

Drinking Water & Watershed Protection Technical Advisory Committee Meeting

July 9th, 2020

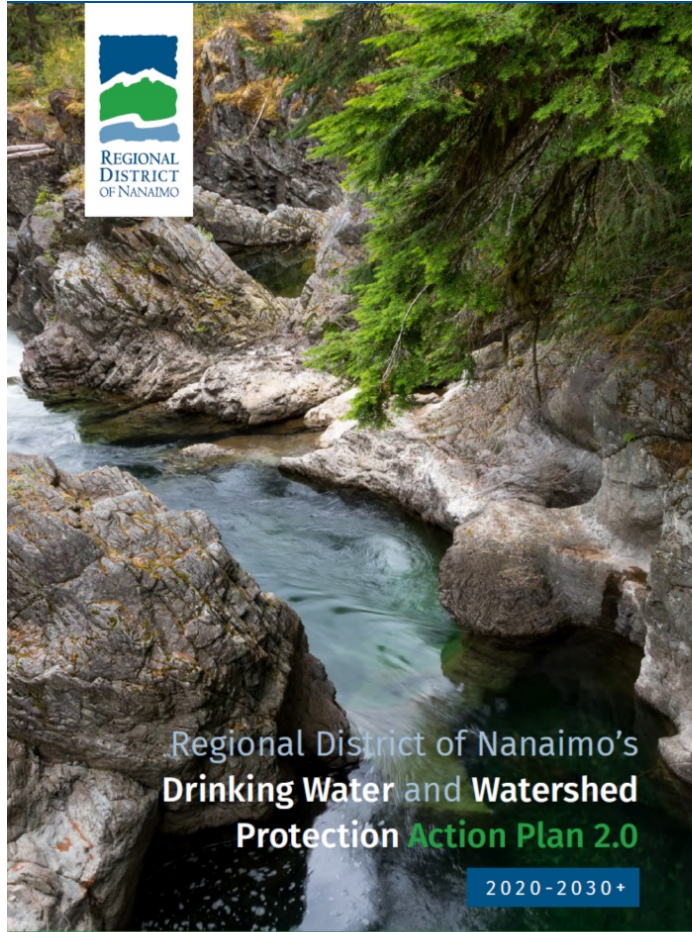
UPDATE
PRESENTATIONS

AGENDA

REPORTS



REGIONAL
DISTRICT
OF NANAIMO



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

2020-2030+

Endorsed by the Board Feb. 25th 2020.
Available for viewing and download @
www.rdn.bc.ca/dwwp-action-plan

TODAY'S AGENDA


- Adoption of minutes
(Feb. 12, 2020)
- Roundtable updates
 - Reports x3
 - Break (5 min) -
- Project updates

ROUNDTABLE UPDATES

- 1) How your organization has been affected by COVID-19 and what adaptations have been made?
- 2) Update on activities since February, and what is your ongoing focus over the next couple of months, projects-wise or otherwise?

DWWP REPORTS

Links circulated
prior to meeting



Regional
Groundwater
Level
Analysis

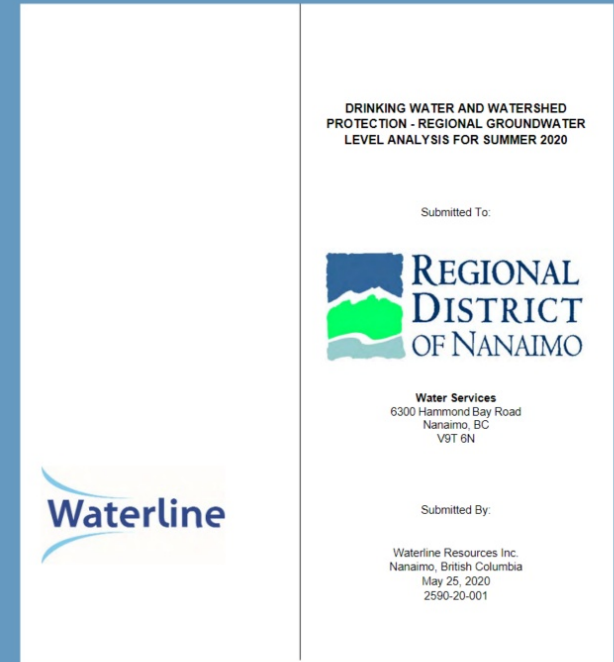
Area F
Water Study

Area E
Water
Budget
Phase 3

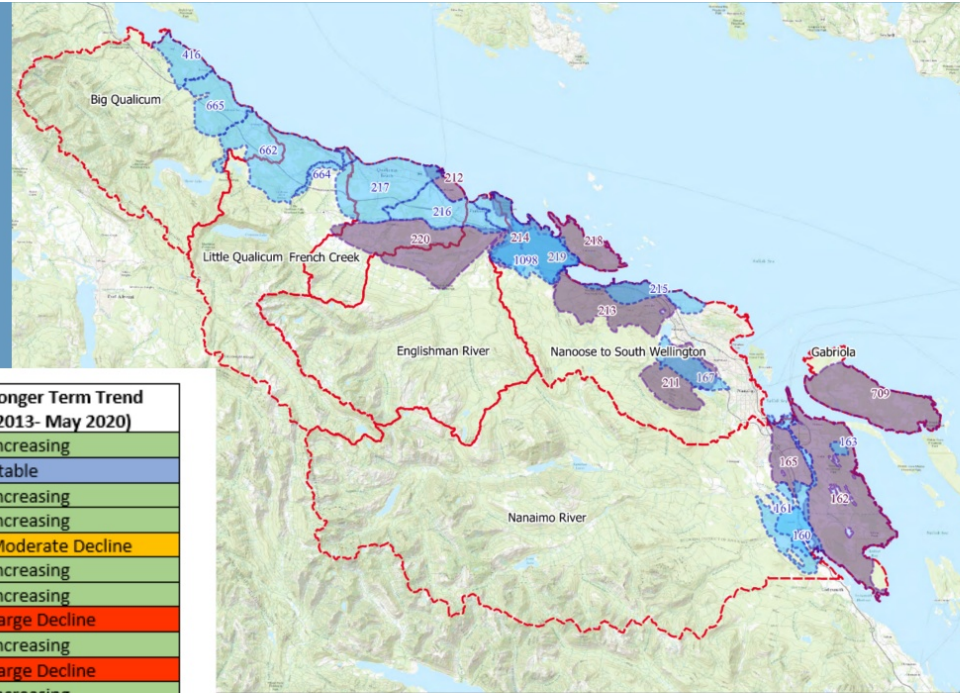
Regional Groundwater Level Analysis Pre-Summer 2020

