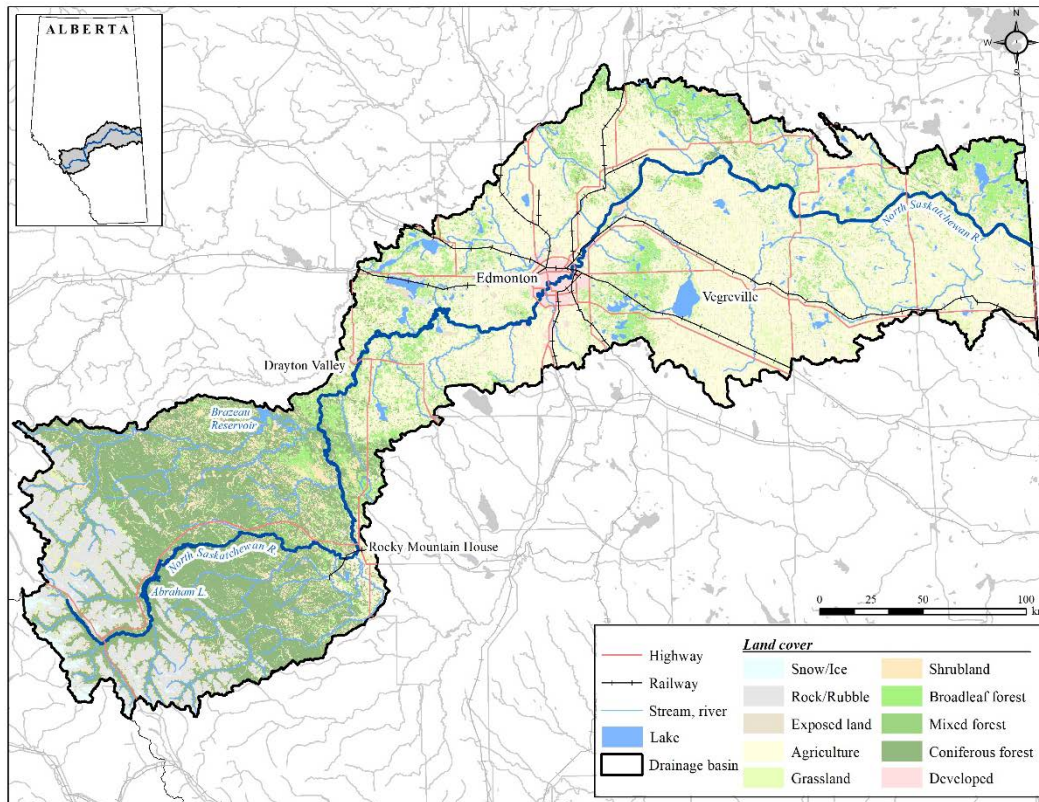
cristina.buendia-fores@gov.ab.ca

Stephanie Neufeld (EPCOR)

sneufeld@epcor.com

November 3rd, 2020

The North Saskatchewan River Basin (NSRB)



- One of Alberta's major river systems
- Area ~57,000 km² (9% of Alberta)
- Rich terrestrial and aquatic biodiversity
- ~ 1/3 Albertans live in the NSRB
- Edmonton's source of drinking water

Watershed initiatives



Watershed initiatives

- NSWA: Integrated Watershed Management Plan
- City of Edmonton: River for Life Strategy
- EPCOR: Source Water Protection Plan
- AEP: Industrial Heartland Water Management Framework and the North Saskatchewan Regional Plan

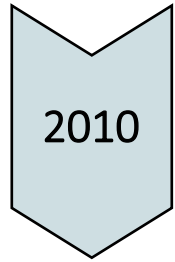
Management initiatives need to be supported by a solid understanding of watershed functioning and the nature and scale of inputs into river systems

Knowledge gaps and monitoring needs

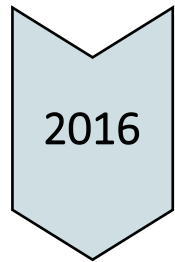
- Identification of sources of point and non-point pollution to the NSR
- Quantification of sediment, nutrient, and contaminant delivery from tributaries
- Land use/land cover and climate change impacts across the NSRB and assessment of future potential risk to river water supplies and water quality
- Evaluation of aquatic ecosystem health and water quality change in the NSR mainstem and tributaries
- Monitoring to support implementation of water management frameworks and actions to maintain and improve water quality in the NSR.

Need for a comprehensive and sustainably funded monitoring program.

WaterSHED: Multi-stakeholder program



- The NSWA forms a Water Quality Working Group to address monitoring challenges in the NSRB
- Need for a scientifically defensible and sustainably funded water quality and AEH monitoring program for the NSR and major tributaries



- EPCOR puts forward a request for \$1M per year for 4 years from the Edmonton Rate Payers
- Initiative supported by the City of Edmonton



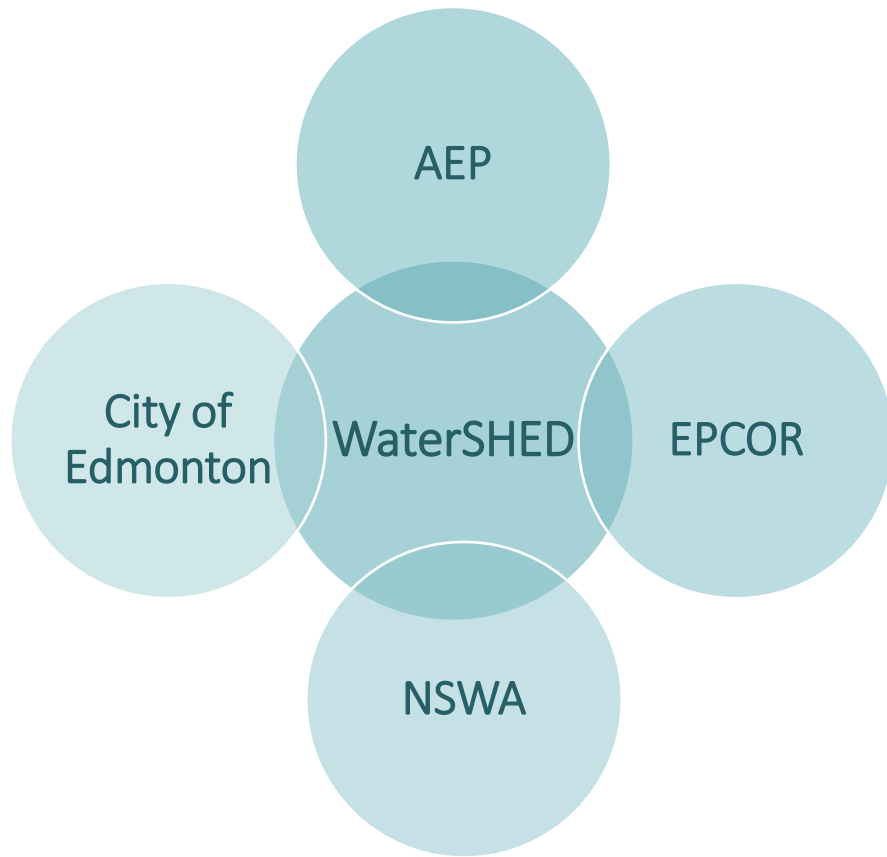
- Monitoring network design
- Permits for new stations



- Installation of stations
- Monitoring starts



Steering Committee and Funding



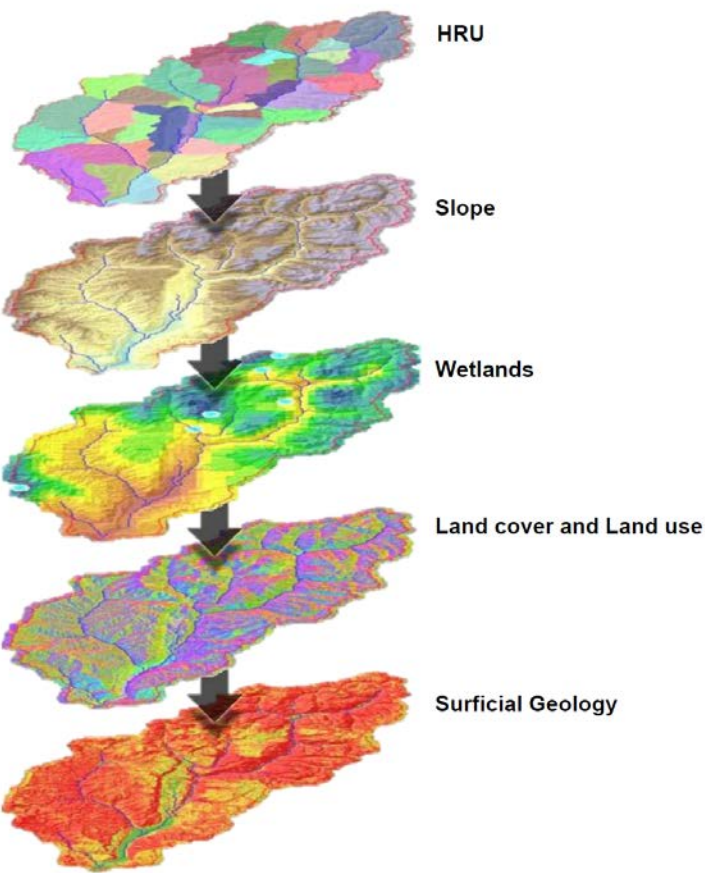
- Up to \$1 Million per year from EPCOR City of Edmonton water rate payers
- 4 years of funding (2018-2021) with possible renewal
- Additional in-kind resources provided AEP-Resource Stewardship Division (Monitoring and Scientific support)

Monitoring network design

- Integrated within AEP's river water quality and quantity monitoring programs
 - Enhance water quality monitoring at current Long Term River Network (LTRN) sites
 - Sites across major rivers in Alberta
 - Includes monthly samples of water for most water quality variables
 - Add a Tributary Monitoring Network (TMN)
 - Augment data generated from LTRN
 - Increase monitoring on tributaries to major river systems
 - Monitoring design based around a mass balance approach
 - Water quality data paired with water quantity data
 - Budgets and fluxes for the substance of interest

Monitoring network design

Site selection based on a **Hydrological Response Unit (HRU)** approach
HRU – Landscape Units with similar hydrological response



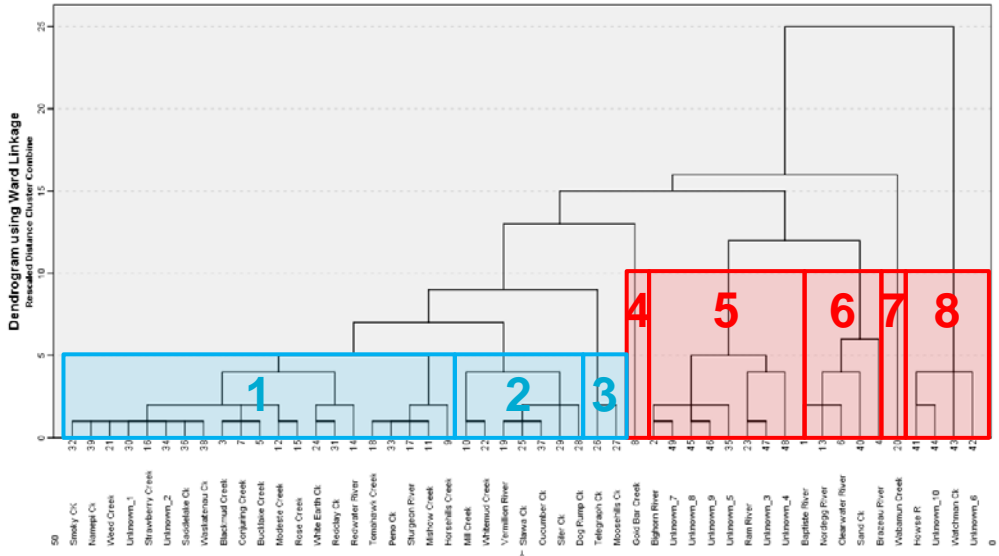
Combination of slope, surficial geology, land cover and land use



