

# The Community Watershed Monitoring Network

## *Data to Action*

Introduction

2022 Data

Data to  
Action

2023  
Monitoring

Contact  
Information

*Presented by:*  
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& Lauren Fegan, RDN DWWP Monitoring Network Coordinator  
July 12, 2023

# Today's Agenda

- Intro & 2022 surface water quality data | 11:00 am
- Hydrometric monitoring opportunities | 11:30 am
- Sensitive Habitat Inventory Mapping | 11:50 am
- Lunch | 12:15 pm
- Group discussion | 1:00 pm
- Visual artist summary of the event | 2:00 pm



INTRO

Foundational  
Action Plan

Monitoring  
Network  
Origins

Partnerships

Water  
Quality  
Sampling

WATER AWARENESS  
AND STEWARDSHIP



WATER INFORMATION  
AND SCIENCE



WATER-CENTRIC PLANNING  
AND POLICY SUPPORT



Regional District of Nanaimo's  
**Drinking Water and Watershed  
Protection Action Plan 2.0**

2020-2030+

# Community Watershed Monitoring Network

- Started with shared goal to increase knowledge and understanding of **surface water quality** in the region.
- Monitoring program began in **2011**, designed with provincial protocols and methodologies.
- Streams sampled during 2 seasonal periods (**summer low flow & fall flush**), 5 consecutive weeks each.
- Sites chosen to **fill data gaps** in provincial monitoring networks, based on local knowledge of Streamkeepers.
- All data entered and stored in publicly accessible, **provincially managed database** - Environmental Monitoring System (EMS).



# Program Partnerships

## Ministry of Environment

Provide training & sampling protocols, public database and portal, technical support, data review.

## Surface Water Quality Data

Supports project prioritization, land use planning, funding applications, awareness & stewardship.

## Mosaic Forest Management

Provide safety gear, land access to upper watershed sites, sponsors QA/QC lab analysis.

## RDN DWWP

Coordinate monitoring program. Facilitate training, manage equipment, technical support. Upload data to public database. Reporting.

## Community Stewardship Groups

Local knowledge, history, and volunteer coordination. Complete annual training, equipment calibrations, perform summer & fall sampling.



# Surface Water Quality Monitoring Parameters



- Water Temperature
- Dissolved Oxygen
- Conductivity
- Turbidity



# Objectives & Guidelines

## Water Quality Guidelines

- Developed by the Province for B.C.'s aquatic resources and the protection of aquatic life, wildlife, agriculture, drinking water sources, and recreation.
- Are used to assess and manage the health, safety, and sustainability of freshwater.
- Approved Water Quality Guidelines for dissolved oxygen, temperature, and turbidity.



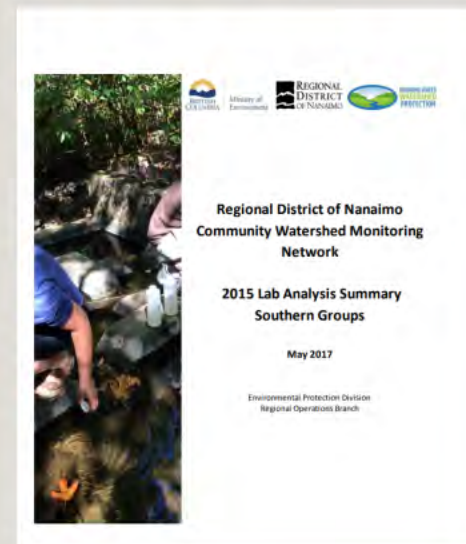
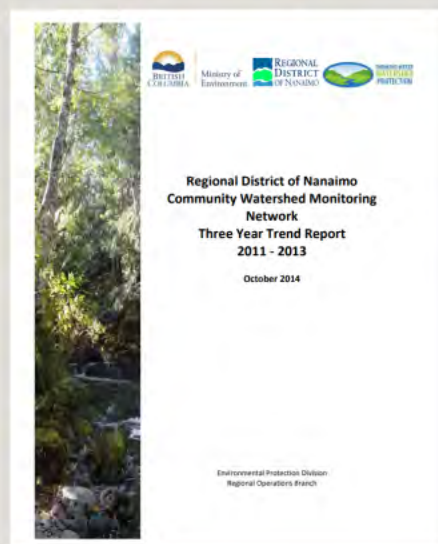
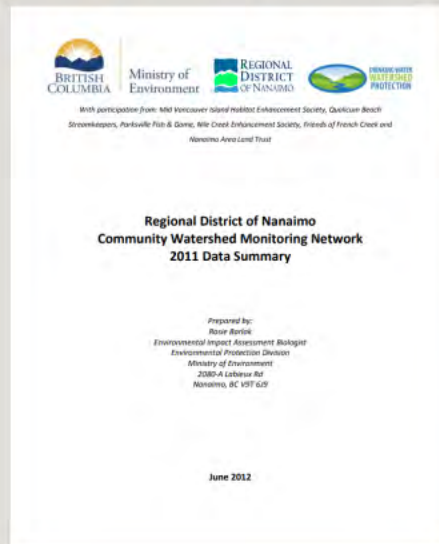
## Water Quality Objectives

