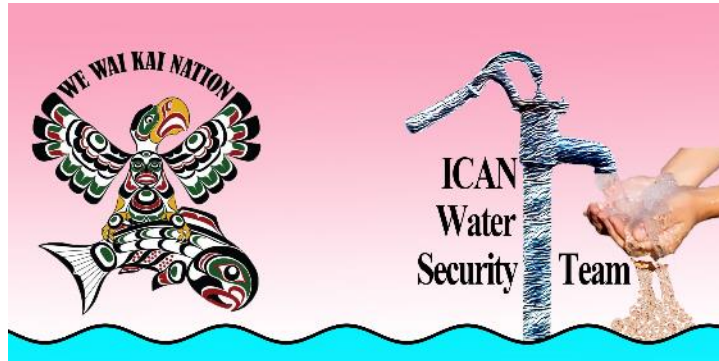


Water Systems of Quadra Island: Preparing for our Future

A collaboration between the **We Wai Kai Nation**
and **ICAN's Water Security Team**.



Welcome – Chief Ronnie Chickite / We Wai Kai
Guardian Manager Shane Pollard

**What information the Province
has on our aquifers** – David van Everdingen,
BC Province Regional Hydrogeologist

Progress on our study so far – We
Wai Kai and ICAN Water Security Team

Comments & Questions – Invited guests
and audience

The **We Wai Kai Nation** have received the project's first funds with an Indigenous Watersheds Initiative Grant



INDIGENOUS
WATERSHEDS
INITIATIVE

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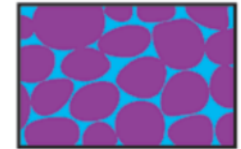
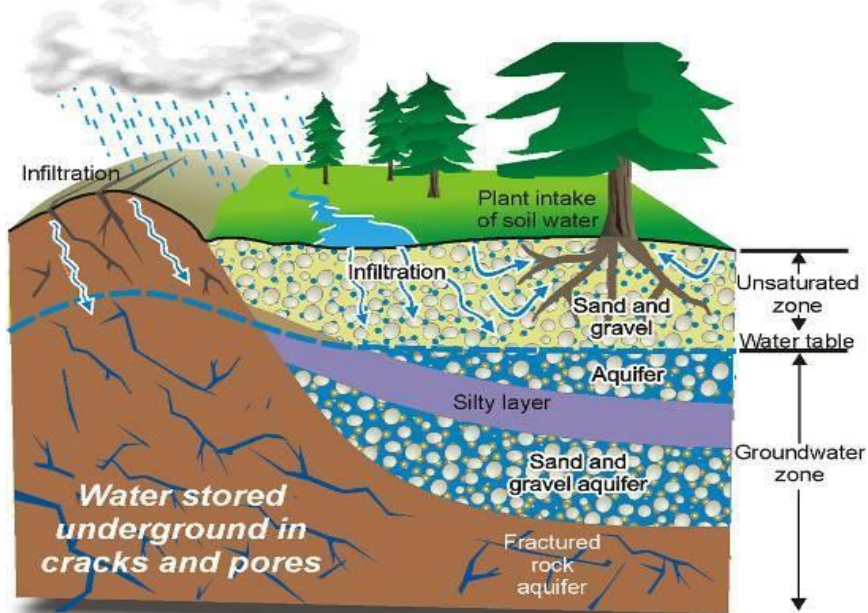


We Wai Kai Watershed Stewardship We Wai Kai Nation (Cape Mudge Indian Band)



The goal of this project is to safeguard Quadra Island's aquifers, vital for providing freshwater to the We Wai Kai Nation. It also supports the We Wai Kai Guardians, youth, and the community in watershed stewardship. By monitoring groundwater, streams, and mapping wetlands in partnership with the Island Climate Action Network-Water Security Team, essential information is gathered for future resource protection. This aligns with the Land Use Plan