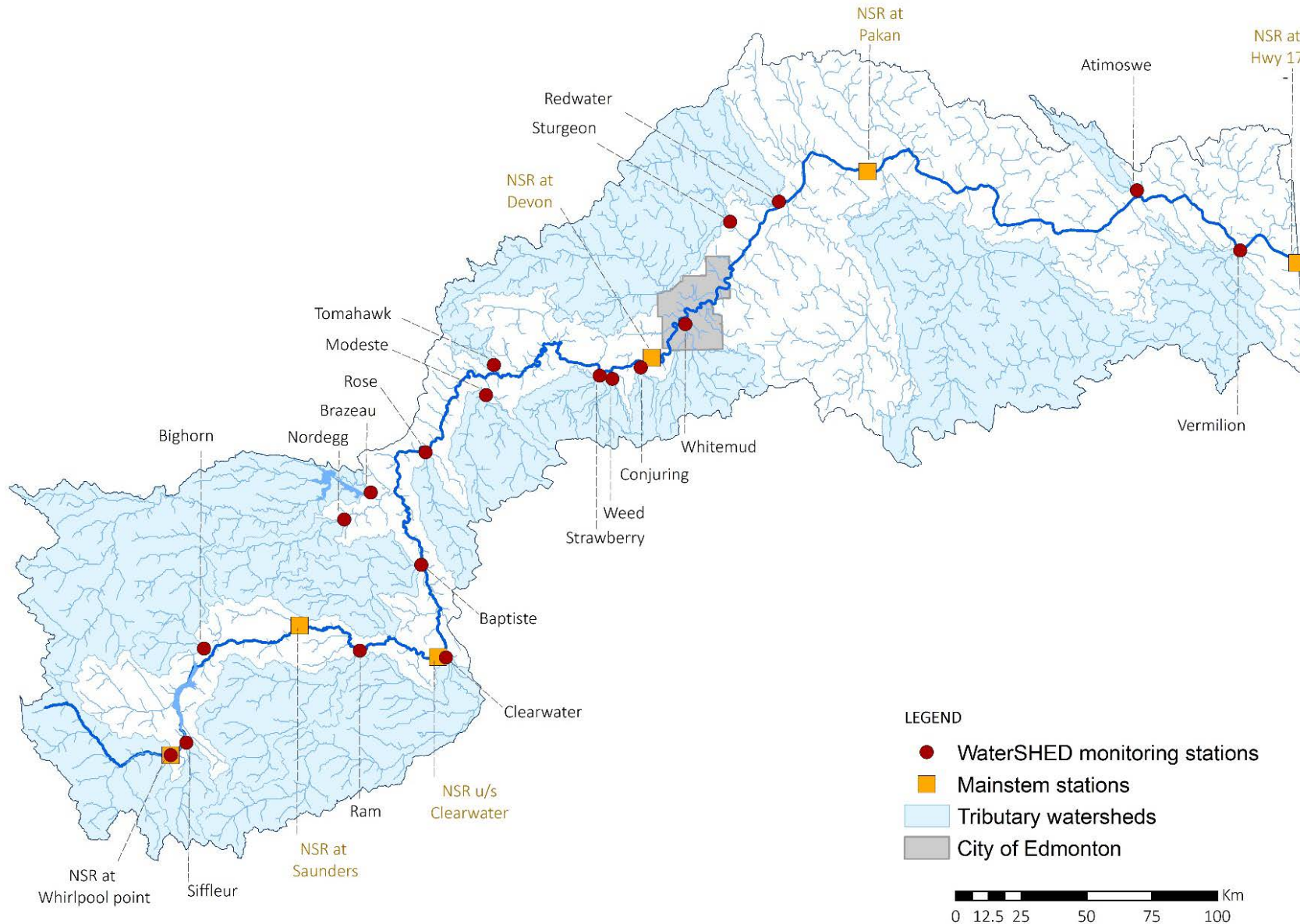
Cluster Analysis to group watersheds into groups of watersheds that are similar to each other



Determine magnitude and timing of the hydrological response of the watershed to a rainfall or snowfall event



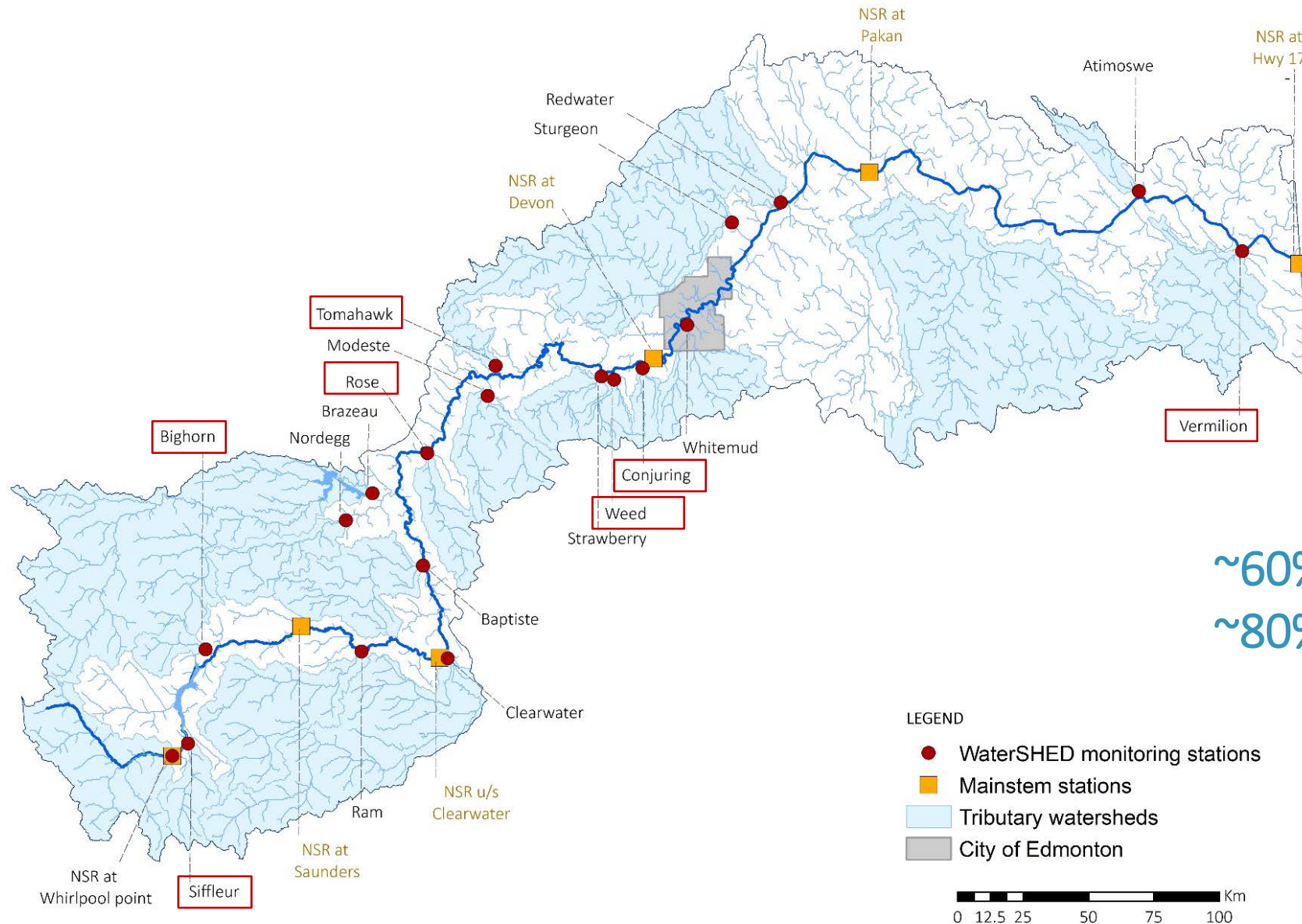
The WaterSHED network



19 sites:
12 enhanced (+WQ)
7 new (+WQ + Q)

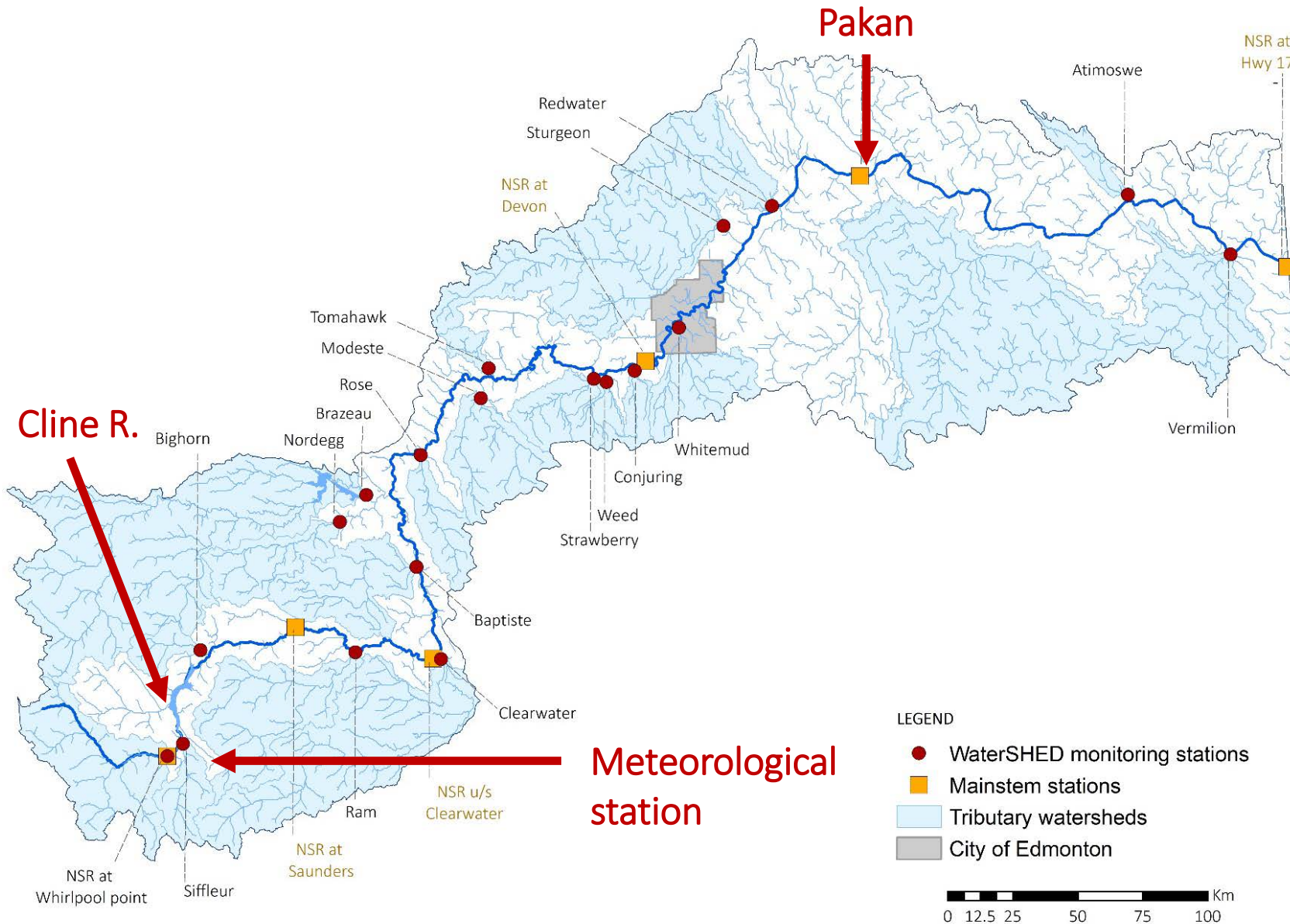
The WaterSHED network

19 sites:
12 enhanced (+WQ)
7 new (+WQ + Q)



~60% of the NSRB
~80% of NSR flow (at AB-SK border)

The WaterSHED network – future expansion-



2 monitoring stations:
- Cline (new)
- Pakan (upgraded)

1 meteorological station

Program structure

- **Core monitoring**

- Collection of flow and water quality data
- Assessments of Aquatic Ecosystem Health

- **Focused studies**

- Short-term research projects
 - Fill information gaps
 - Develop or assess new monitoring methods and compare past methodologies



Core Monitoring

Sampling approach

Mass loading monitoring approach at all sites

- Continuous flow
- Continuous water quality (data sondes) : pH, temperature, conductivity, turbidity, dissolved oxygen
- Monthly discrete water quality: major ions, nutrients, trace metals, Chlorophyll-a, fecal coliforms, isotopes