- Developed by the Province for specific waterbodies.
- Are used to manage protect specific water uses in that watershed.
- Within the RDN, Objectives have been developed for the Englishman River, French Creek, and Little Qualicum River.



# Surface Water Quality Data Results

- Data analyzed and reported on annually; results used to support decisions, inform research projects, and increase understanding of watershed health.
- Surface water quality sites that have levels outside the Guidelines and Objectives are flagged for further investigation: i.e. physical stream assessments, lab analysis, additional monitoring, etc.
- Reports, presentations, and previous years of data are available at [www.rdn.bc.ca/cwmn](http://www.rdn.bc.ca/cwmn).





# 2022 Surface Water Quality Data

- 67 surface water quality sites sampled on 38 streams in 24 watersheds
- Engaged Ecoscape Environmental Consulting to analyze and report on data collected 2011-2022
- Summary of the data presented today
- All data available online at [www.rdn.bc.ca/cwmn](http://www.rdn.bc.ca/cwmn)

Monitoring Sites

Climate Data

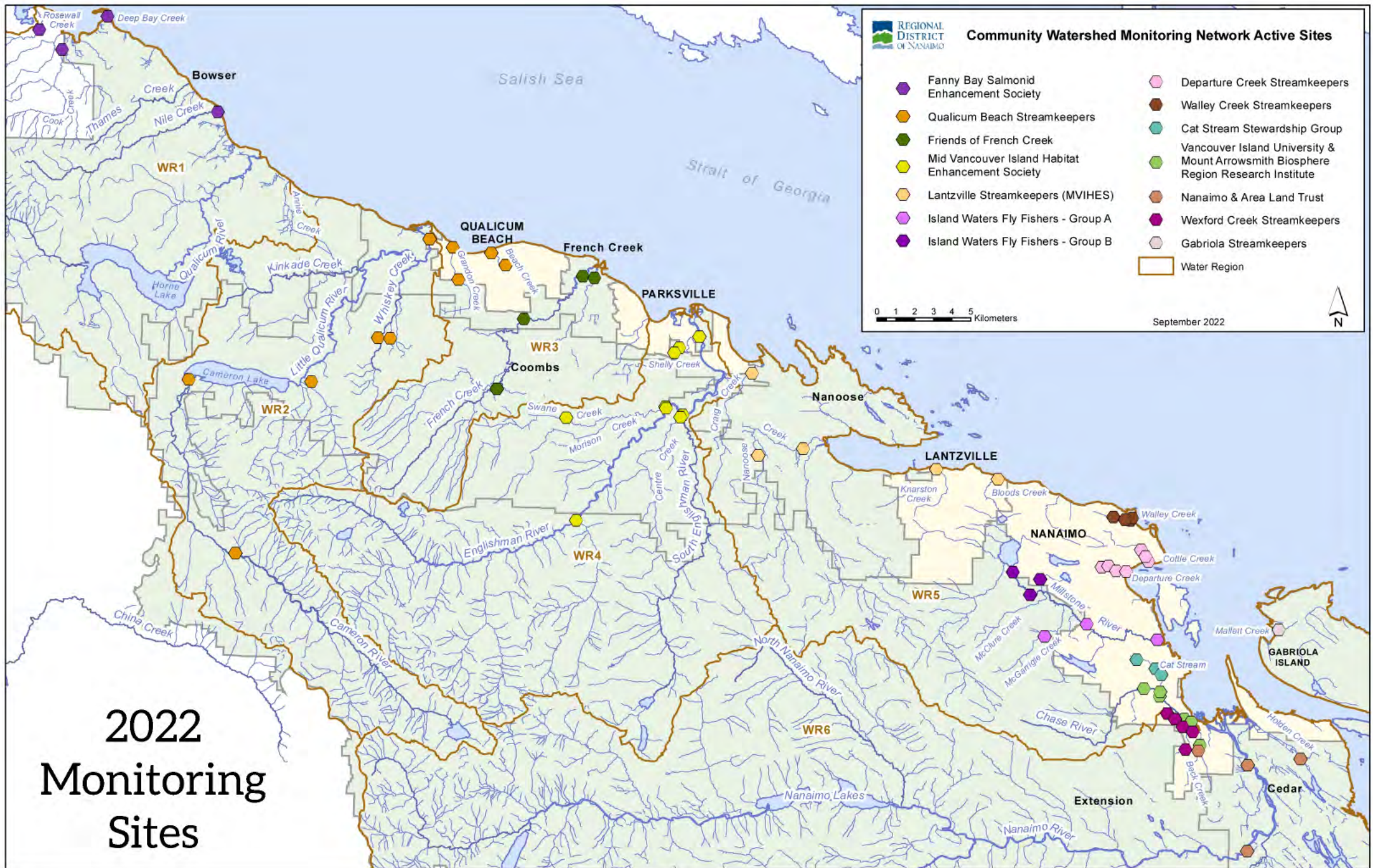
Water Temperature

Dissolved Oxygen

Turbidity

Specific Conductivity

Conclusions



# Overarching Climate Change Impacts



- Earlier and longer dry periods
- Hotter seasonal averages
- Wet season more unpredictable
- Heavier and more sporadic rains

**Climate resilience depends on functioning, and healthy watersheds!**



**Hydrological monitoring (climate, snow, surface water, and groundwater) supports decision-making for drought, flood, infrastructure planning, and ecological modeling**

# Impacts on Surface Water Quality Parameters

Measured parameters (water temperature, dissolved oxygen, turbidity) are influenced by air temperature and volume of stream flow