Seasonal Trends (early May 2020) & Longer-Term Trends (2013- 2020)

- 7 aquifers tracking at **average** seasonal levels
- 2 aquifers tracking at **above average** seasonal levels
- 11 aquifers tracking at **below average** seasonal levels
 - 4 of these are demonstrating longer term increasing trends since 2013
 - 1 is demonstrating a stable trend during this period
 - 6 aquifers are currently both below average seasonal levels and experiencing longer term decline.
 - 5 of these are **bedrock**; 1 is **sand and gravel**
 - The 5 bedrock aquifers are not sources for larger community water supply systems, but they do support a number of domestic wells and small water systems.
 - The one sand and gravel aquifer is Aq1098 in the Englishman River / Nanoose area; it does support an RDN water service area.



Regional Groundwater Level Analysis



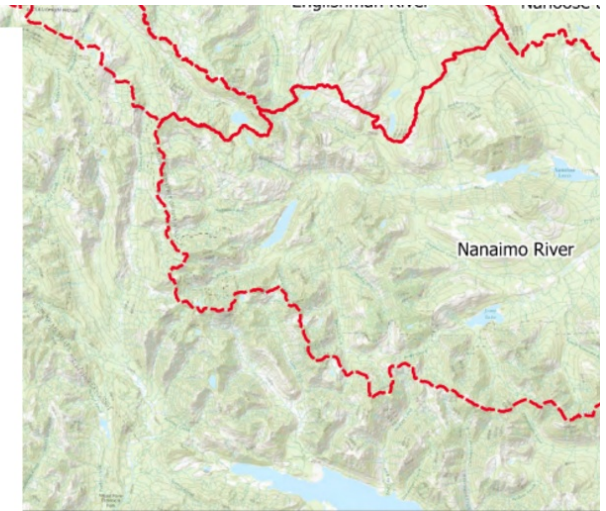
LEGEND:
 Water Regions
 Aquifer in Overburden (ID #)
 Aquifer in Bedrock (ID #)

*Note: only mapped aquifers associated with known VQWN and PQQWN locations are displayed.

Water Region	Aquifer	Type	Seasonal Trend (May 2020)	Longer Term Trend (2013- May 2020)	
WR1	416 – Deep Bay	Surficial	Average	Increasing	
	665 – Bowser	Surficial	N/A	Stable	
WR2	662 – Qualicum Bay	Surficial	Above Average	Increasing	
	664 – Qualicum Beach	Surficial	Below Average	Increasing	
WR3	217 – Qualicum, Hilliers	Surficial	Average	Moderate Decline	
	212 – French Crk	Bedrock	Average	Increasing	
WR4	216 – Parksville, French Crk	Surficial	Above Average	Increasing	
	220 – Errington	Bedrock	Below Average	Large Decline	
WR5	167 – Millstone Valley	Surficial	Below Average	Increasing	
	211 – Benson Meadows	Bedrock	Below Average	Large Decline	
	213 – Upper Lantzville	Bedrock	Average	Increasing	
	214 – Nanoose Bay	Bedrock	Average	Increasing	
	215 – Lantzville	Surficial	Below Average	Stable	
	218 – Nanoose Peninsula	Bedrock	Average	Stable to Increasing	
	219 – Nanoose	Surficial	Average	Stable	
	1098 – Nanoose	Surficial	Below Average	Stable to Mod. Decline	
	WR6	160 – Cassidy	Surficial	Below Average	Increasing
		161 – Cassidy	Surficial	N/A	Stable
162 – Yellowpoint		Bedrock	Below Average	Stable to Mod. Decline	
163 – Cedar		Surficial	Below Average	Increasing	
165 – S. Wellington		Bedrock	Below Average	Increasing to mod. Decline	
WR7	709 – Gabriola	Bedrock	Below Average	Stable to large decline	

6 = Primary Concern
 2 = Moderate Concern
 4 = Potential Short-term Concern
 4 = No Concern / Stable
 6 = Good News - Increasing

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 4 = Potential Shortage
 4 = No Concern / Stable
 6 = Good News - Increasing

DWWP REPORTS

Links circulated
prior to meeting

Regional
Groundwater
Level
Analysis

Area F
Water Study

Area E
Water
Budget
Phase 3



Overburden aquifer levels are generally stable & some are increasing. Aquifer 216 showing recovery from previous declines.

Bedrock aquifer 220 contributes to stream flow and recharges surficial aquifers.

Nitrate concentrations of concern are present in groundwater (predominantly bedrock aquifer 220) in 300m radius from medium and large animal farms.

Spatial information on groundwater quality has been mapped and analyzed.

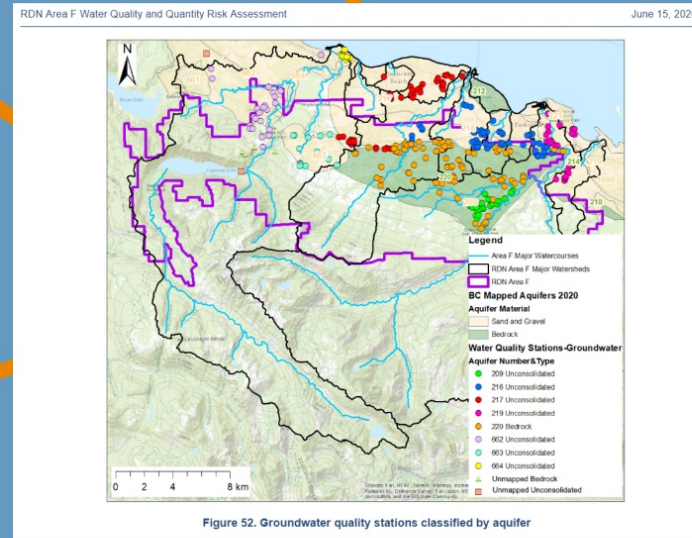


Figure 52. Groundwater quality stations classified by aquifer

Bedrock aquifer 220 is experiencing large decline linked to climate, also water usage and land modification.