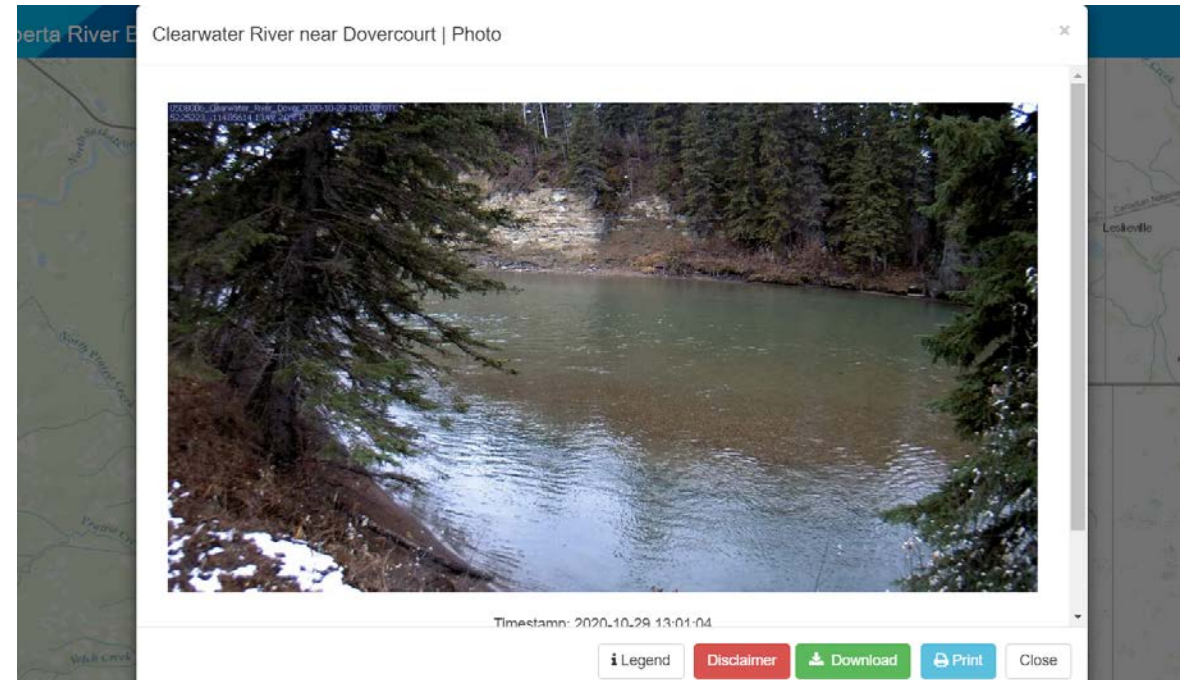
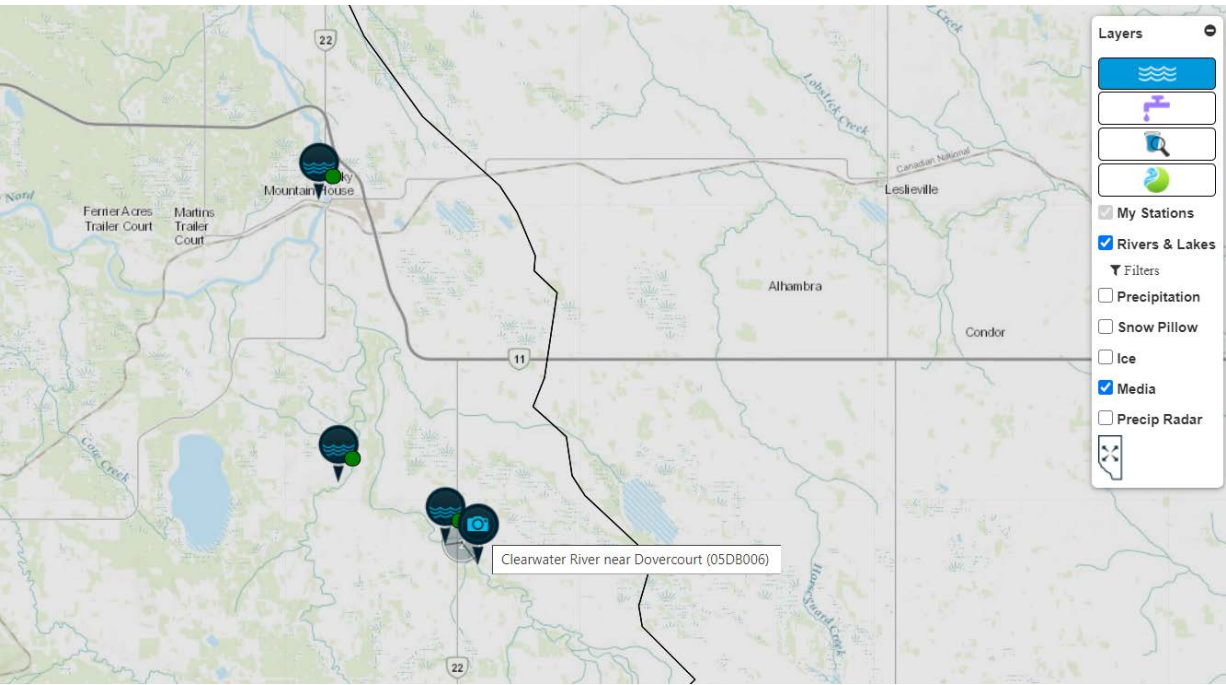
Sampling approach

Sites equipped with cameras that provide daily images of the sites



How to access the data

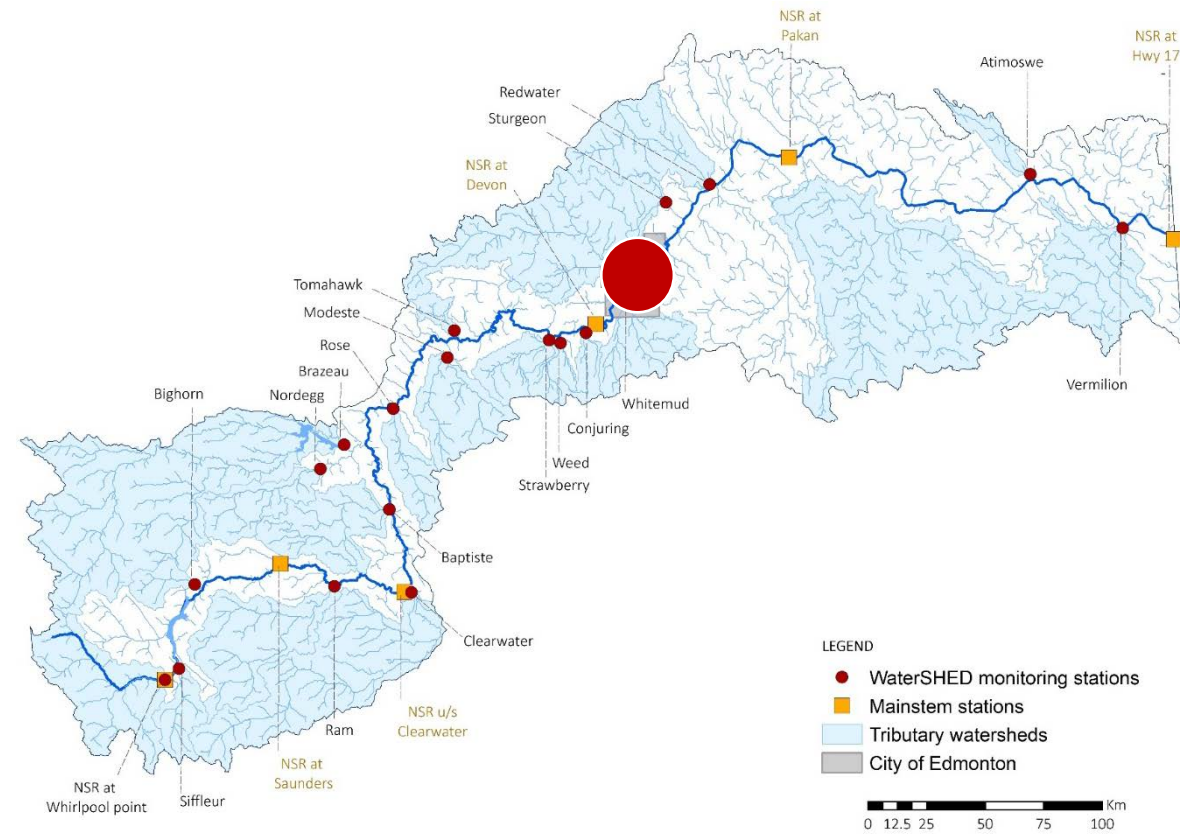
Flow data and daily photos: <https://rivers.alberta.ca/>



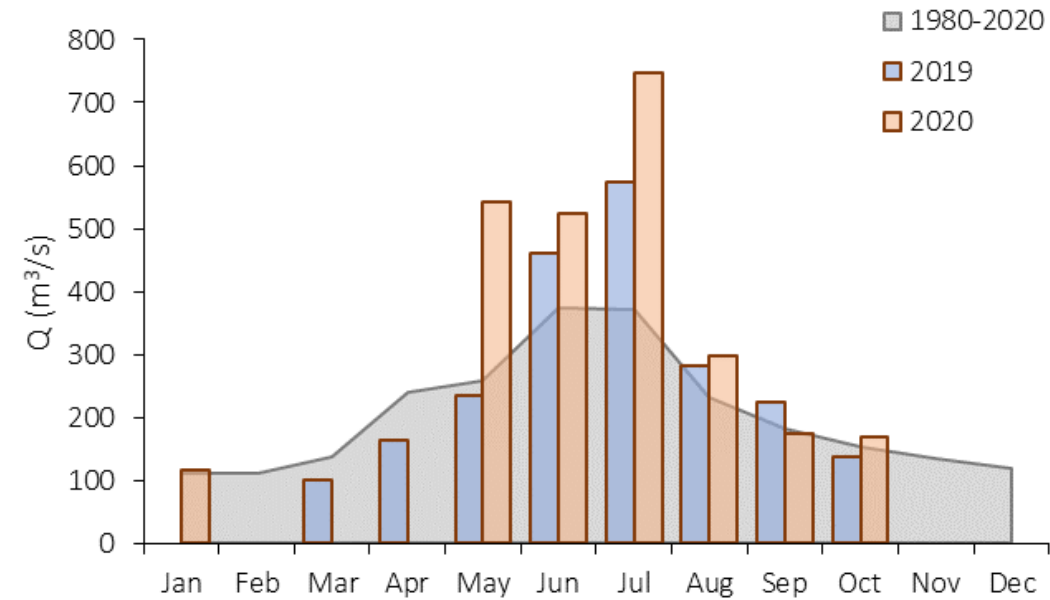
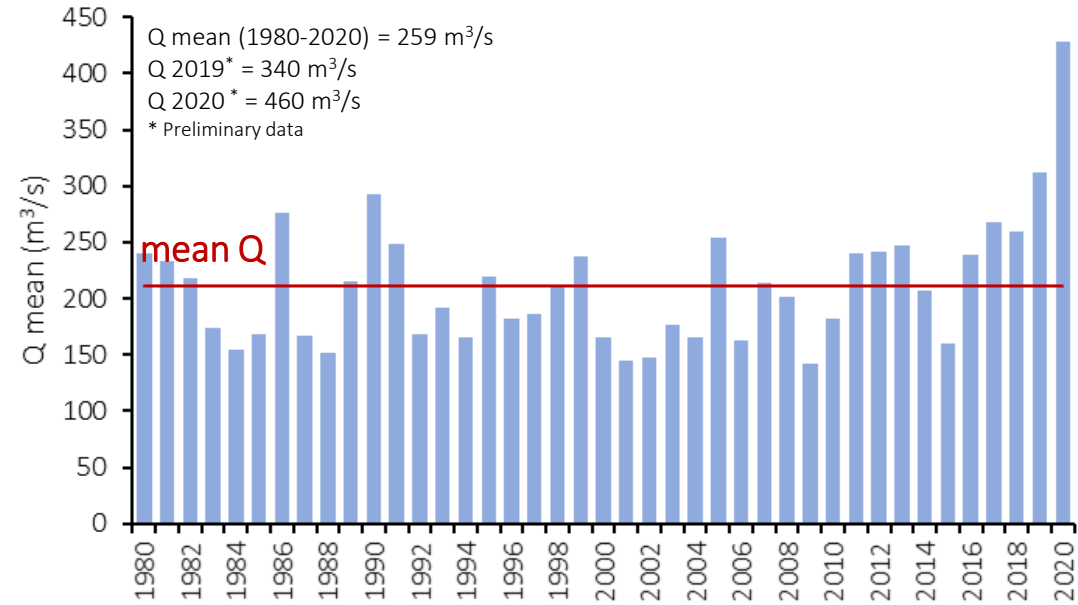
Water quality data: <https://www.alberta.ca/surface-water-quality-data.aspx>