*Example:*

*Summer Sample Period Comparison  
Average Air Temperature & Total Precipitation*

Year	Avg Temp.	Total Precip.
2014	24.3°	26.0 mm
2015	24.1°	23.1 mm
2016	25.1°	19.6 mm
2017	26.1°	3.3 mm
2018	25.3°	1.5 mm
2019	24.0°	19.3 mm
2020	23.7°	40.7 mm
2021	25.1°	5.1 mm
2022	26.1°	1.0 mm



**Climate change trends** (hotter air temp, longer dry periods, heavier rains) **influence** measured surface water quality parameters

# Water Temperature

- Objective for Englishman River for drinking water supply weekly average  $\leq 15^{\circ}\text{C}$
- Guideline for aquatic life (Coho rearing) weekly average  $\leq 17^{\circ}\text{C}$

- Increased water temperature can alter chemical properties of water, e.g., warmer water holds less oxygen
- *Exceedances of this parameter are recorded during summer low-flow period*



Beach Creek at Hemsworth



# Water Temperature

- *Across a watercourse there is a natural variation of water temperature*
- *In watercourses with temperature exceedances, cool refuges (i.e., deep pools) support the survival of juvenile salmon*



# 2022 Water Temperature Results

- 38 of 67 sites experienced temperature Guidelines exceedances
- 42% of sites sampled met temperature Guidelines
- Compared to 2021, there was 2% increase in sites that met temperature guidelines; however, this most likely is a result of starting sampling one week later in 2022



# 2022 Water Temperature Results

- Highest weekly average air temperature correlated with greatest amount of temperature exceedances on a given sample date
  - 38% on Aug. 23
  - 27.3°C Qualicum
  - 29.0°C Nanaimo
- *Exceedances of temperature are more common in the lower reaches*
- *Urban streams tend to experience higher temperatures compared to more naturalized watercourses*