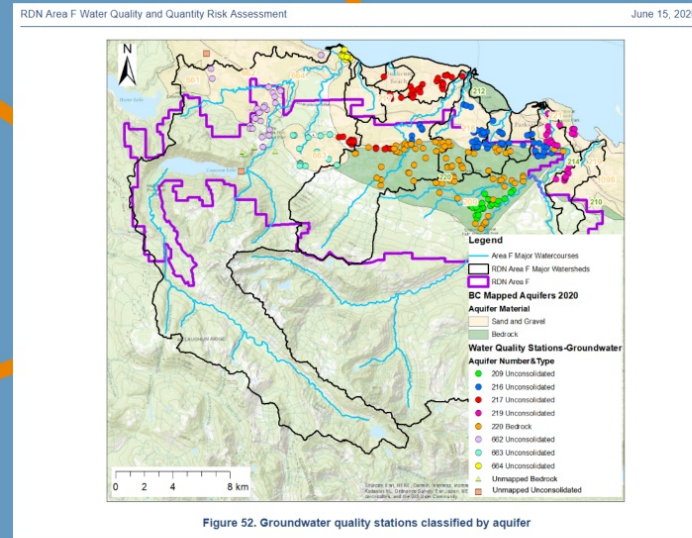
AREA F WATER QUALITY & QUANTITY RISK ASSESSMENT

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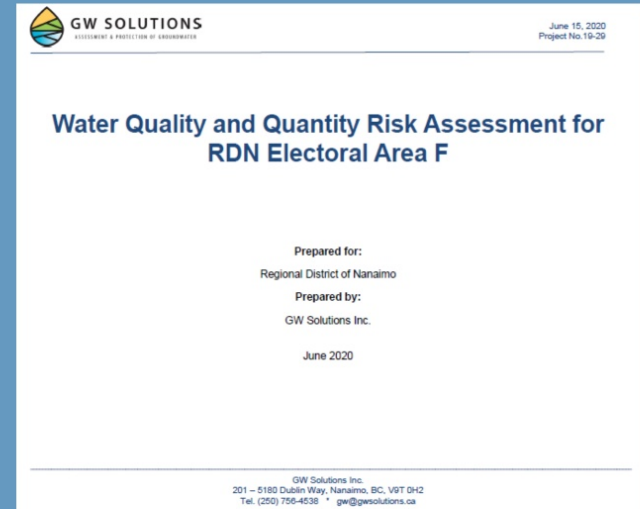
Area F OCP Support...

Aquifer Protection DPA?

Consider water information in context of Village Centres and servicing

Agricultural advocacy & support for BMPs

OCP Public engagement on hold until further notice



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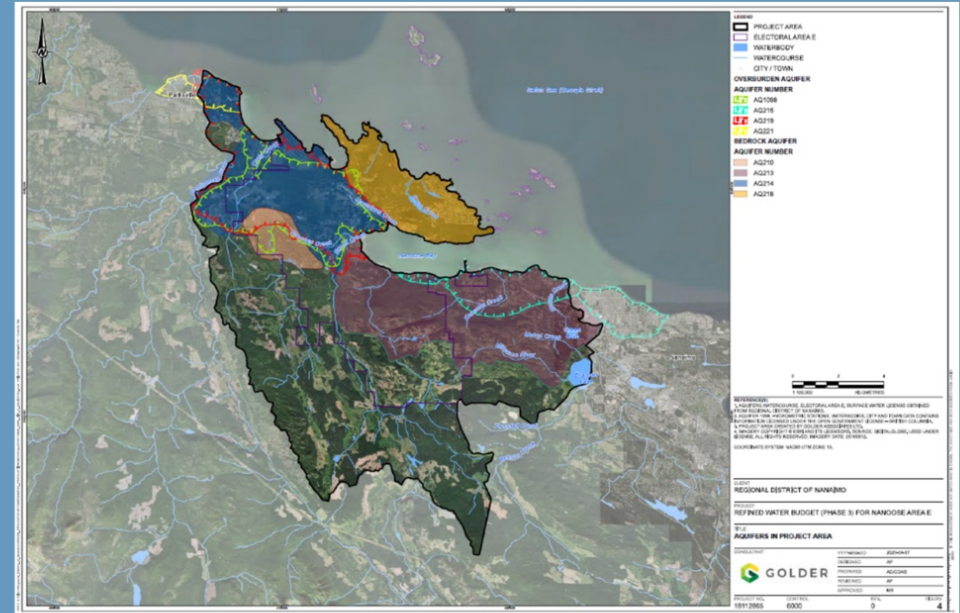


AREA E (NANOOSE) WATER BUDGET PHASE 3

Numerical groundwater model built in FEFLOW

- Integrated climate, groundwater and hydrometric data along with demand data & maximum parcel coverage information.

Scenarios run for Climate Change, Water Demand at Full Buildout, Increased Impervious Coverage.



AREA E (NANOOSE) WATER BUDGET PHASE 3

Findings:

The combined scenarios – predominantly climate change (drought) and land cover change (impervious surfaces) illustrate the most impact to groundwater levels and baseflow.

The median climate change projections modelled for the 2020s, 2050s and 2080s are predicted to have a significant effect on dry and wet season groundwater conditions with average declines of up to 3m in Overburden Aquifers and declines of up to 9m in bedrock at the end of the dry season.

Predicted water level declines due to climate change and reduced infiltration in Aquifers 219 and 218 show that areas close to the coast may be at risk of saltwater intrusion due to relatively flat hydraulic gradients.