2019-20 Flow data

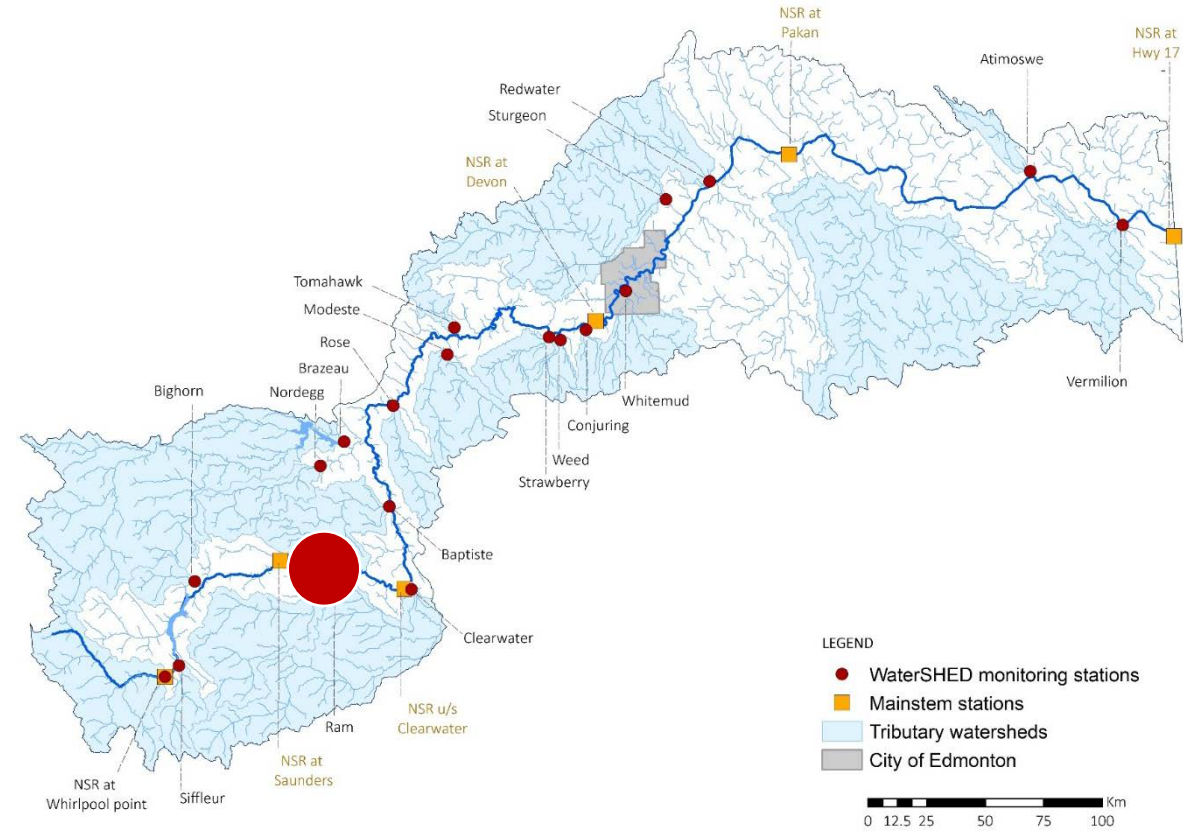
Flows above long-term average



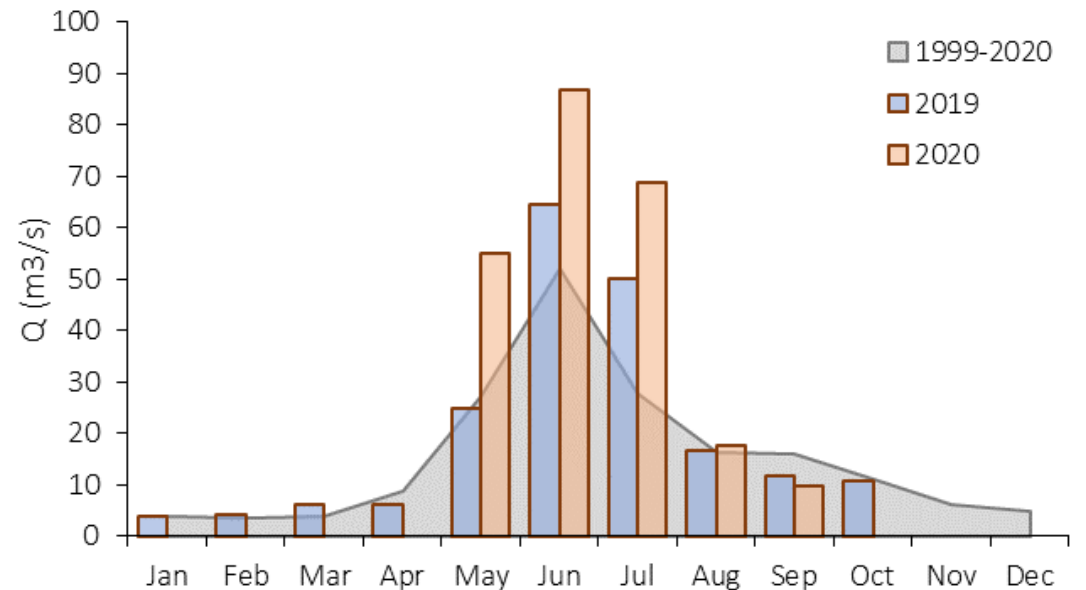
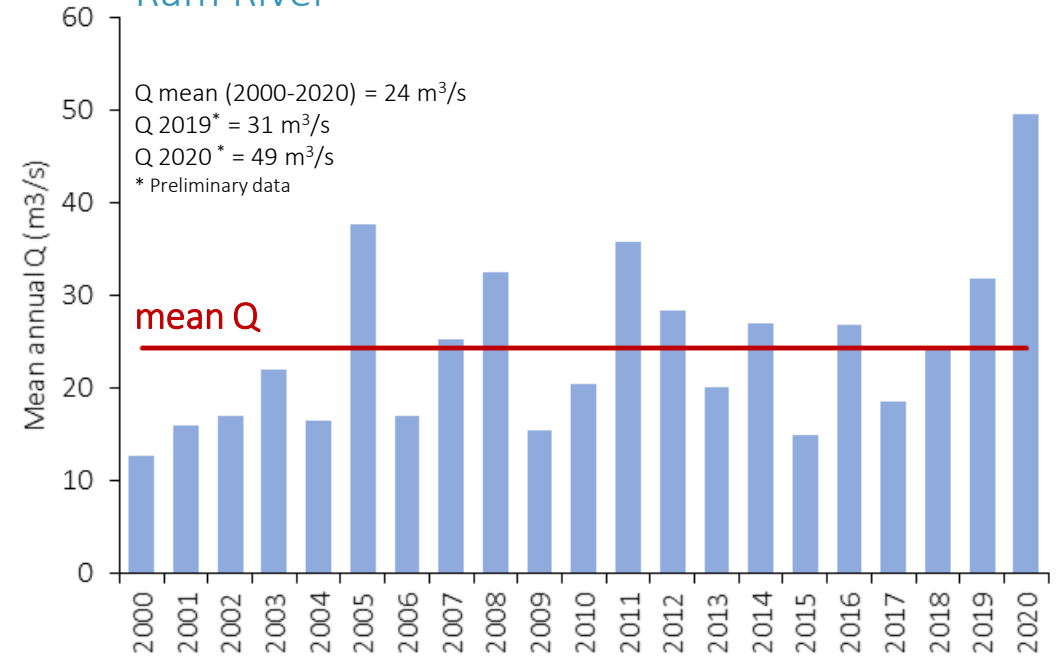
NSR at Edmonton



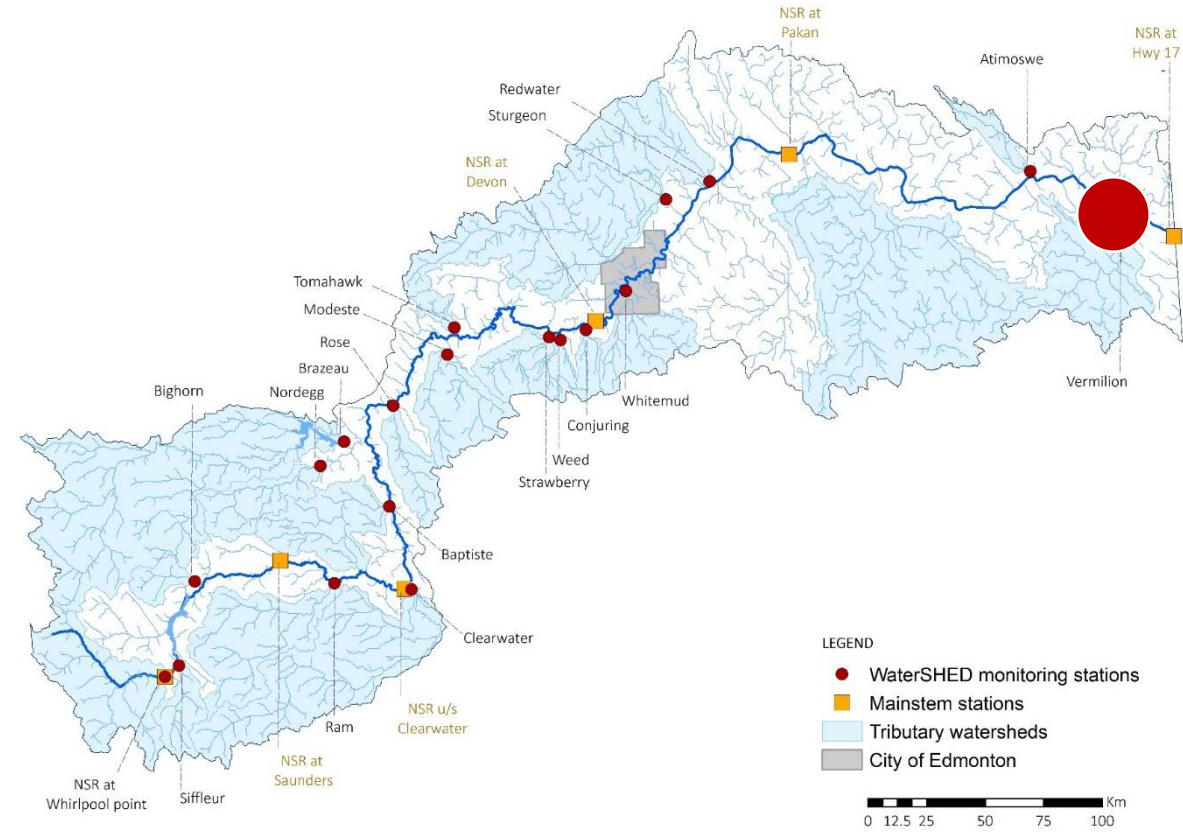
2019-20 Flow data



Ram River

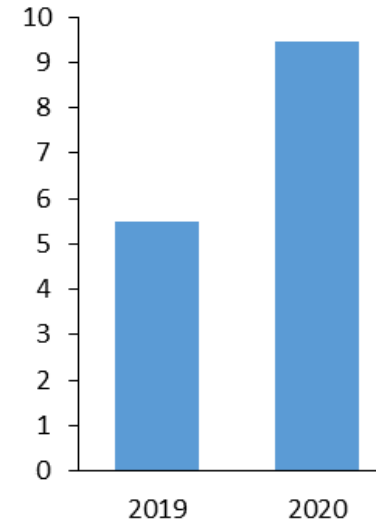


2019-20 Flow data

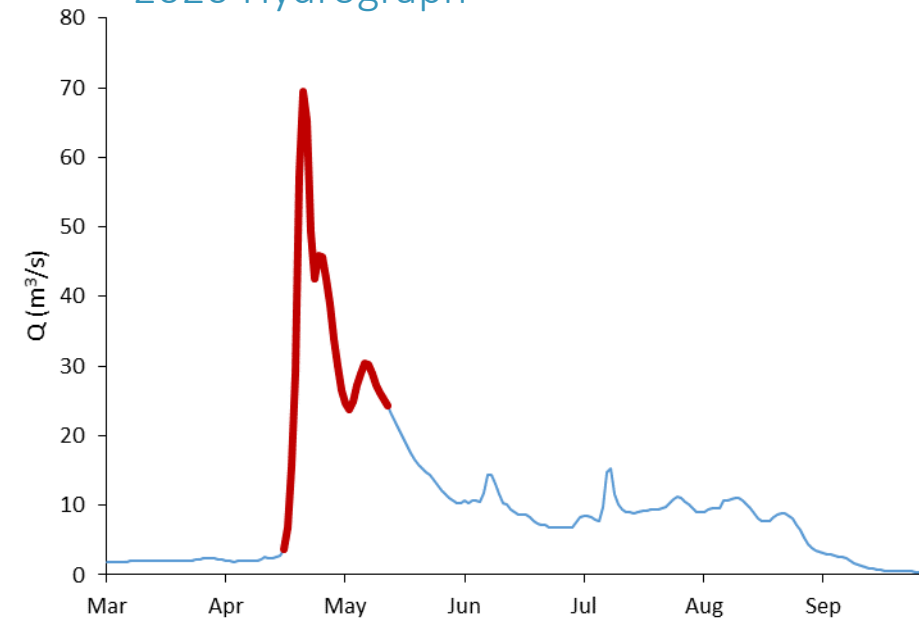


Vermilion River

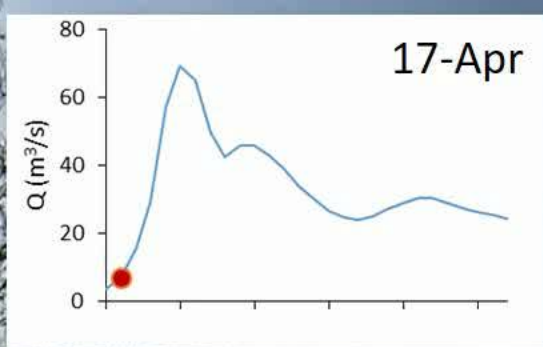
(Preliminary data)
Q - 2019 = 5.48 m³/s
Q - 2020 = 9.47 m³/s