Little Qualicum River



# Water Temperature Trends

- Trend analysis was completed on sites with 6 years or more of data
- 12 sites have degrading trends in water temperature, of these, half also experienced exceedances in 2022

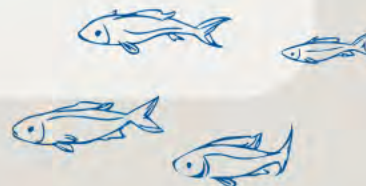
EMS Number	Site Name	2022 Exceedances	Degrading Trend
E298597	Big Qualicum u/s Hwy 19	None	Overall
E299852	Centre Creek u/s South ER	None	Overall
E290452	Shelly Creek at Blower	None	Fall
E287131	Shelly Creek at Hamilton	None	Overall
E308186	Swayne Creek	None	Overall
E287697	Whiskey Creek at Hwy 4	None	Summer
E288092	Beach Creek at Hemsworth	1	Summer
E243022	French Creek at Barclay	2	Summer
E243024	French Creek at Grafton	1	Summer
E288090	Grandon Creek at West Crescent	2	Summer
E287699	Nanaimo River u/s Haslam Ck	5	Summer
E294020	Nanoose Creek at Matthew Crossing	3	Summer

To better understand the source of temperature exceedances and degrading trends, physical stream assessments and an understanding of adjacent land uses and inputs are recommended

# Dissolved Oxygen

## Two Guidelines

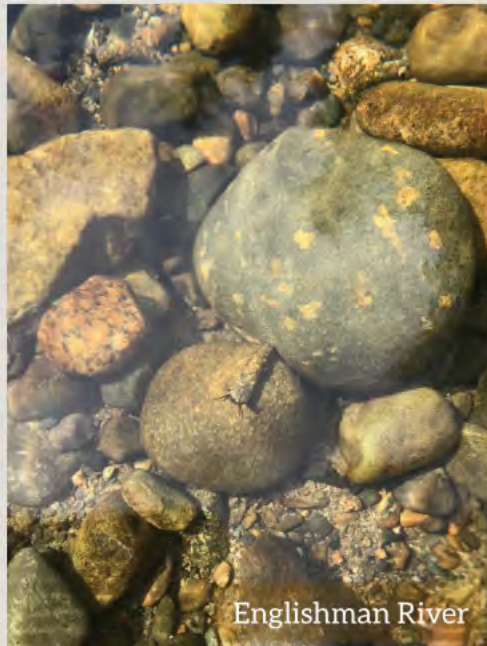
- 5-in-30 day average of 8 mg/L
  - Instantaneous minimum of 5 mg/L
- 
- **Oxygen is key for surface water self-purification processes and maintenance of aquatic organisms**
  - *Dissolved Oxygen (DO) levels below both Guidelines are most often recorded during summer low-flow period*
  - *Sites with very low flow may also experience DO levels below Guidelines during the fall sample period*



Benson Creek at Biggs

# Dissolved Oxygen

- Influenced by water temperature, stream structure, amount of flow, and biological oxygen demand, as these vary across a watershed, so does DO levels
- Riffles and groundwater inputs help to maintain DO levels for aquatic life and stream health