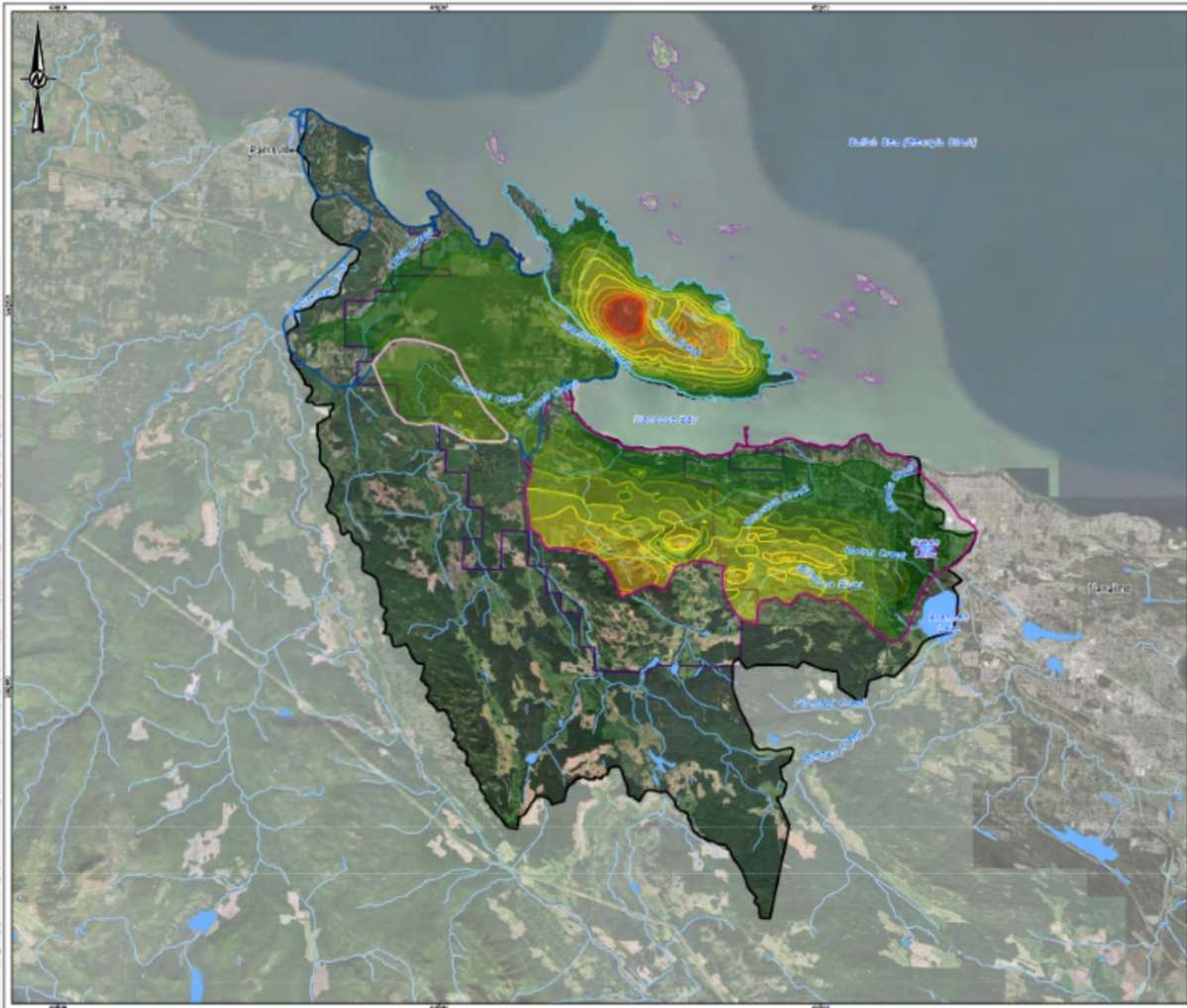
Baseflow in Craig Creek would be impacted with approximately 40% decline under the climate change scenario with an additional 15 -20% decline with the combined scenarios.

AREA E (NANOOSE) WATER BUDGET PHASE 3

Findings continued...

Withdrawal for water supplied by municipal providers would represent only a small component of the overall flow within the aquifers, and full build-out water demand alone will not have a significant effect on the groundwater conditions in the project area.

Conservative estimates show that increased coverage with impervious surfaces due to land development could contribute to a decline of up to 10m in groundwater levels in Aquifer 218. A smaller decline is predicted in Aquifers 219, 1098, 214 of up to 2m. These estimates have NOT included effects of enhanced recharge through stormwater infiltration or injection.



- LEGEND**
- PROJECT AREA
 - ELECTORAL AREA E
 - CITY / TOWN
 - BEDROCK AQUIFER
 - AQUIFER NUMBER
 - AD210
 - AD213
 - AD214
 - AD218

- DECLINE IN WATER LEVEL**
- 2 - 4 m
 - 4 - 6 m
 - 6 - 8 m
 - 8 - 10 m
 - 10 - 12 m
 - 12 - 14 m
 - 14 - 16 m
 - 16 - 18 m
 - 18 - 20 m
 - > 20 m

- DECLINE IN WATERLEVEL (CONTOURS)**
- 2 m
 - 4 m
 - 6 m
 - 8 m
 - 10 m
 - 12 m
 - 14 m
 - 16 m
 - 18 m
 - 20 m



REFERENCES

1. AQUIFER WATERLICENSE, ELECTORAL AREA E, SURFACE WATER LICENSE OBTAINED FROM REGIONAL DISTRICT OF NANAIMO
2. AQUIFER AREA, HYDROMETRIC STATIONS, WATERBODIES, CITY AND TOWN DATA CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENSE - BRITISH COLUMBIA
3. PROJECT AREA OWNED BY GOLDER ASSOCIATES LTD.
4. GOLDER COMPANY © 2013 AND ITS LICENSORS. SOURCE DATA LICENSE USED UNDER LICENSE. ALL RIGHTS RESERVED. PROJECT DATE: 2013/04/07

