


# A Hydrology-Based Approach to Sustainability and Resiliency in the Brandt's Creek Watershed



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# Sustainability and Resiliency approach

- Sustainability is the quality a system has, if it can continue to persist, nourish and be nourished in its relationship within its environment.  
(Working definition #4 from Bender, Judith & Beilin, in Bender, Ch. 14)
- Resiliency: hydrological contribution to maintaining all current ecosystem and societal services.



# Geography & topology



Source: Ray Lewis, “Brandt’s Creek: The Good, The Bad and the Ugly”.

# Geography & topology



Source: Sncwips  
<https://www.sncwips.com/tours>

# Background - Hydrology

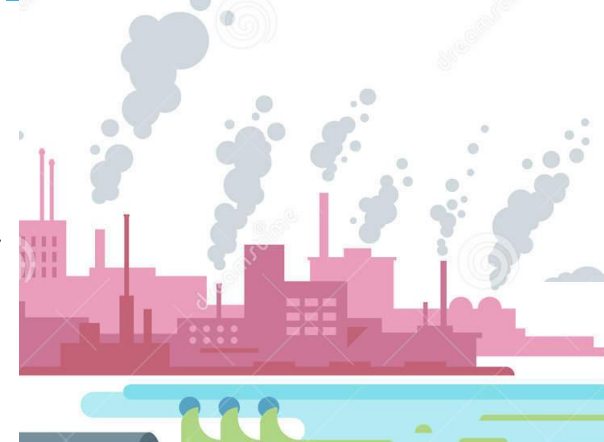
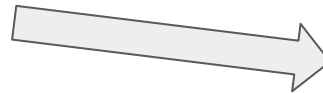
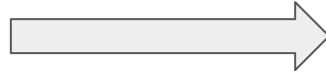
Flow rate:  $0.023 \text{ m}^3/\text{s}$  + inconsistent

Discharge:

1. Non-point

2. Waste discharge


$2650 \text{ m}^3/\text{d} \rightarrow 0.030 \text{ m}^3/\text{s}$



# Background - Hydrology

Ph 

Metal measurements 

Dissolved solids 

Bacteriological quality 



- Water test incomprehensive = based on irrigation water protection



# Background - Biology



# Background - Economy

- Historical role of rivers
- The North End Industrial Area
- A win-win scenario
- Recreational economy and its long-term impact