# 2022 Dissolved Oxygen Results

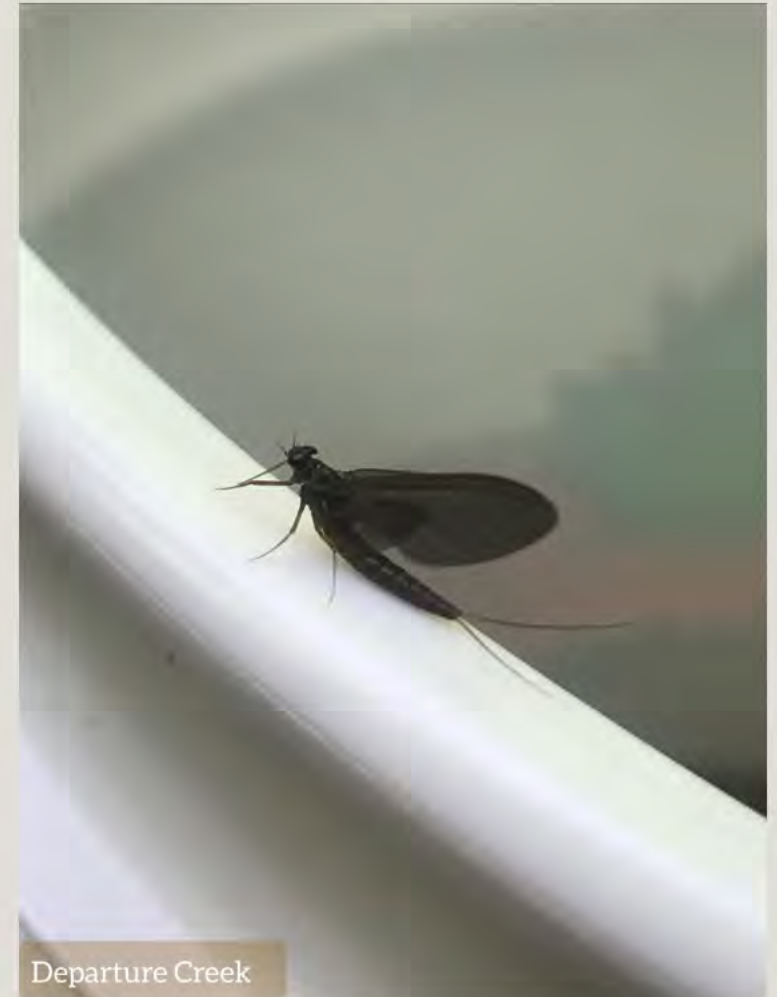
## Instantaneous minimum Guideline

- 36 instances occurred at 17 sites

## 30-day average Guideline

- 26 occurrences at 24 sites

- *All sites with levels below instantaneous Guideline were also below the 30-day average*
- *64% of sites sampled met both DO Guidelines*



Departure Creek

# 2022 Dissolved Oxygen Results

- Compared to 2021, there was a 7% decrease in the number of sites that met Guidelines; this decrease is most likely correlated to the 2022 drought period that extended into Oct.
- **Levels below DO Guidelines are more common at sites with low-flow**

## **Additional factors:**

- *higher water temperatures*
- *nutrient inputs from adjacent land uses*
- *little to no stream structure or gradient*



# Dissolved Oxygen Trends

- Trend analysis was completed on sites with 6 years or more of data
- Three sites have degrading trends in dissolved oxygen, two of these also experienced exceedances in 2022



EMS Number	Site Name	2022 Occurrences $\leq$ 5 mg/L	2022 Average $\leq$ 8 mg/L	Degrading Trend
E256394	Little Qualicum River at Intake	None	None	Summer
E290478	Millstone River at Biggs Rd	3	2	Overall
E290481	Millstone River in Barsby Park	1	1	Summer

*To better understand why sites have low DO levels and degrading trends, physical stream assessments, an understanding of adjacent land use inputs, and flow measurements are recommended*

# Turbidity

## Two Guidelines

- **2 NTU maximum January to September** used for summer low flow period
- **5 NTU maximum October to December** used for fall flush period