2020 Hydrograph

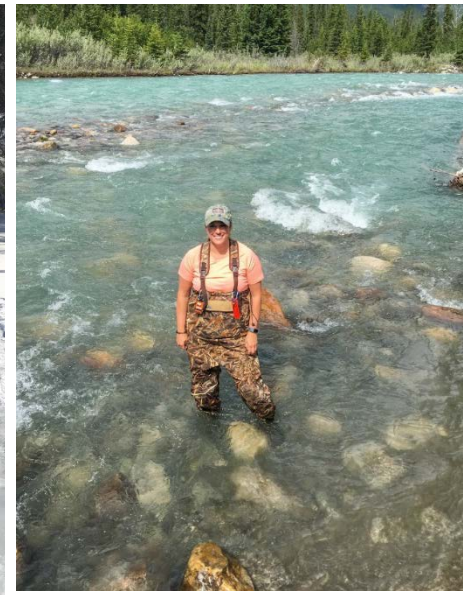
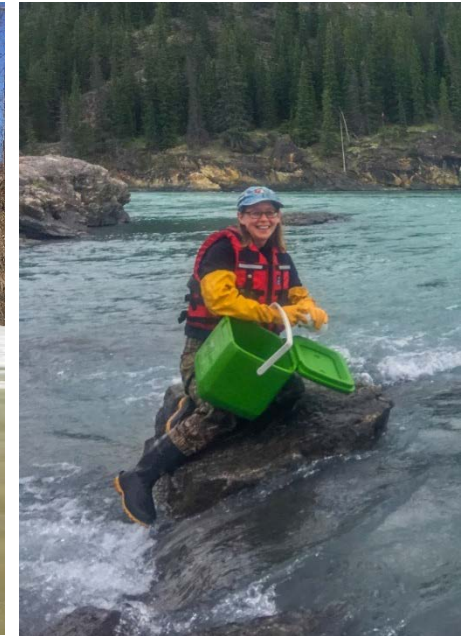
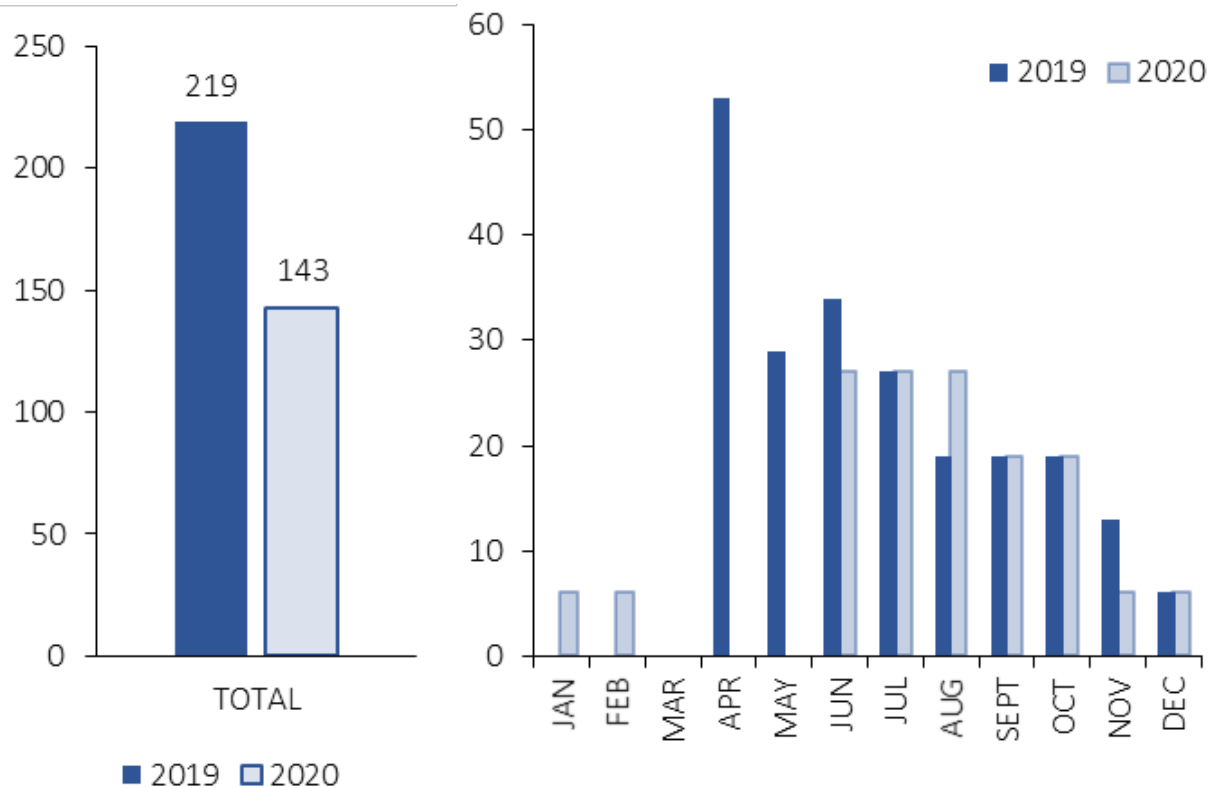


05EE002_Vermilion_River_Lea_Park_2020-04-17_19:01:02_01
53.65150, -110.34458 13.7V 13.0°C P



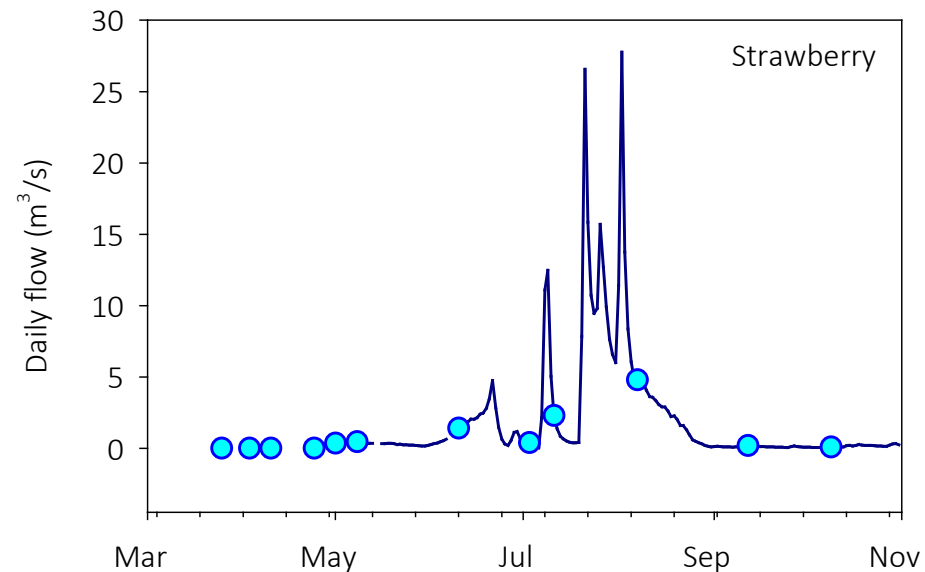
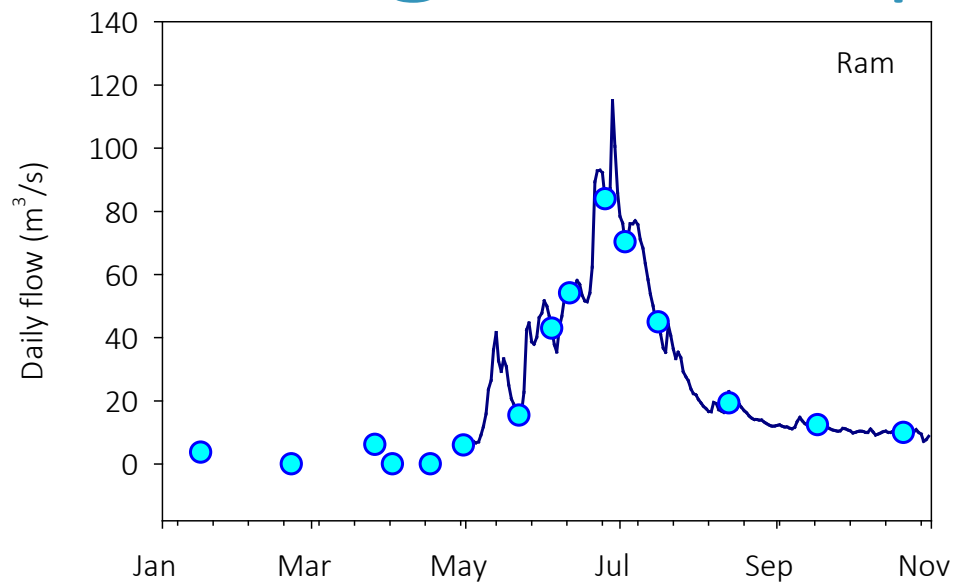
2019-20 – grab samples

No. Samples collected

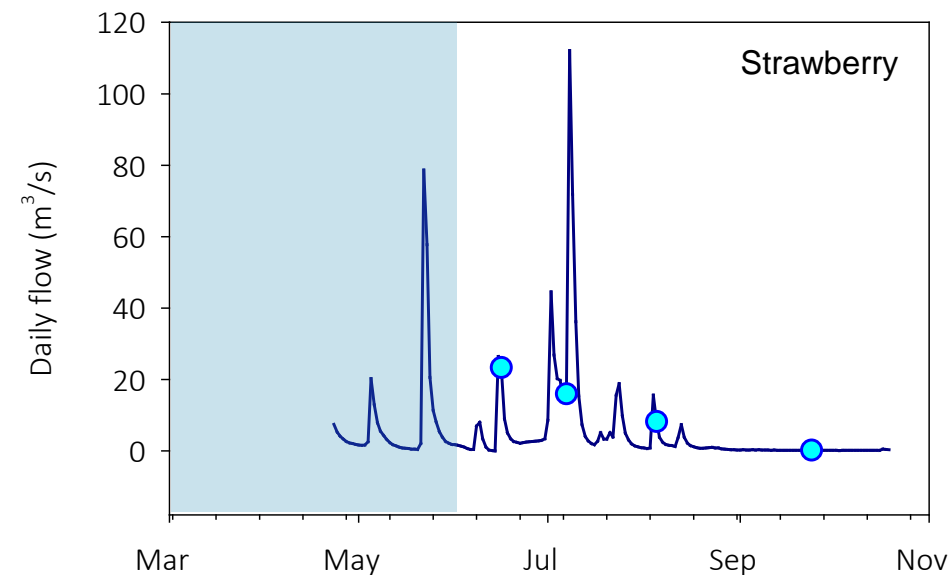
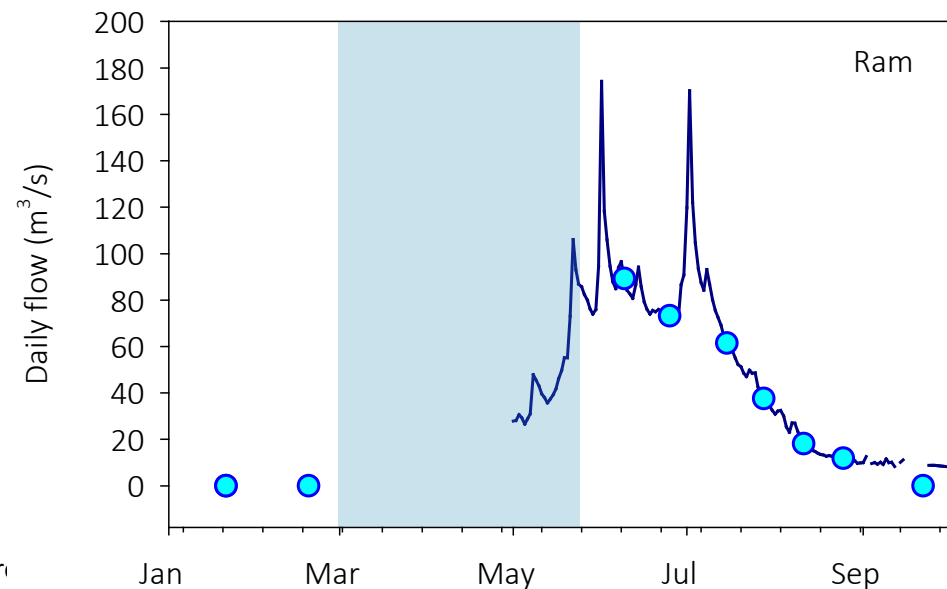