COORDINATE SYSTEM: NAD83 UTM ZONE 19

CLIENT
REGIONAL DISTRICT OF NANAIMO

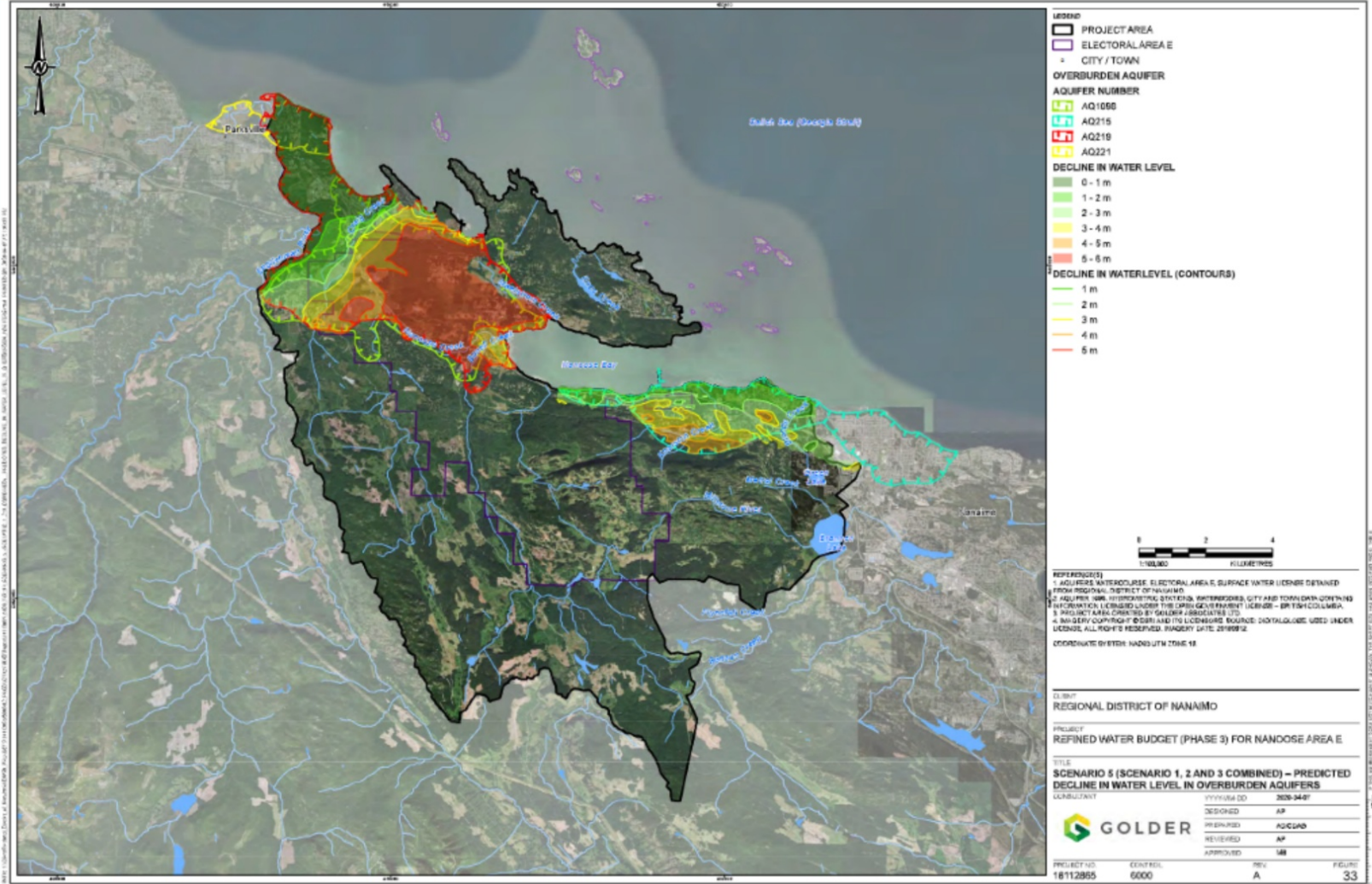
PROJECT
REFINED WATER BUDGET (PHASE 3) FOR NANOOSE AREA E

TITLE
SCENARIO 5 (SCENARIO 1, 2 AND 3 COMBINED) - PREDICTED DECLINE IN WATER LEVEL IN BEDROCK AQUIFERS

DATE	2013-04-07
DESIGNED	AD
ENGINEER	AD/CMB
REVIEWED	AD
APPROVED	MB

PROJECT NO. 18112855 **CONTROL** 6000 **REV** A **PAGE NO.** 34





Project Update Presentations



Outreach
Programs

Monitoring
Networks

Water-
centric
Planning

Outreach Programs - on hold

Irrigation Checkups

DWWP Video Series

Rebates: rainwater
harvesting, wellhead
upgrades, irrigation
and soil

Public opinion and
perspectives benchmark
survey

Review and redesign
of outreach programs
(CBSM)

Project Update Presentations



Outreach Programs

Monitoring Networks

Water-centric Planning

Community Watershed Monitoring Network

2019 Summary

- 65 surface water quality sites.
- 41 streams sampled.
- 8 new sites added in WR's 2, 3, 5 & 6.
- QA/QC completed on 10% of sites.
- Implemented recommended actions from 2018 Trend Report including:
 - Additional lab analysis for Phosphorus and Chloride.
 - Biomonitoring - CABIN & eDNA completed at 4 sites in partnership with ENV.
 - Riparian restoration at two sites supported through Stewardship Seed Funding.



Community Watershed Monitoring Network

2019 Surface Water Quality Results - 4 parameters

Temperature

- Exceedances of WQG common in lower reaches.
- Overall temp. was cooler, and more rainfall was experienced than in previous years = fewer exceedances in 2019.

Dissolved Oxygen

- Values below WQG's occurred at very low flow and low gradient sites.

Turbidity

- Summer low flow exceedances:
 - 44% coincide with rainfall events; 56% most likely due to anthropogenic influences.
- Fall flush exceedances:
 - All but one coincide with rainfall events.