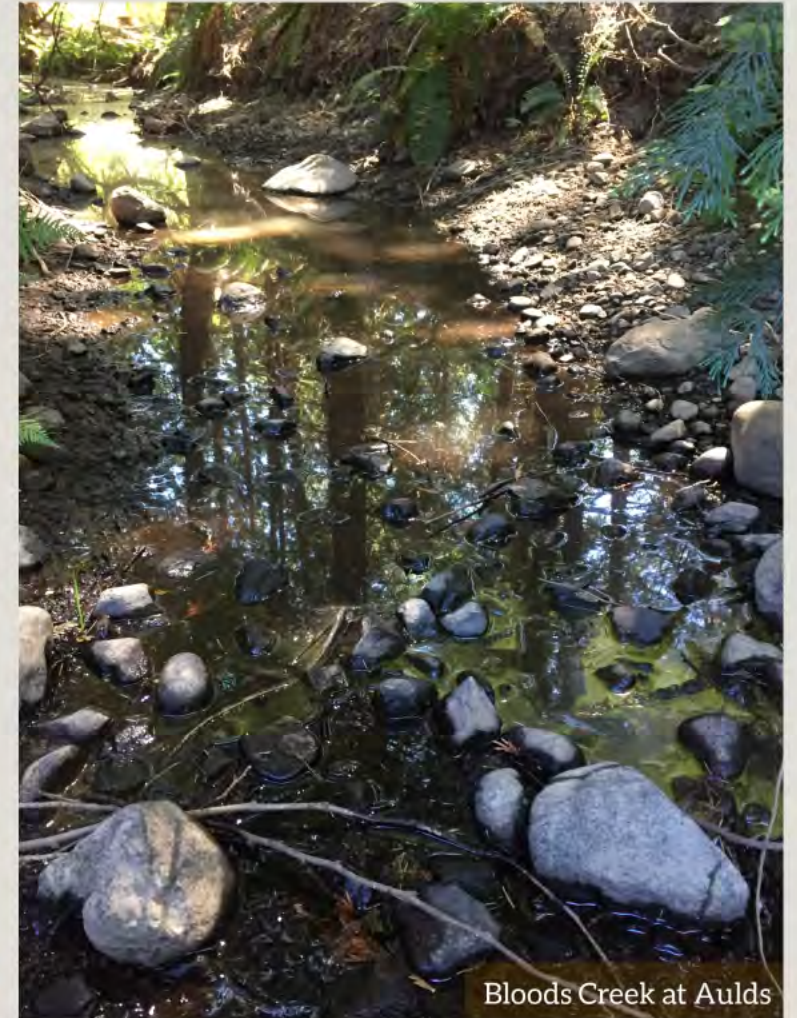


- Measurement of water clarity via light reflected by suspended particles
- *Turbidity exceedances during fall flush period in correlation with rainfall*
- *Exceedances have also occurred in summer period, most likely due to human influences*

# 2022 Turbidity Results

## Two Guidelines

- **Summer period 2 NTU maximum**
  - 74 exceedances at 25 sites
- **Fall period 5 NTU maximum**
  - 30 exceedances at 20 sites
- *14 of the above sites had exceedances in both sample periods*
- *54% of sites sampled met both turbidity Guidelines*





# 2022 Turbidity Results

- Compared to 2021, there was a 7% increase in sites that met turbidity Guidelines in 2022
- This increase is most likely attributed to the prolonged drought and less precipitation experienced during the fall sample period
- *Summer exceedances likely attributed to algae, anthropogenic influences, and extremely low flows*



# 2022 Turbidity Trends

- Trend analysis was completed on sites with 6 years or more of data
- Eight sites have degrading trends in turbidity, in 2022, five of these sites also experienced turbidity exceedances



EMS Number	Site Name	2022 Summer Exceedances	2022 Fall Exceedances	Degrading Trend
E306374	Rosewall Creek at Park	None	None	Summer
E256394	Little Qualicum River at Intake	None	None	Summer
E288093	Beach Creek d/s Golf Course	3	2	Fall
E287131	Shelly Creek at Hamilton Rd	None	None	Summer
E309186	Cottle Creek d/s Hammond Bay	4	None	Summer
E290472	Departure Ck at outlet (Stn 4)	None	1	Summer
E290480	Millstone River at East Wellington	5	None	Summer
E290478	Millstone River at Biggs Rd	2	None	Overall

*To better understand degrading turbidity trends, physical stream assessments, flow measurements, and mapping flow inputs are recommended*

# Specific Conductivity

- Measures the concentration, charge, and mobility of dissolved ions in water
- Influenced by water temperature, turbidity, groundwater, evaporation, pollution, and other saline inputs (i.e., sea water, road density, agricultural run-off, etc.)
- Specific conductance measures conductivity corrected to 25°C, standardizing readings

**No approved provincial Guideline for this parameter**

**Adds context to other parameters when interpreting data**



# Summary

- Publicly available surface water quality data collected by trained volunteers serves as a baseline and record of regional water quality
- The data collected has and continues to support projects and studies, expanding watershed knowledge and advocacy for water protection in our region and beyond

## Local Volunteer Stewards

- Have dedicated their valuable time gathering surface water quality data
- Provide intimate knowledge of streams and work diligently to protect them
- Complete citizen science to a high standard so data collected can be confidently used



# Data to Action

- **Action occurs at all levels**, including Streamkeepers, environmental stewards, private industry, local and senior government, and First Nations.
- Ensuring **data is publicly available** promotes collaboration and transparency for the **common goal of promoting watershed health**.
- **Funding** is required to support actions, as is organizational support and coordination across jurisdictions.