2019-20 – grab samples

2019

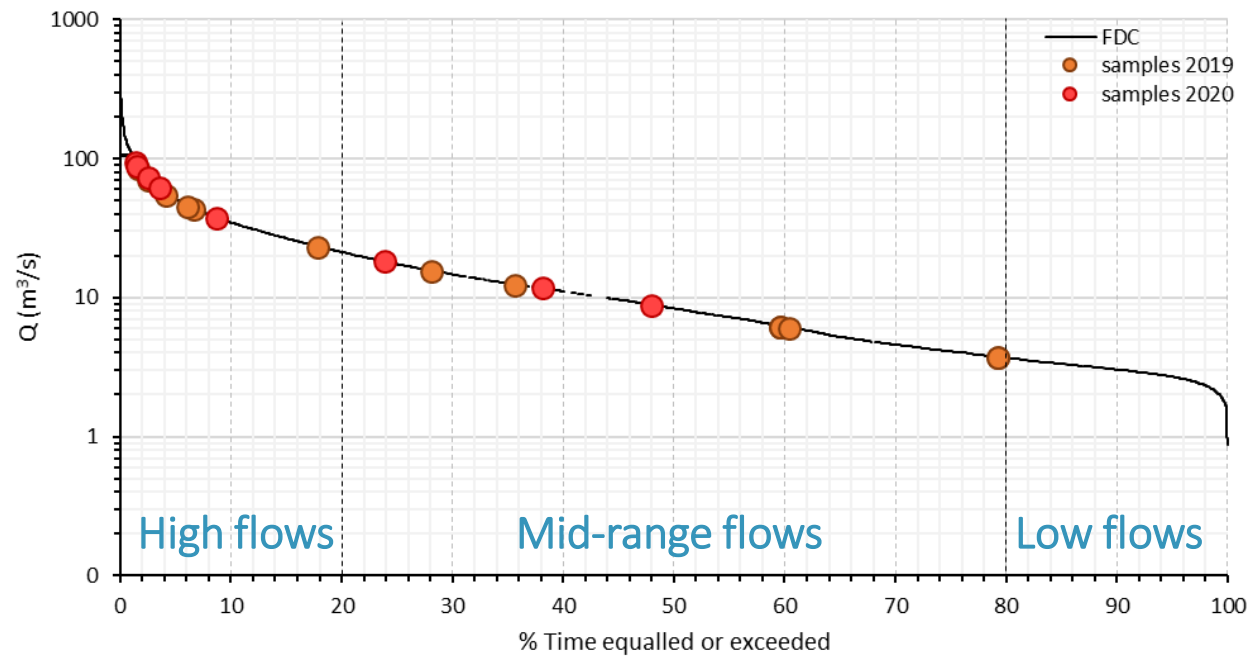


2020

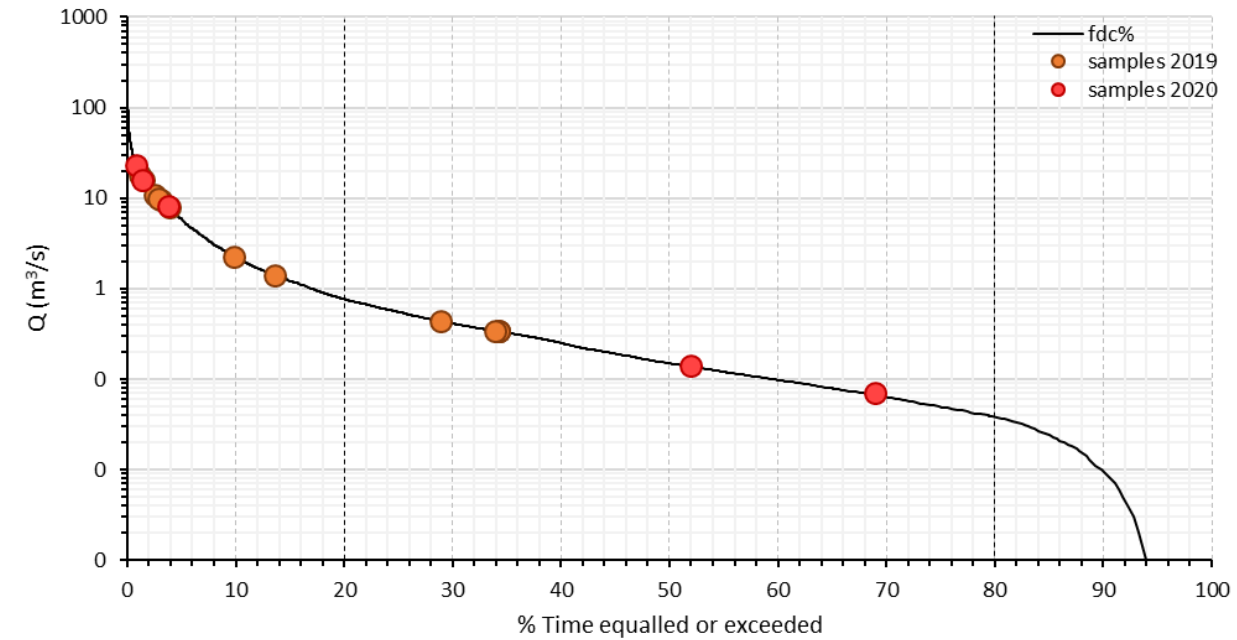


2019-20 – grab samples

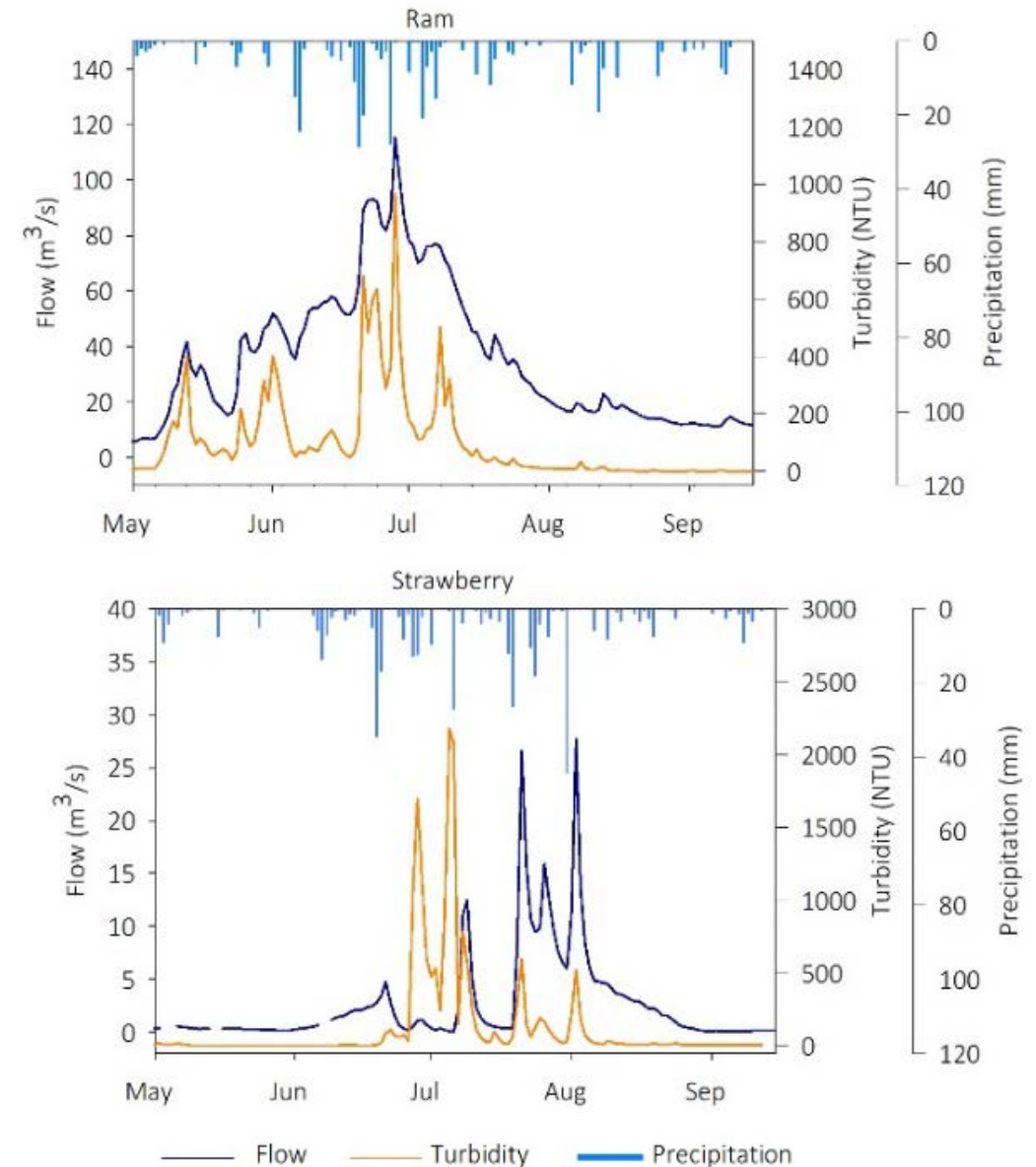
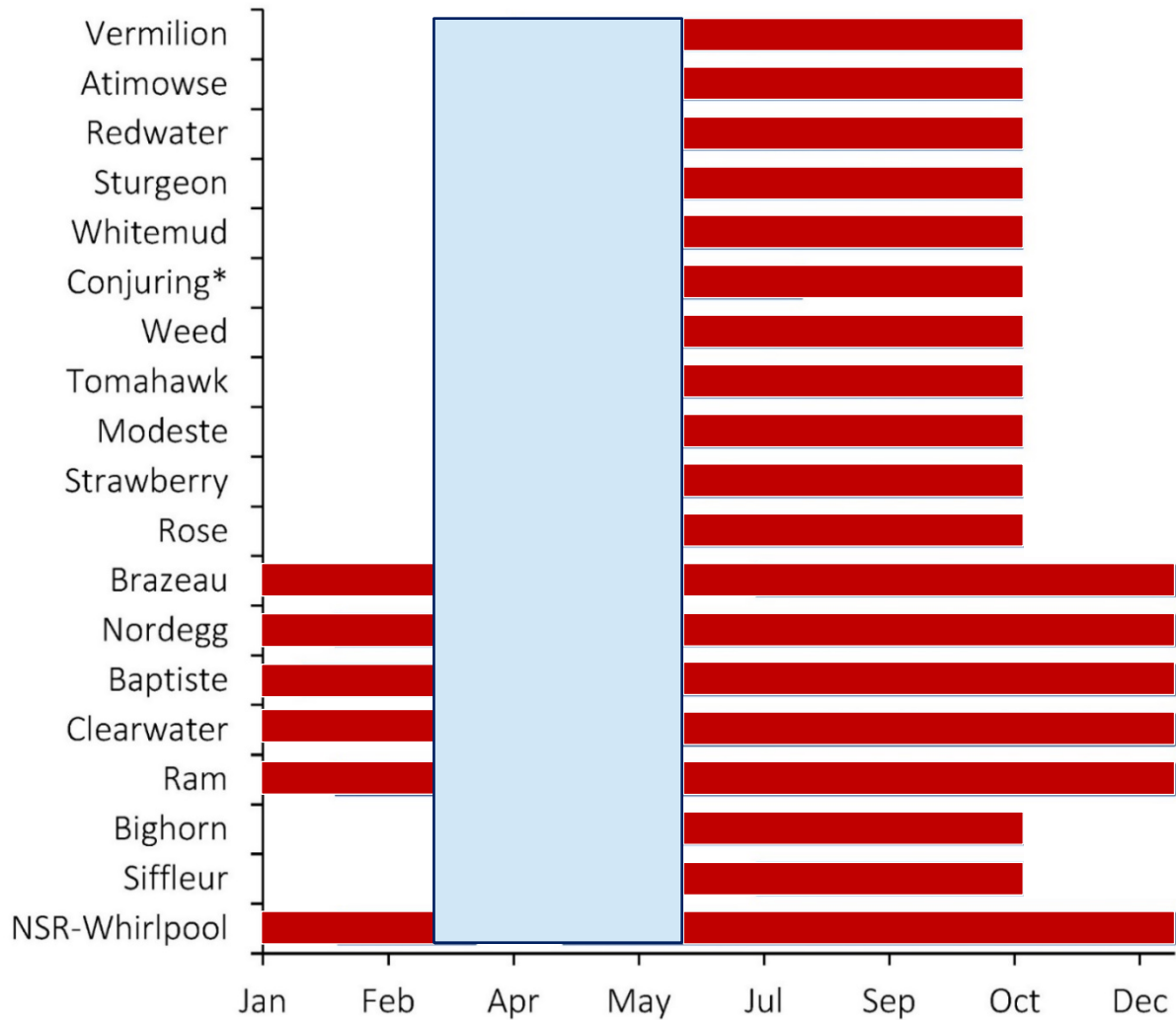
Ram