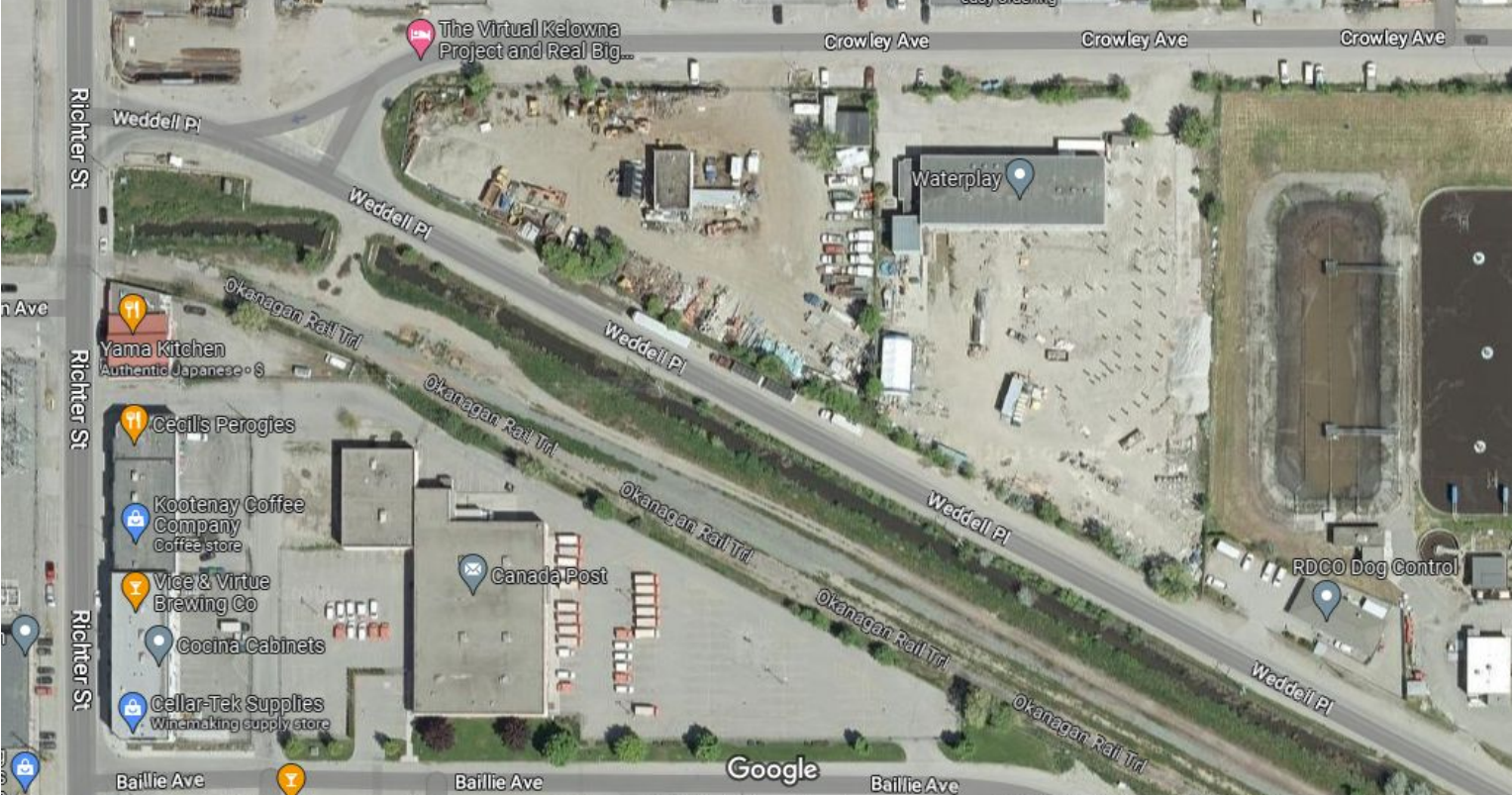




# Background - Community and Culture



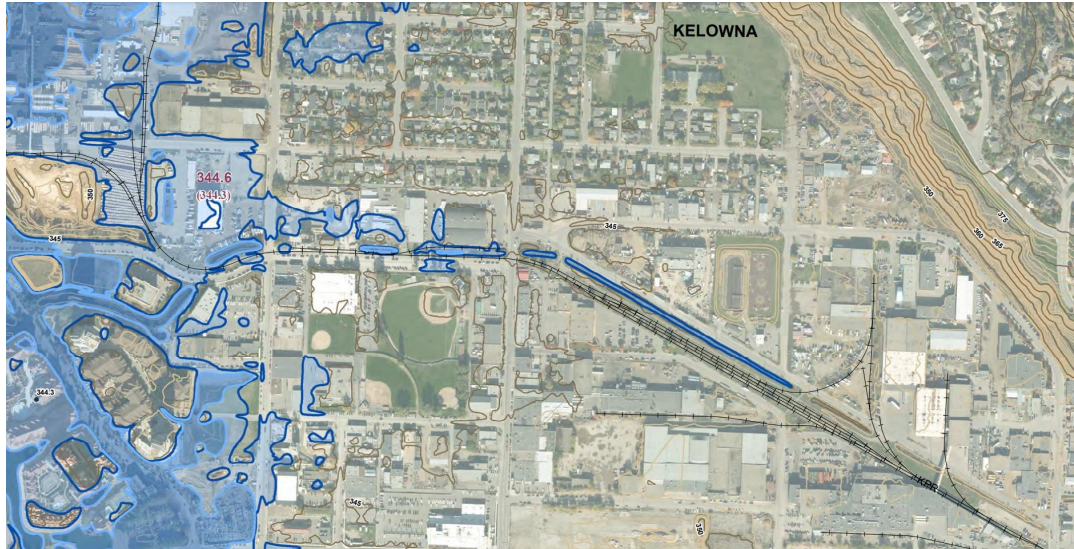
# Background - Unhoused community





# Flood

- There have always been floods in the Okanagan – a valley born of water and ice. As times change, with different weather and different ways we live on the land, the story of flooding in the Okanagan changes with each generation. (Okanagan Basin flood map)
- **This map shows only the section of floodplain of the Brandts Creek for the design flood.**