Stewardship  
Seed  
Funding

Additional  
Monitoring

Planning  
and Policy  
Advocacy



Photo credit David Cotton (QBSS 2020)

# RDN Stewardship Support

- With **multiple years of data** we can **identify sites** that have consistent water quality concerns, and **support community actions** to address those concerns.
- This includes **prioritizing sites for restoration and enhancement works** undertaken by stewards, and **providing funding partnerships and tools** for these efforts.
- Over 30 projects have been supported across the region since 2016.

[www.getinvolved.rdn.ca/dwwp-monitoring-and-stewardship-network](http://www.getinvolved.rdn.ca/dwwp-monitoring-and-stewardship-network)



**Borrow Equipment**  
[rdn.bc.ca/tool-lending-library](http://rdn.bc.ca/tool-lending-library)

**Apply For Funding**  
[rdn.bc.ca/stewardship-seed-funding](http://rdn.bc.ca/stewardship-seed-funding)

# Additional Monitoring

Surface water quality lab analysis -- total Phosphorus, E.Coli, metals

- Work with ENV, identify sites based on water chemistry field sampling results
- Additional testing has led to outreach and education, and some compliance enforcement

Other watershed monitoring that adds insights surface water quality results:

- Physical assessments - i.e. USHP surveys
- Lake monitoring
- Streamflow monitoring
- Sensitive Habitat Inventory Mapping
- Wetlands
- Snowpack monitoring
- CABIN - benthic invertebrates



# Planning and Policy Advocacy

Rainwater / Stormwater management

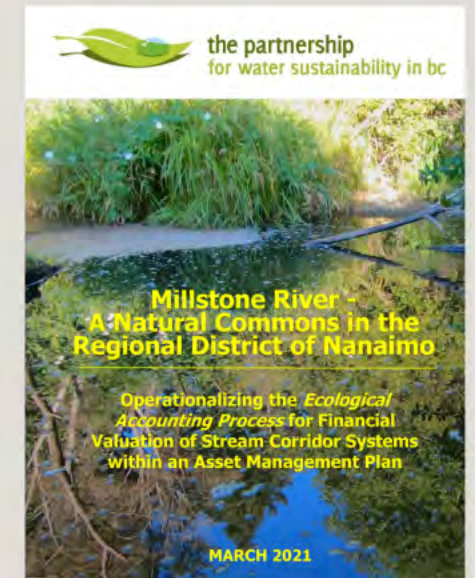
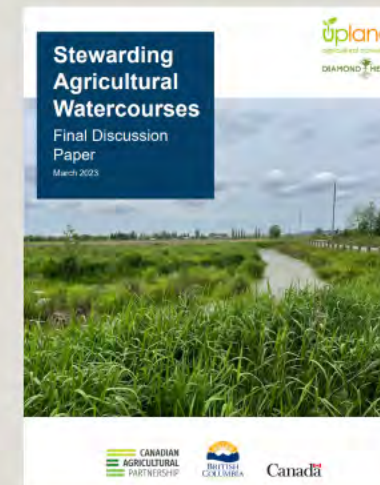
Green Infrastructure

Development referrals

Provincial permitting

Agricultural best practices

Ecological accounting / natural assets





# COMMUNITY WATERSHED MONITORING NETWORK

DRAFT



# 2023 Surface Water Quality Monitoring

## Annual Training

- In-person training session on Provincial sampling methodology and how to calibrate and use monitoring equipment
- Scheduled for Jul. 31 - Aug. 2, 10 am to noon
- Mandatory for participants using equipment to complete 2023 sampling
- Located stream-side at French Creek & Millstone River



## 2023 Start Date

- Summer sample period Aug. 8, 15, 22, 29, & Sept. 5
- Fall sample period is weather-dependent, occurs in Oct./Nov.

## Benthic Sampling

- Occurs during low-flow
- Sites selected based on water quality exceedances and trends
- CABIN completed in partnership with ENV

# RDN Drinking Water & Watershed Protection Program Contact Information

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## Thank You