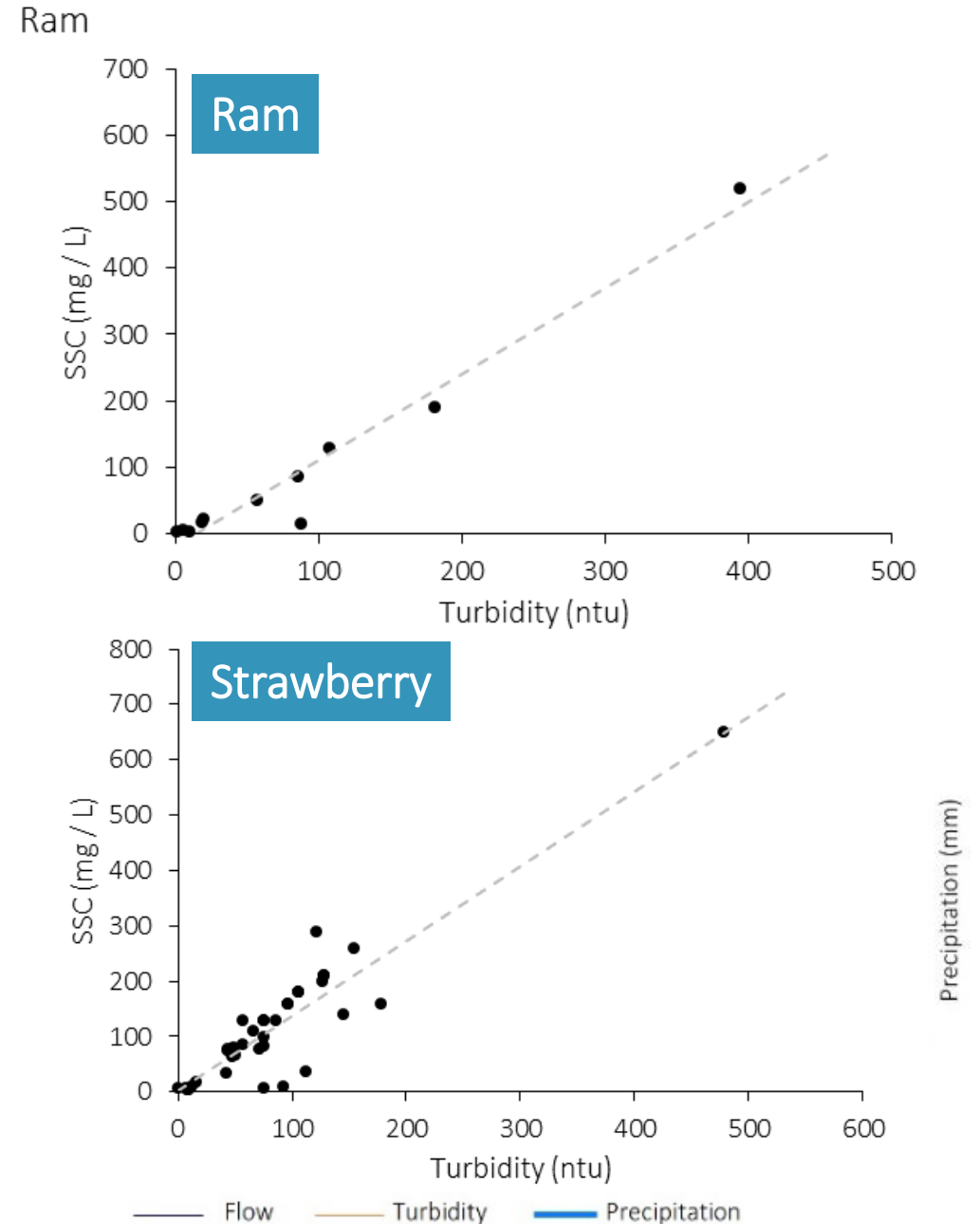
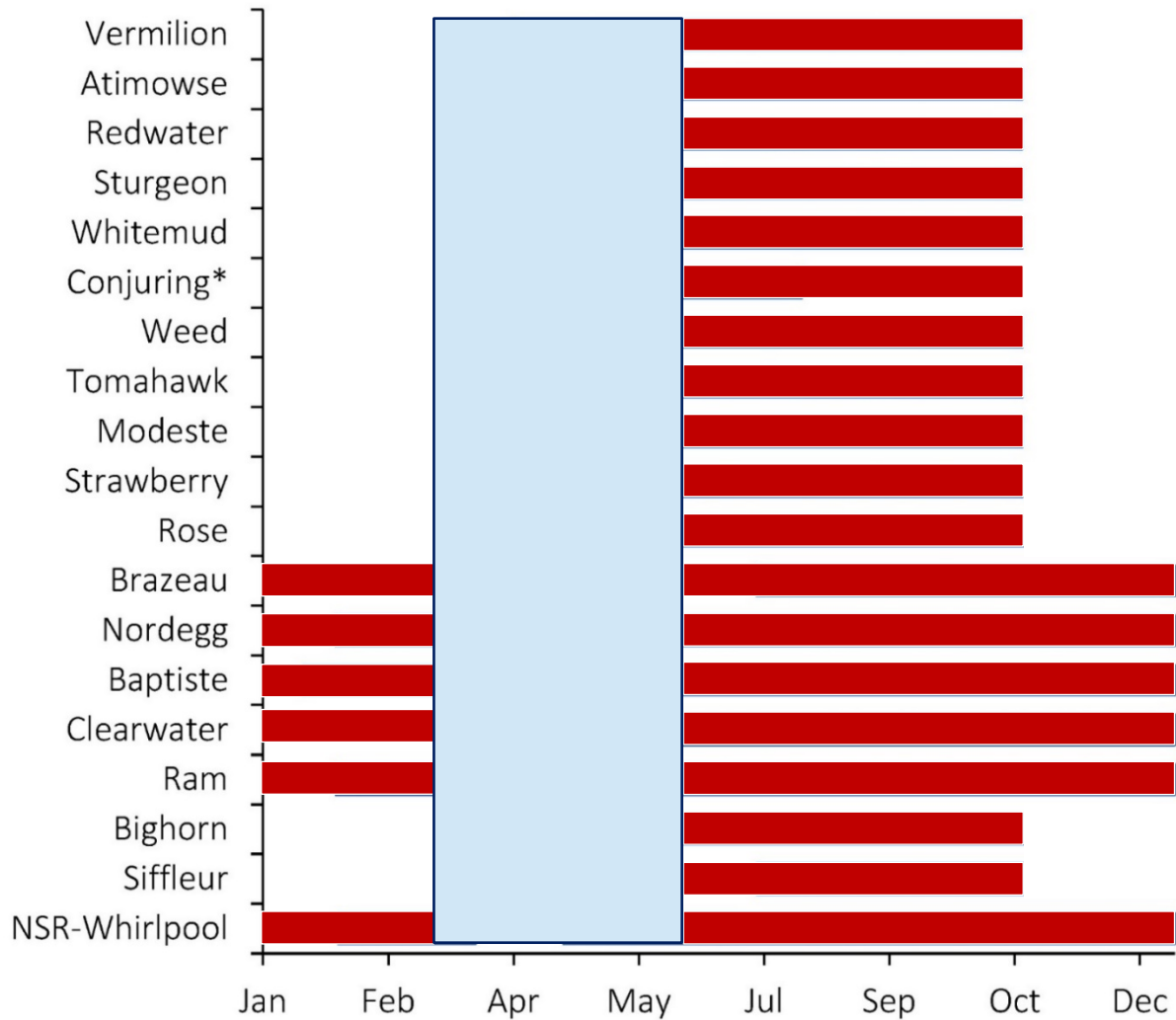
Strawberry



2019-20 – sonde data

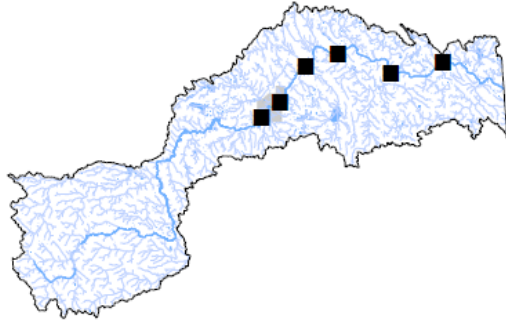


2019-2020 – sonde data

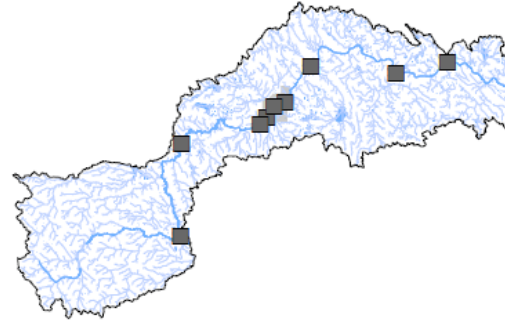


2019- Aquatic Ecosystem Health Assessment

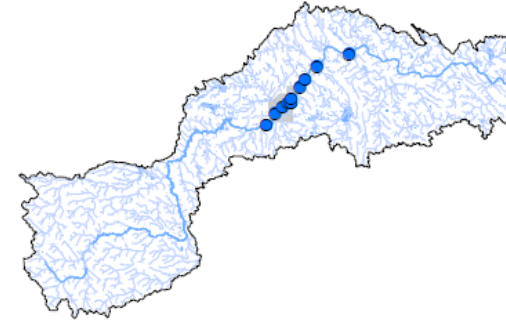
1969-1973



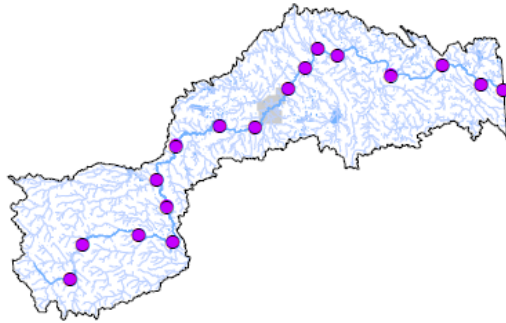
1974-1975



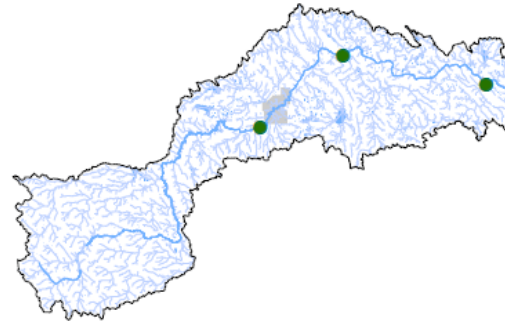
1982



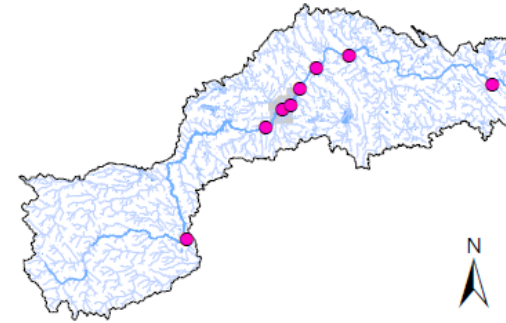
1985



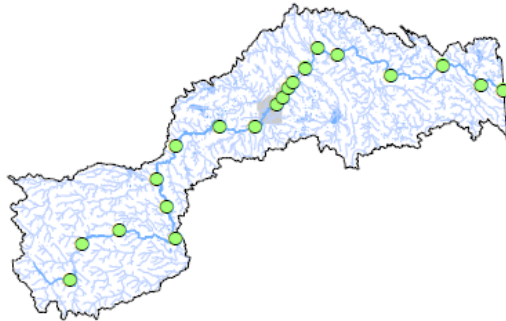
1983-1987



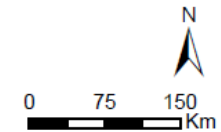
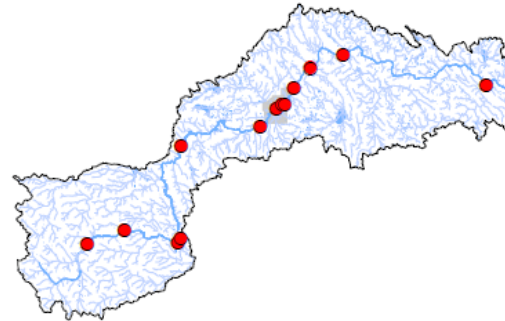
2007



2008



2015

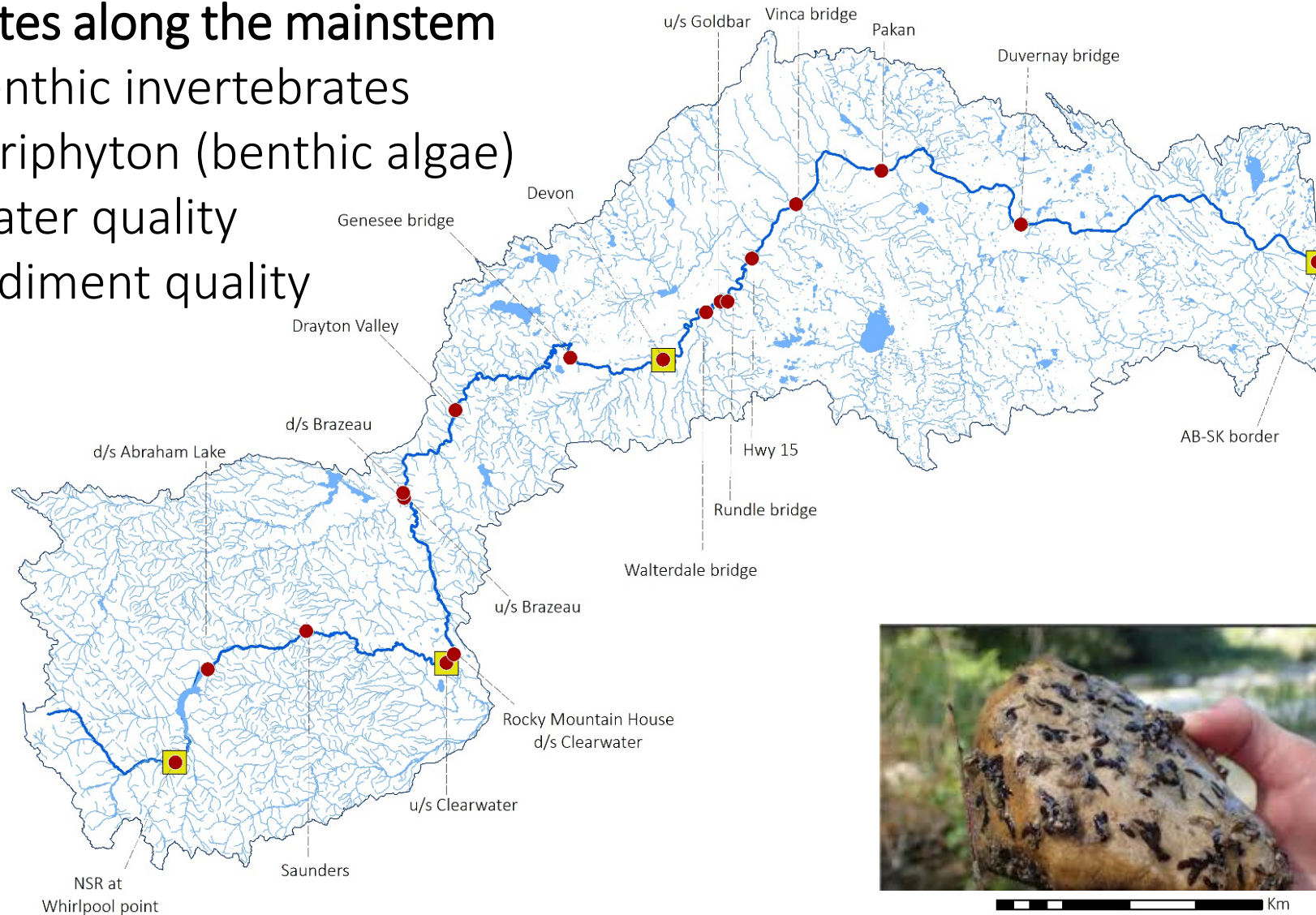


**Benthic invertebrate
monitoring stations in the
North Saskatchewan
River Watershed**

2019- Aquatic Ecosystem Health Assessment

17 sites along the mainstem

- Benthic invertebrates
- Periphyton (benthic algae)
- Water quality
- Sediment quality