Specific Conductivity

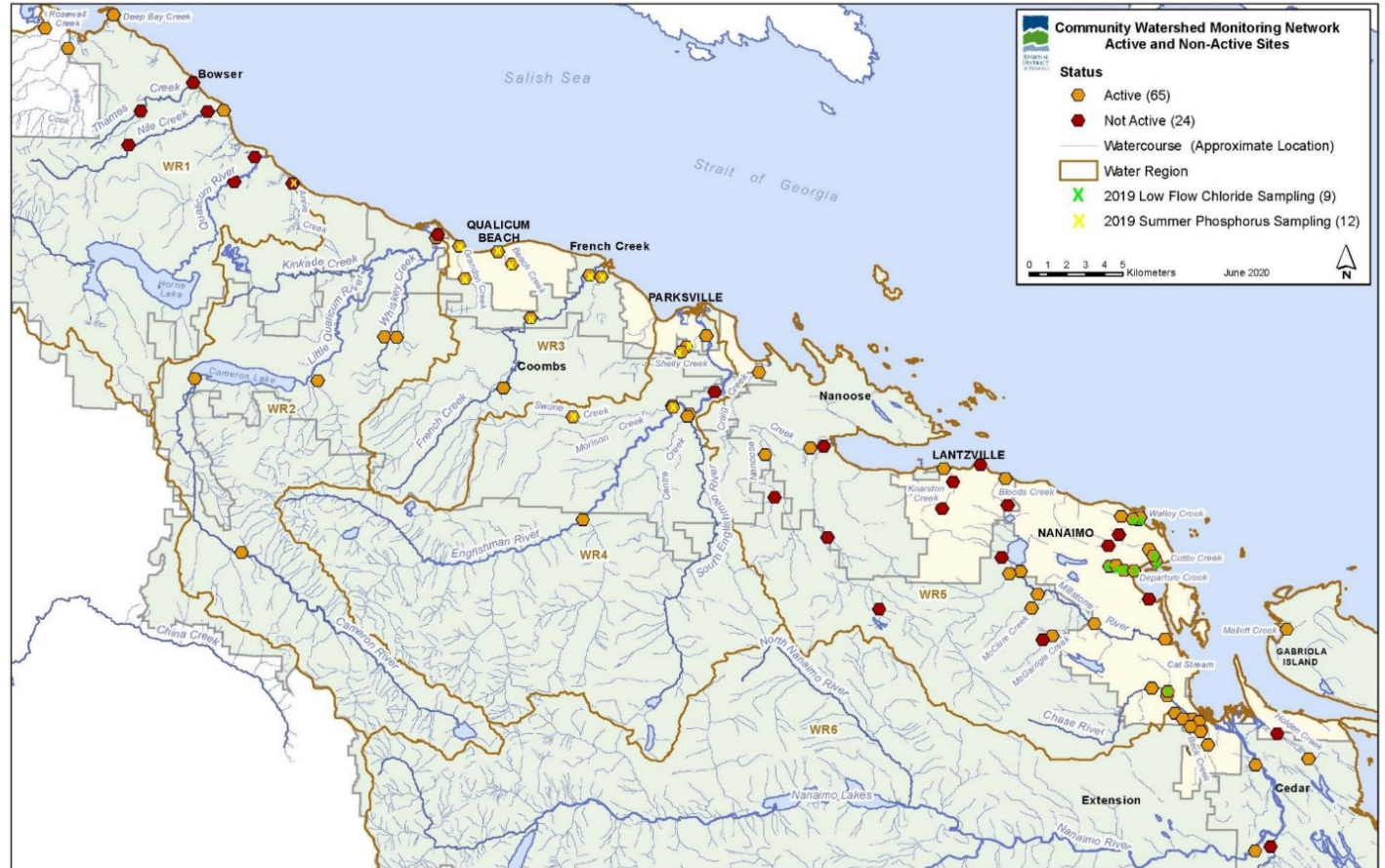
- No WQG, gives added context to above parameters – i.e., high levels with no turbidity may indicate larger contribution of groundwater to stream flow.



2019 Lab Analysis

All 12 phosphorus sites had values above recommended levels.

No exceedances of WQG's were experienced at any of the 9 chloride sites.



Community Watershed Monitoring Network

2011- 2019 Analysis of Trends

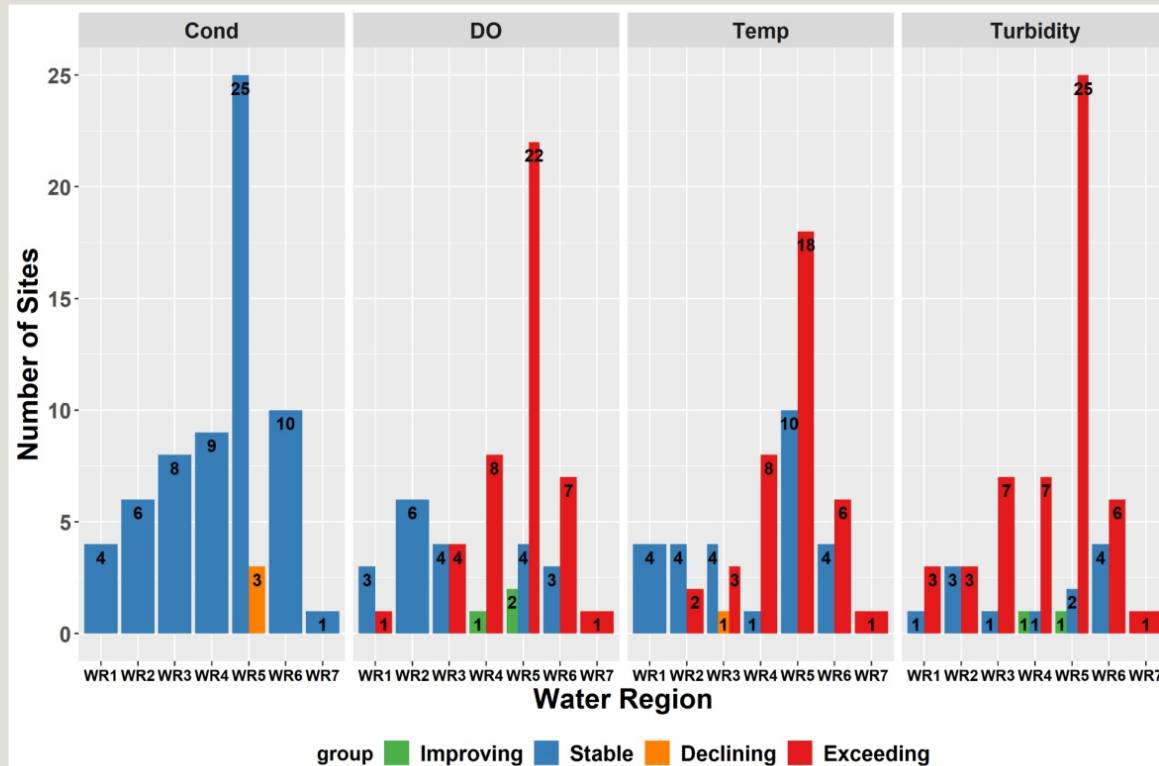
- 2019 data analyzed by professional biologists Ecoscape for trends.
- Trends observed by water region, parameter, and category.
- 66 sites included in analysis.
- Four trend categories:
 - **Improving*** = Significant Mann-Kendall Trend indicates improving WQ.
 - **Stable** = No Exceedances or less than 6 years of data.
 - **Declining*** = Significant Mann-Kendall Trend indicates declining WQ.
 - **Exceeding** = Has exceeded a WQG at any time from 2011 - 2019 (DO, temp., turb. only).