# Background - Flood

**1- Different branches lead to the creek, which can increase the power of flood.**



# Challenges

**3- Cut Down Trees**



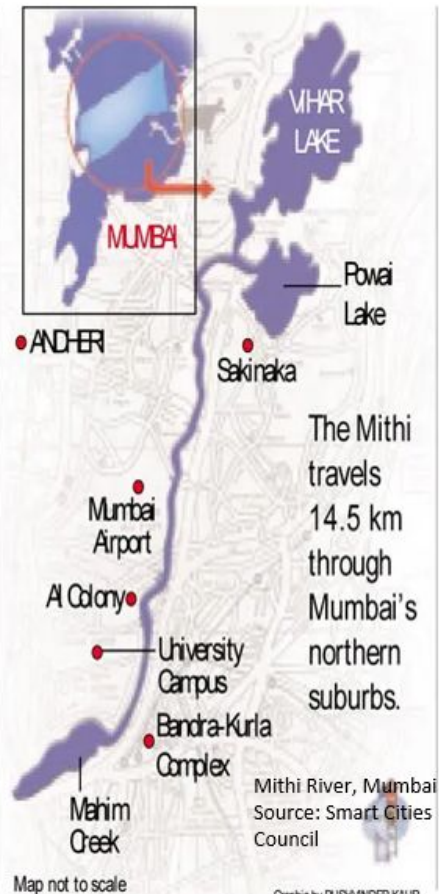
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# Solutions

- **Preserve and restore natural floodplain functions**
- **Naturalize the creek**
- **Developing a sediment and erosion control plan**
- **Implement green infrastructure measures:**
- **Plant native vegetation**



# Case Study: Mithi River



## FACTS:

- Span 14.5 km with the width of the river is narrowed to 10- 15 meters and a depth of 5.5 meters
- Encroached by over 1500 industries and more than 3000 illegal establishments which directly dump waste into the water.
- 80-110 metric tonnes of plastic waste in addition to the chemical discharges, concrete and cement debris, mud, and household waste
- Frequent environmental disasters during monsoons
- Plagued by Eutrophication (Algae) and Water Hyacinth



### ADMINISTRATIVE ACTIONS:

- In 2013, the **Nation Green Tribunal** had asked for shut down of the 239 industries which were polluting the river.
- In 2015, 100 of these industrial units were issued closure notices by the **Maharashtra Pollution Control Board (MPCB)** and by 2018, electricity and water supply was disconnected for 200 industrial units which were operating around Mithi.
- Over the past few years at least 700 other small-scale industries have also been shut
- RA Rajeev, metropolitan commissioner, MMRDA, said, “A process of **bioremediation and phytoremediation** will be used to improve the water quality. We will also share the technology with the Brihanmumbai Municipal Corporation (BMC) during the project.”



### CITIZEN ACTIONS

- The phrase “River as the Soul of the City” encouraged people to help the river recover from its dangerous status and undeniably bad development.
- Afroz Shah, an activist and lawyer, is in charge of a group of volunteers who work to clean the river.
- The Dawoodi Bohra Community is actively involved in helping him with this. This community also teaches the people who live along the river about the dangers of dumping and the penalties of doing so, in addition to cleaning up pollution.
- The founder of Beach Please, Malhar Kalambe, also started a cleanup mission. This crew started working on the Mithi River in 2018 and has collected about 3,800 tonnes of rubbish.



# Policy - Owners of Brandt's Creek

Who is responsible and accountable for Brandt's Creek?

The City of Kelowna: lots of moving parts

Other considerations:consultation





# Policy - Biology

## BC NEEDS TO GET ITS ENDANGERED SPECIES ACT TOGETHER

For the full report and list of  
supporters, visit  
[www.scientists-4-species.org](http://www.scientists-4-species.org)

British Columbia has the *most biodiversity* of any province or territory in Canada and also *the most species at risk of extinction*.

It is one of only a few provinces with *no endangered species legislation*

1807

Species in decline

278

Species at risk of extinction

Of 455 federally-listed species at risk evaluated more than once, most have *worsened in status or failed to improve*

18% worse    64% no change    18% better



## WHAT SCIENTISTS PROPOSE

Our species at risk expert panel recommends an endangered species law that promotes the recovery of species at risk and simultaneously safeguards BC's biodiversity. This law should:



### Commit to species recovery within a broad and integrated framework

- Integrate with the provincial land-use planning framework
- Ensure sustained funding
- Commit to scientific integrity: rigour, transparency, independence, and open data



### Implement effective protections and stewardship

- Implement automatic protections on Crown land and work with landholders to apply additional protections
- Use permits and exemptions sparingly and with justification
- Support evidence-based stewardship



### Take an evidence-based approach to recovery

- Mandate an independent Oversight Committee to prioritize assessment, list species, guide prioritization of recovery actions, and evaluate effectiveness
- Adopt automatic listing
- Establish Recovery Teams for species or multi-species groups
- Prioritize recovery actions quickly and transparently, while aiming to recover all species