0 12.5 25 50 75 100 Km

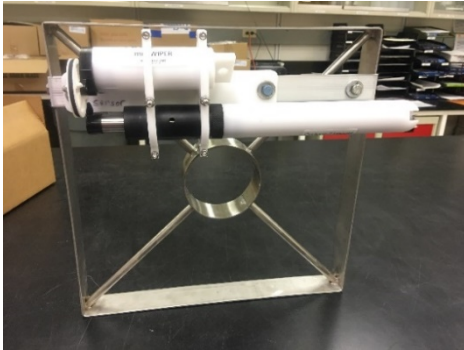
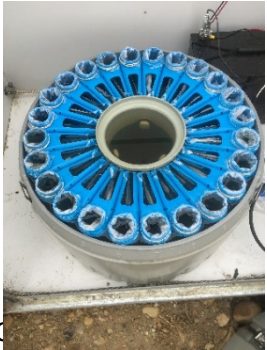
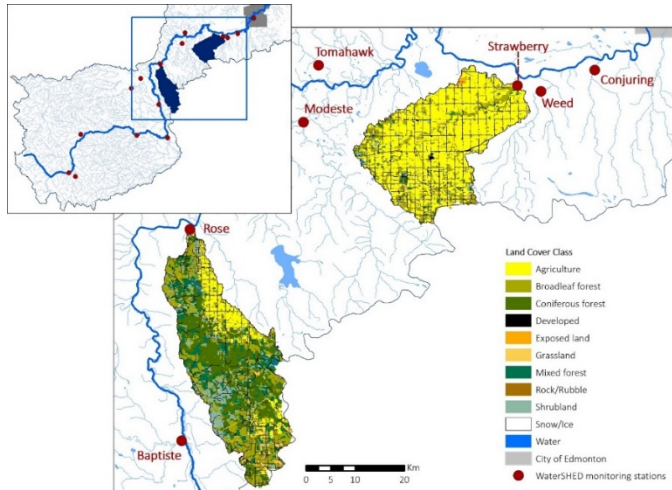


Focused studies

Focused studies

DOM dynamics

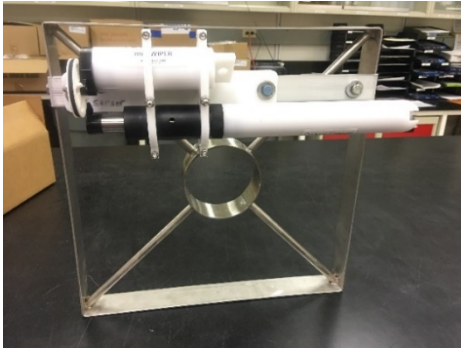
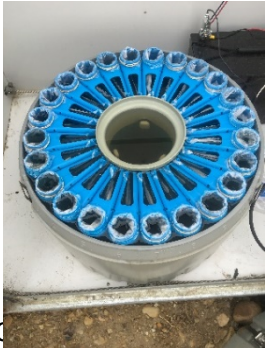
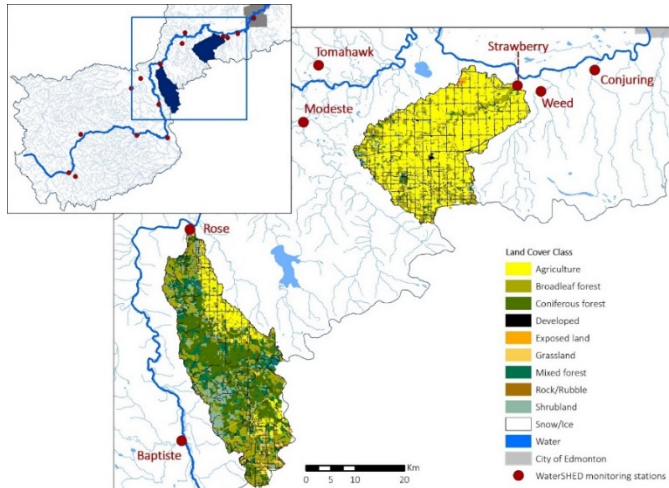
- Quantify the nature, concentration and export of DOM in tributaries draining contrasting land covers and link to DOM and color observed at WTPs in Edmonton



Focused studies

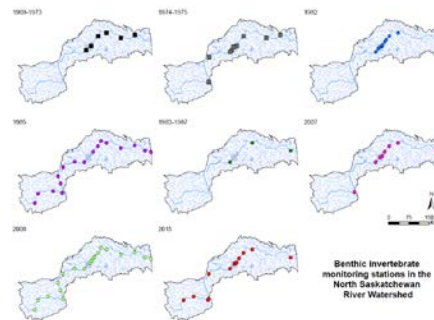
DOM dynamics

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Neill vs. CABIN

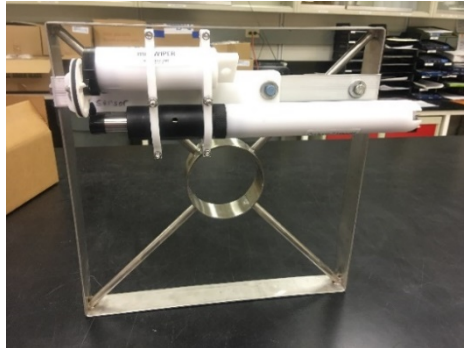
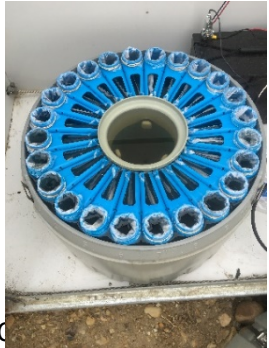
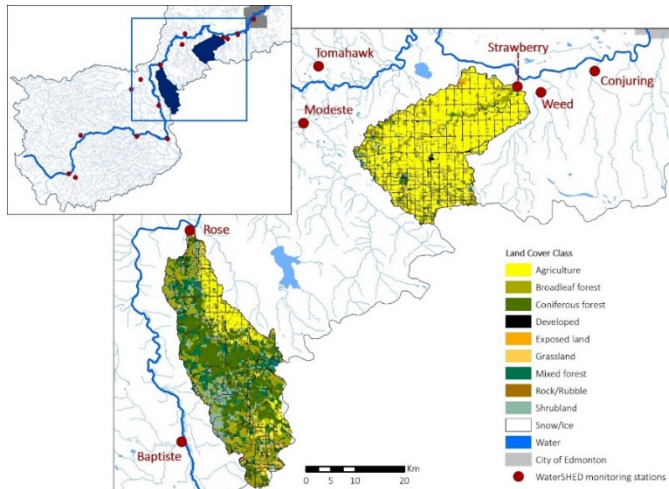
- Compare sampling methods to determine appropriate data collection techniques for the WaterSHED program.
- Reach consistency in sampling methods across the province



Focused studies

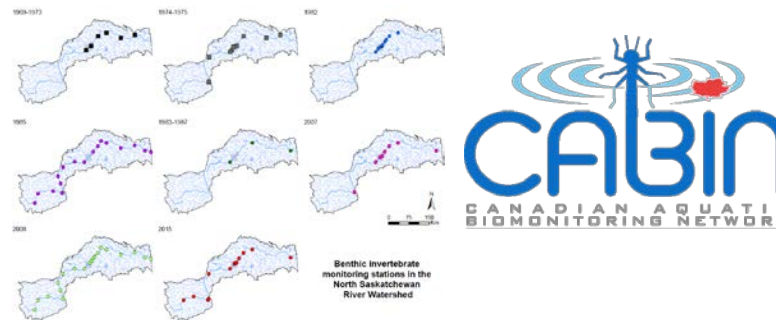
DOM dynamics

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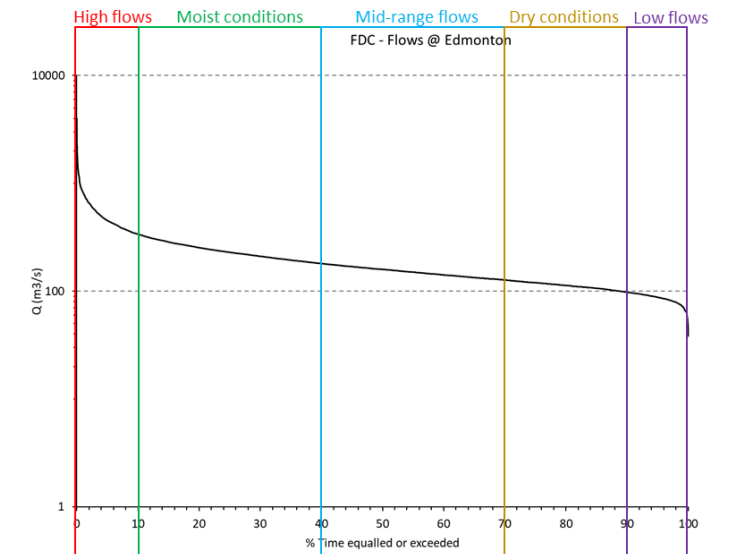
Neill vs. CABIN

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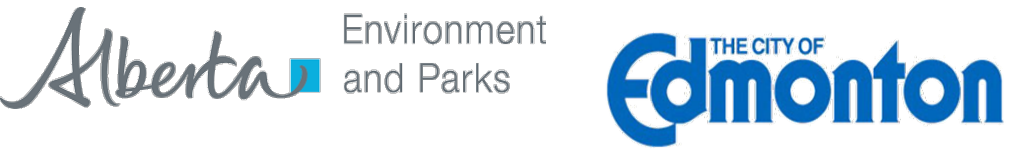
Support to MALs

- Use flow-weighted sampling to update and set Maximum Allowable Loads in the NSR for ~ 40 Parameters of Concern.
- Work done under the "Industrial Heartland and Capital Region Water Management Framework" led by AEP's Resource Management team.

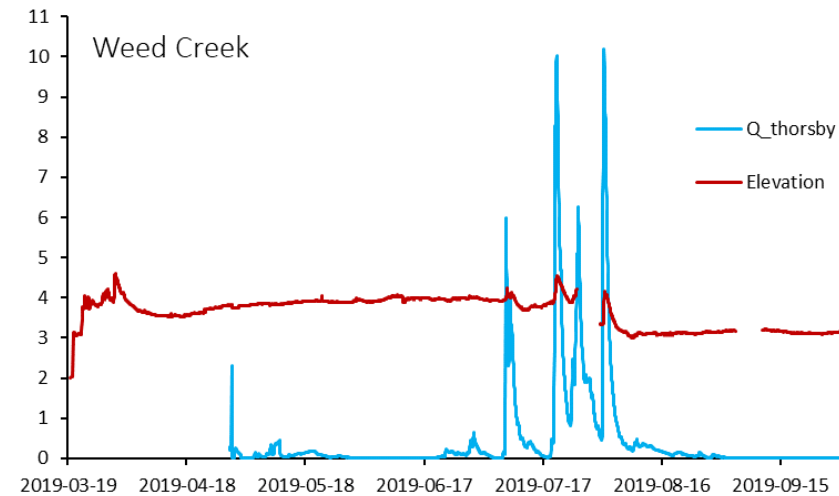


For more info about the IH-WMF contact Dr. Vanessa Swarbrick (vanessa.swarbrick@gov.ab.ca)

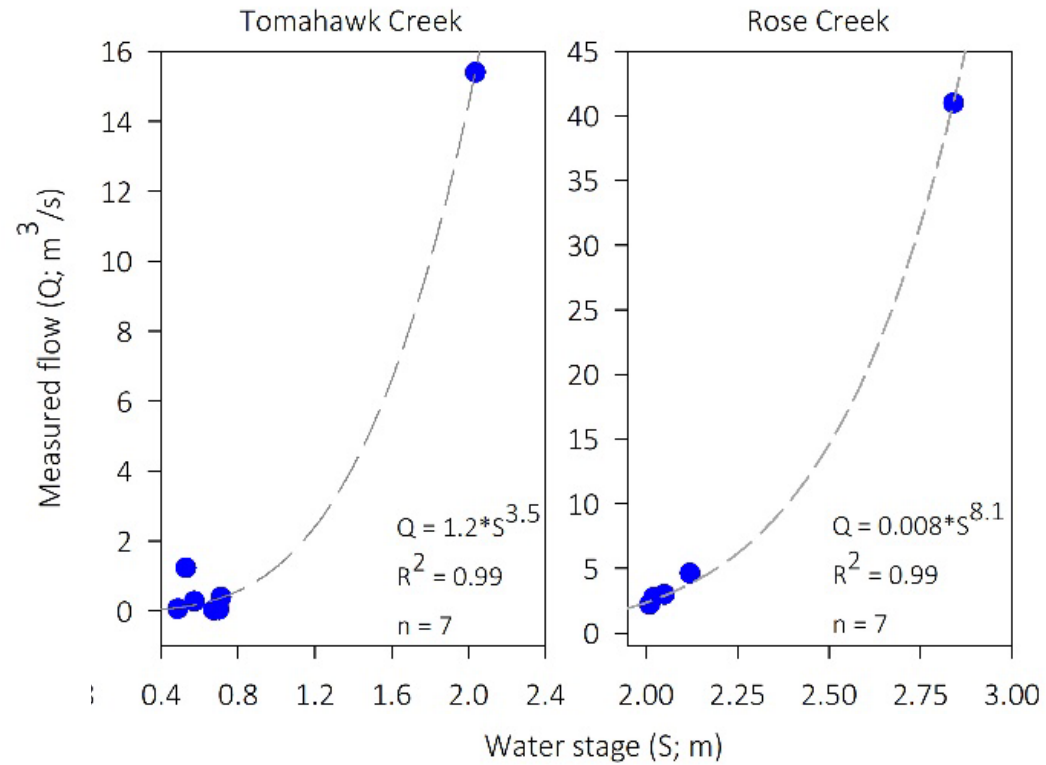
Monitoring: successes and challenges



Monitoring: successes and challenges



Monitoring: successes and challenges



- Some new stations don't have flow data available yet.
- Rating curves under development