*Category only includes sites with 6 years of data or more.

Community Watershed Monitoring Network

2011 - 2019 Analysis of Trends



Some **Improving**
(DO and turbidity).

Some **Declining**
(temp. increasing but
still below WQG and
cond. values increasing).

Turbidity highest
% of **Exceeding**
WQG = Points to need
for stormwater
management and
stream restorations.

2020 CWMN Annual Training Sessions

July Training

- Dates Scheduled for July 20 – 29.
- Mandatory for participants completing 2020 sampling.

Small Sessions

- Max. 8 participants & 2 facilitators.
- Outdoor streamside locations.
- Face masks required & all equipment sanitized.

Focused

- Video for mandatory viewing & sign-off before in-person training.
- In-person training will cover:
 - 1) Equipment Calibration
 - 2) Sampling Procedure



2020 CWMN Sampling - August to November

- Will continue to collect water quality samples following provincial protocols.
- Added precautions for COVID-19 that adhere to current BC Health Officer guidance.
- No QA/QC or additional lab analysis in 2020 to minimize exposure risk.
- Volunteer safety and comfort is paramount.



Volunteer Observation Well Network



- 34 active groundwater level monitoring sites in RDN's VOWN.
- Compensation for barometric pressure completed with RDN barologgers installed in 2019.
- Data contributed to Waterline Regional GW Level Analysis Report.
- In 2020, site hardware will be upgraded at four more sites.
- Phased approach for remaining upgrades in 2021 & 2022.

Lake Level Gauges

Installed Nov. 2017 by Northwest Hydraulics Consultants, part of the RDN Phase 2 Water Budget for Cedar-Yellowpoint, two lake level gauges: Holden & Quennell.

This year we are getting an Operations & Maintenance program / protocol developed by NHC; based on RISC standards, for entry into Provincial database; build capacity for DWWP staff to upkeep the stations and follow data mgmt standards.



Benthic Invertebrate Monitoring - Nanaimo River

Purpose: Understand productivity and water quality conditions that are limiting Chinook populations and indicating watershed health concerns.

Part of a larger collaborative effort to develop a watershed recovery plan for the Nanaimo River led by DFO including filling data gaps, completing restoration works and influencing water management & land use practices.

Partners: DFO, ENV, SFN, RDN, CoN

2020: Design sampling program based on CABIN protocols including site selection (July / Aug); baseline sampling (late Aug or early Sept) & analysis.

2021+: Training for SFN Community Members



Canadian Aquatic Biomonitoring Network

Measure freshwater ecosystem health with standardized methods, database, activities map, training.

Snowpack Modelling Update from Bill Floyd

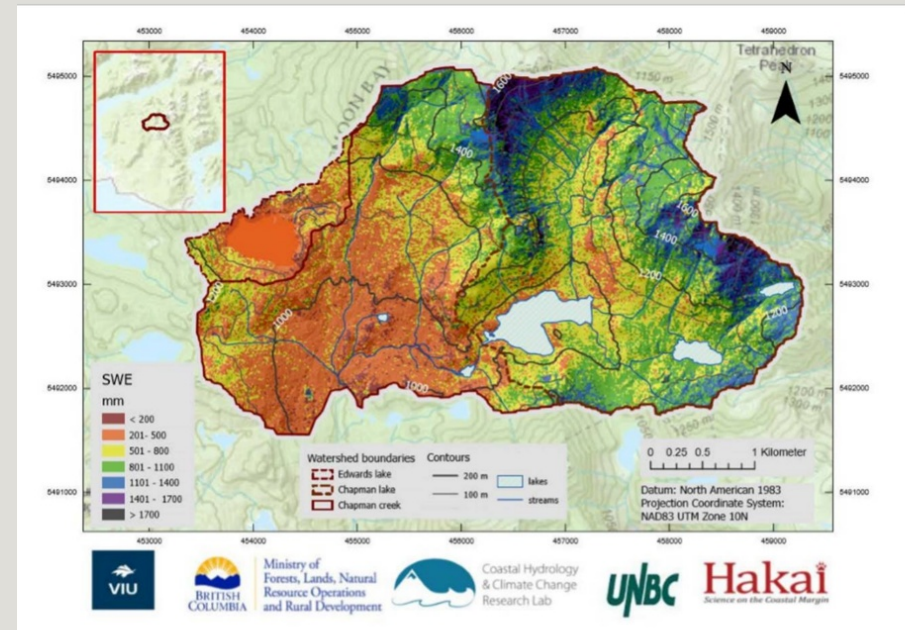
5 LiDAR surveys completed from Mid March to Mid June in the upper Englishman River watershed

The Englishman River LiDAR surveys were done in conjunction with 5 in the Cruickshank (CVRD), 5 in the Tsitika, 5 in Seymour (Metro Van) and 1 in the Chapman Creek watershed (SCRD).

We had to scale back the field validation data due to CoVID, so none were done in the Englishman as we were not able to fly in a helicopter due to Ministry protocol.