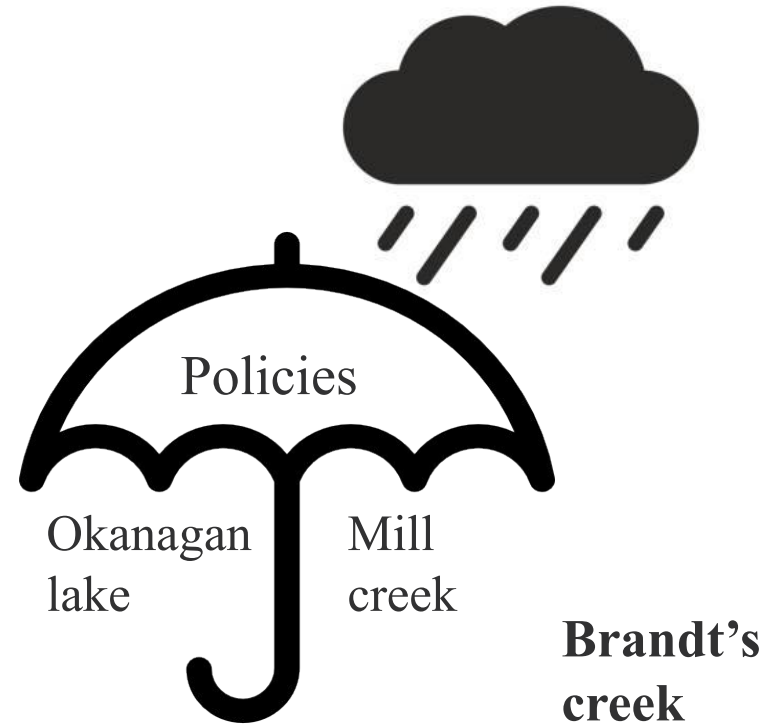


### Ensure accountability to meeting Act objectives

- Require government progress reports detailing recovery actions and outcomes


# Policy - Hydrology

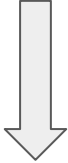
- Memorandum of Agreement for water Quantity Surveys
- Water Sustainability Act (WSA)
- The Waste Discharge Regulation under the Environmental Management Act (EMA)
- Environmental flow needs (EFN) policy for British Columbia





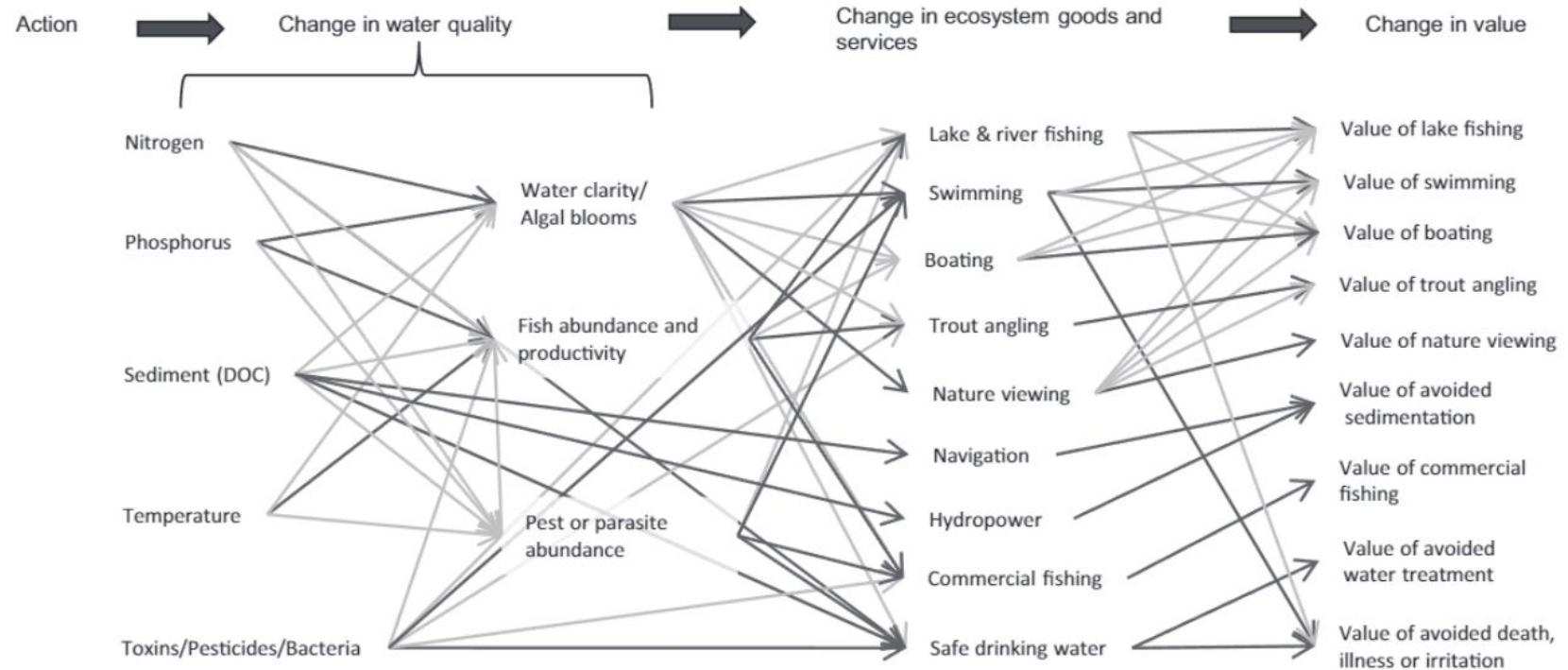
# Issue of focus: Hydrology-based challenges

- Little is known
  - Outdated results
  - Determinant of stream health
- 
- Preserving water as a resource
  - Functions
  - Ecosystem services
  - Supporting wildlife, flora, Kelowna's communities
  - Environmental and safety concerns



Sustainability interventions

# Importance of hydrology



→ Primary driver  
→ Secondary driver

# Addressing hydrology-based challenges

Recreation water quality testing

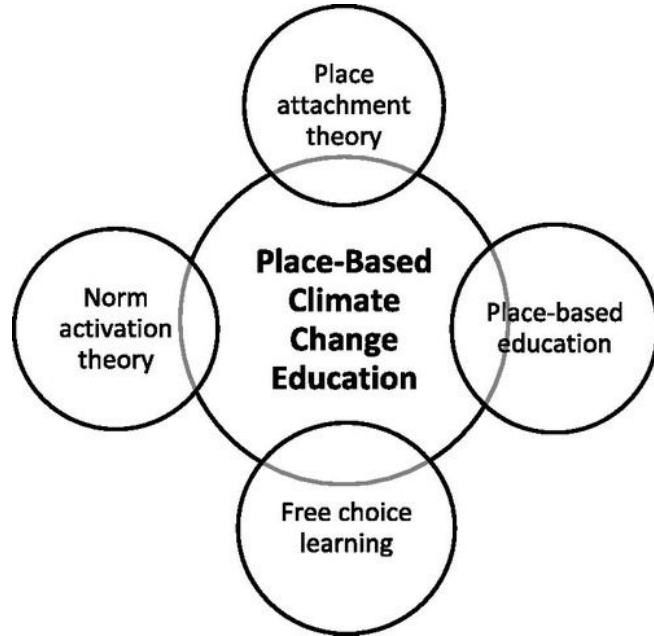
Phosphorus + nitrogen

Water flow + depth (sediment accumulation)

Initial hydrology investigations for Brandt's creek



# Literature review of place-based methods



Rousell, Cutter, and Knowles (2020)

*David Rousell & Amy Cutter-Mackenzie-Knowles (2020) A systematic review of climate change education: giving children and young people a 'voice' and a 'hand' in redressing climate change, Children's Geographies*

-The study identifies a pressing need for participatory research that empowers children and young people in addressing or redressing the complex implications of climate change in their communities and environments.

Khadka, Li, Stanis, and Morgan (2021)

*Unpacking the power of place-based education in climate change communication, Applied Environmental Education & Communication,*

# Proposed citizen science at the University of British Columbia–Okanagan.

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# Proposed Citizen Science Project

## Temperature

### Why do we measure water temperature?

Have you even been outside on a really hot day? How does it feel? Now imagine you're a being (like a fish or a cattail) that spends its life in the water. The water in Brandt's Creek won't get as hot as the air in downtown Kelowna during a heat wave, but it still might be uncomfortable for some of the creek regulars who are used to cooler temperatures!

But what actually happens when a stream gets too warm? Well, warmer water can hold less oxygen in it—which the fish need to breathe as much as you do! Warmer water in streams can also cause plants and soils to release more of other types of *nutrients* (the substances in food that help living things grow). And while that might sound like a good thing, sometimes having too many of a certain kind of nutrients isn't the best thing for plants and animals. Like if you've ever eaten too much dessert and had a stomachache afterward.

So it's important to monitor water temperature in Brandt's Creek so we know if it's healthy for the plants and animals living there!

### Steps to Measure Water Temperature:

1. **Submerge** thermometer 2/3rds of the way underwater near the center of the creek.
2. **Hold** thermometer in water for at least **1 minute**.
3. **Remove** thermometer from water and quickly **record** date and temperature in the chart below.

Date	Temp.

Date	Temp.

## Who Do You See?

### Get Creative!

There are lots of ways to write about the things you observe in nature! For a fun challenge, try using your observations to write one of the prompts below:

A poem about what or who you found along Brandt's Creek today.

A conversation between two plants along the creek.

Do you see any animal tracks? Write a short story about the animals that might have made them.