We still need to do a bare earth survey in the Englishman, this will occur in the late summer.

We are currently processing LIDAR data and making snow depth maps. Once complete, we will assign densities and come up with estimates of SWE and water volume stored as snow.



Project Update Presentations



Outreach Programs

Monitoring Networks

Water-centric Planning



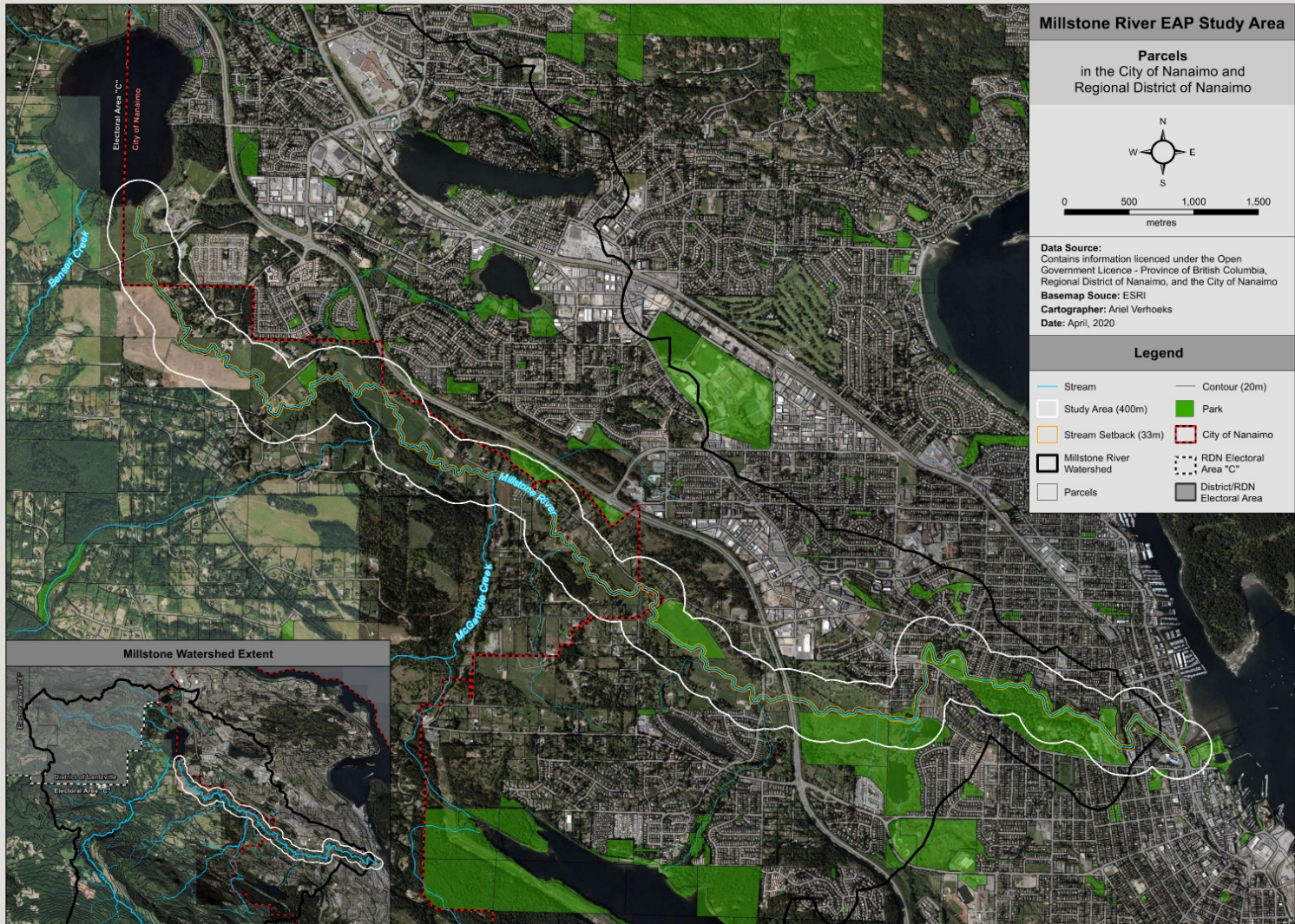
Millstone River Ecological Accounting Pilot

Purpose:

- Describe the stream as Natural Commons (ecological system) which provides a range of ecological services enjoyed by the community.
- Summarize the recent condition of the stream's hydrology and how subdivision of riparian parcels as influenced hydrology.
- Calculate the approximate investment (recent 10-20 years) made by the community to maintain (prevent degradation) and manage (enhance / restore) the stream.
- Find the financial value of the Natural Commons Asset, which is the stream corridor and riparian zone defined in regulations, using the assessed values of samples of parcels (agricultural, rural residential and urban /suburban)
- Compare assessed values of parcels distant to the stream (>200 m) to the assessed values of parcels abutting or adjacent to the stream, as a proxy statement of the asset value of the land occupied by the stream and riparian.



Help to rationalize financial investment in riparian restoration.



Millstone River EAP Study Area

Parcels
in the City of Nanaimo and
Regional District of Nanaimo



Data Source:
Contains information licenced under the Open Government Licence - Province of British Columbia, Regional District of Nanaimo, and the City of Nanaimo
Basemap Source: ESRI
Cartographer: Ariel Verhoeks
Date: April, 2020

Legend

- Stream
- Study Area (400m)
- Stream Setback (33m)
- Millstone River Watershed
- Parcels
- Contour (20m)
- Park
- City of Nanaimo
- RDN Electoral Area "C"
- District/RDN Electoral Area

Millstone Watershed Extent





Rainwater Working Group

Re-initiate this year. Meet in August & October.

Include Municipalities, MOTI, RDN, Mosaic

Role to guide implementation of rainwater management activities in the LWMP/
DWWP Action Plan:

- Watershed Performance Targets - pilot in 2020
- Demonstration sites & interpretive signage - ongoing
- Regional Rainwater Management Strategy - to be developed in 2021



THANK YOU!

Next meeting is scheduled for Nov. 12th, 2020