Grab this booklet, a pencil, some weather-appropriate clothes, and head outside. Find a comfortable, quiet place to observe the creek in your neighborhood. What can you see? Hear? Smell? Feel? What's different about this spot that you haven't seen elsewhere in Kelowna? Write down your observations in the space below.

Or draw them!

*Knowledge mobilization  
from citizen science project*

Care

Engagement

Democratisation & inclusivity.



# The Report!

City of Kelowna

2021 Annual Drinking Water and Filtration Deferral Report

## Introduction

As required by the *British Columbia Drinking Water Protection Act*, the City of Kelowna (COK) provides the following annual report in accordance with our conditions on permit and conditions on filtration treatment deferral.

This report provides an overview of our service area, water quality monitoring program, water sustainability initiatives, distribution system maintenance, capital works projects, cross connection program, staff certification program, water source protection activities, emergency response plan, and water services provided.

The City of Kelowna's primary focus is to reliably provide sustainable, quality drinking water from source to tap for the customers of the Kelowna Water Utility. For further details on the content of this report or to request additional information, please contact the City of Kelowna Utility at 250-469-8502 or email [watersmart@kelowna.ca](mailto:watersmart@kelowna.ca).

## Water System Overview

The City of Kelowna water utility is one of four large water providers operating within the municipal boundary and services approximately 86,000 residents. Within the water boundary, there is one main potable water



# Content of the report

- Ammonia, Phosphate, Nitrate, Chloride, true color, conductivity, dissolved oxygen, E. coli, pH, total suspended solids, temperature, turbidity....
- 5/30 days
- First flush + >7mm rain event

- British Columbia Aquatic Water Quality Guidelines (BCAWQG)
- Canadian Drinking Water Quality guidelines (CDWQG) Aesthetic Objectives (AO)
- Canadian Council of the Ministry of Environment (CCME)
- Guidelines for Canadian Recreational Water Quality (GCRWQ)



# Key Findings

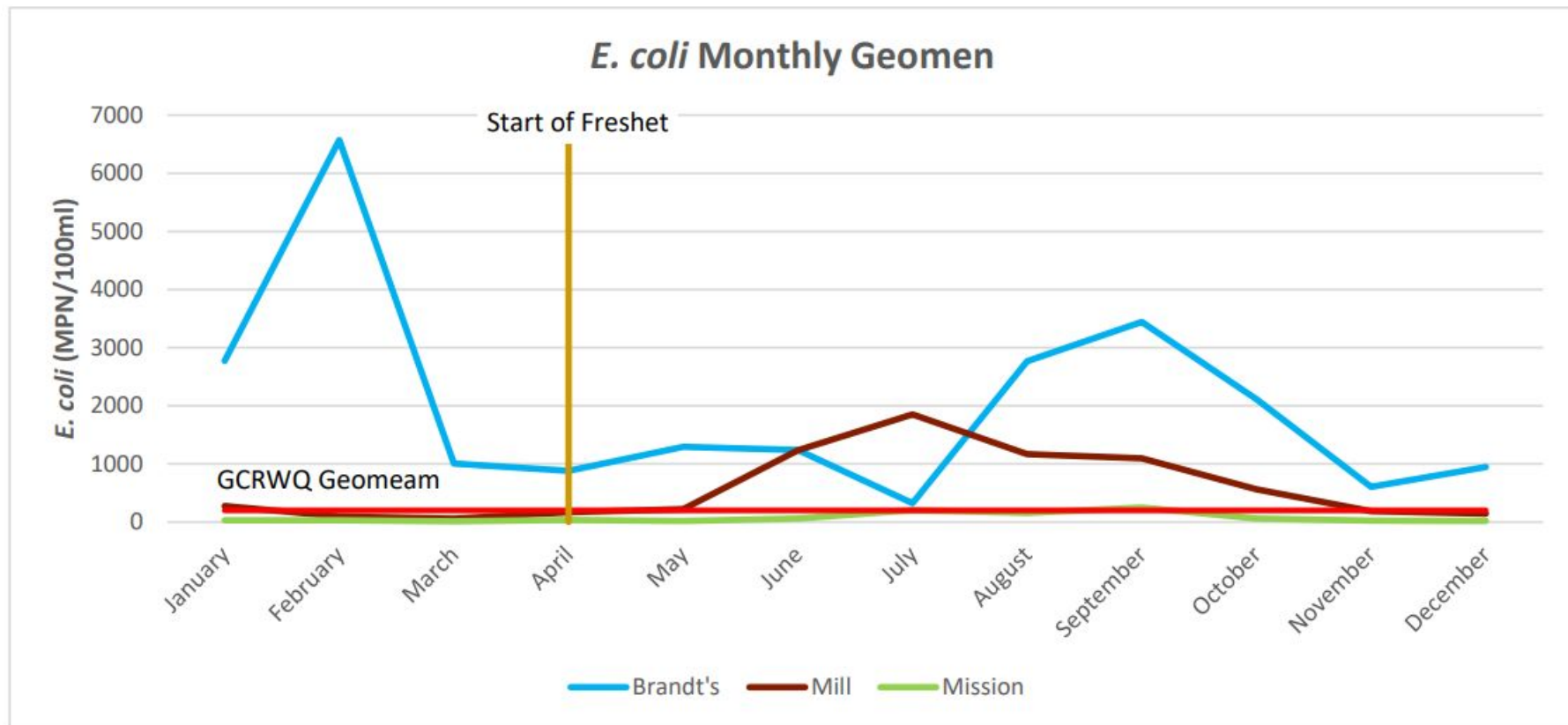


Figure 52. Monthly *E. coli* averages in creek samples

# Key Findings

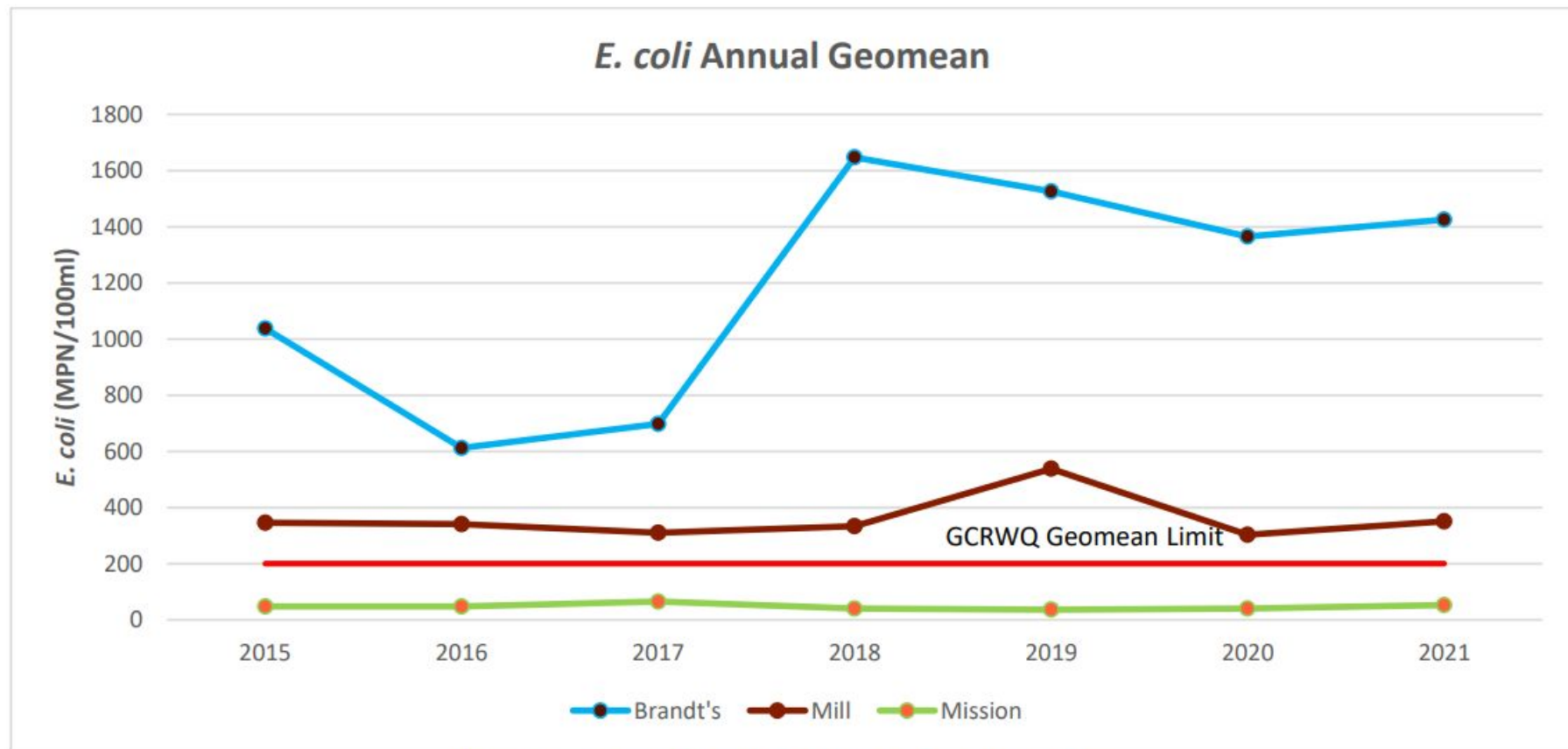


Figure 53. 7-year *E. coli*. average for creek samples

# Key Findings

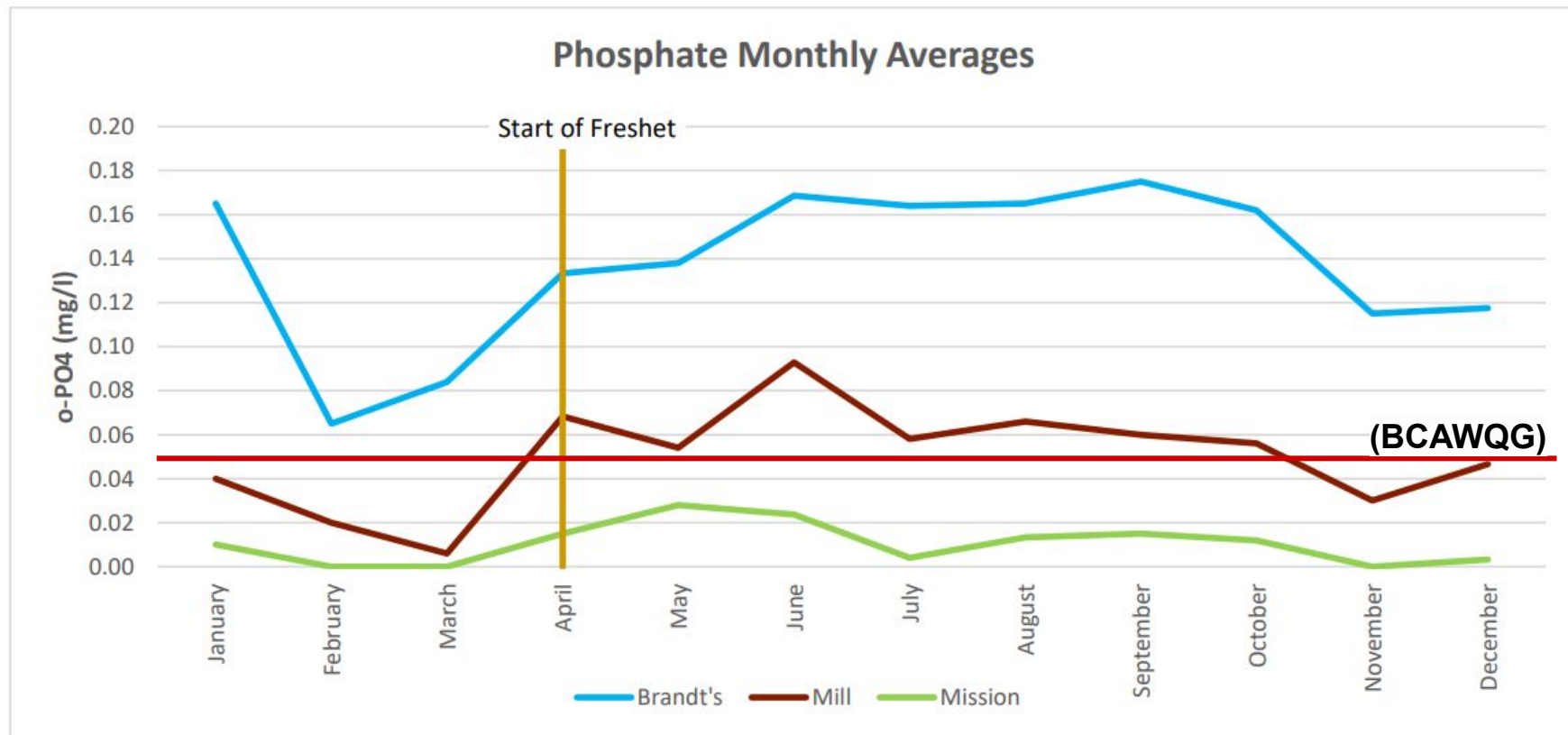


Figure 63. Monthly Phosphate concentrations for creek samples

# Implications of the report.

These findings need to be the groundwork for sustainability interventions.

However, still space for citizen engagement (with restrictions due to those E.coli results!).

Illustrative of the challenges in knowledge mobilisation.



**Parallel issue of focus: communication, knowledge flows & mobilisation.**

**Sheds light on the challenges of knowledge mobilisation, collaboration, and policy making.**

**Essential & urgent knowledge: there is a public health risk here (for North End Community, and particularly unhoused community)**

# Brandt's Creek Knowledge Flows