Understanding Groundwater



UNCONSOLIDATED
Sand & gravel pore
spaces



BEDROCK
Water in rock
fractures

Aquifer Properties

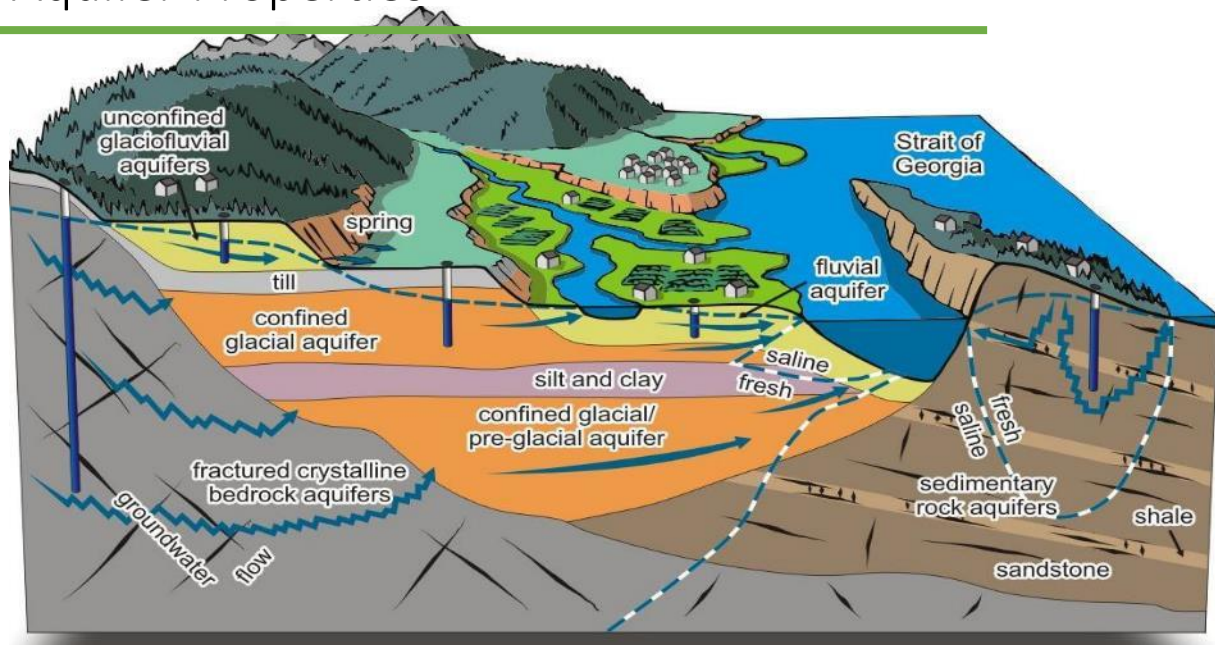
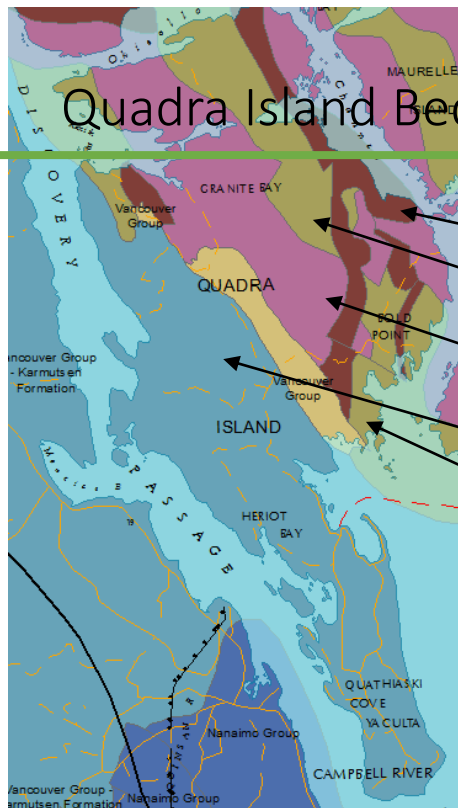







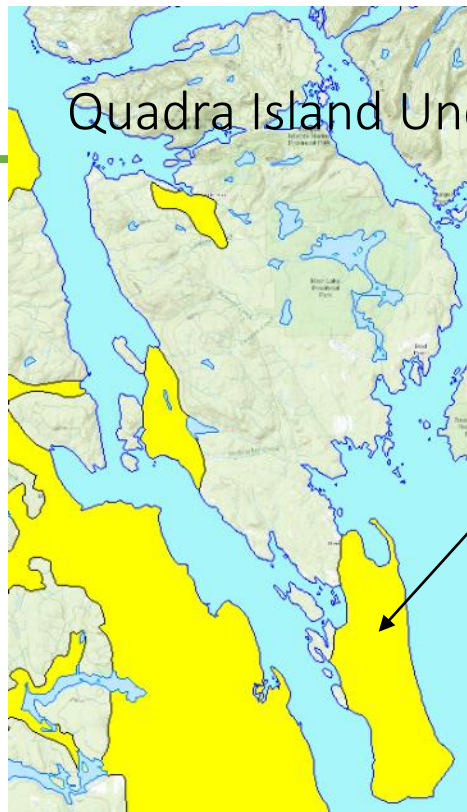
Photo credit: Natural Resources Canada

Quadra Island Bedrock Geology



-  Intrusive Diorite
Jurassic-Cretaceous
-  Intrusive Granodiorite
Jurassic-Cretaceous
-  Intrusive Granodiorite and Diorite
Jurassic
-  Karmutsen Basalt pillows & flow, limestone
Upper Triassic
-  Vancouver Group – mixed limestone and basalt
Triassic

Quadra Island Unconsolidated Geology



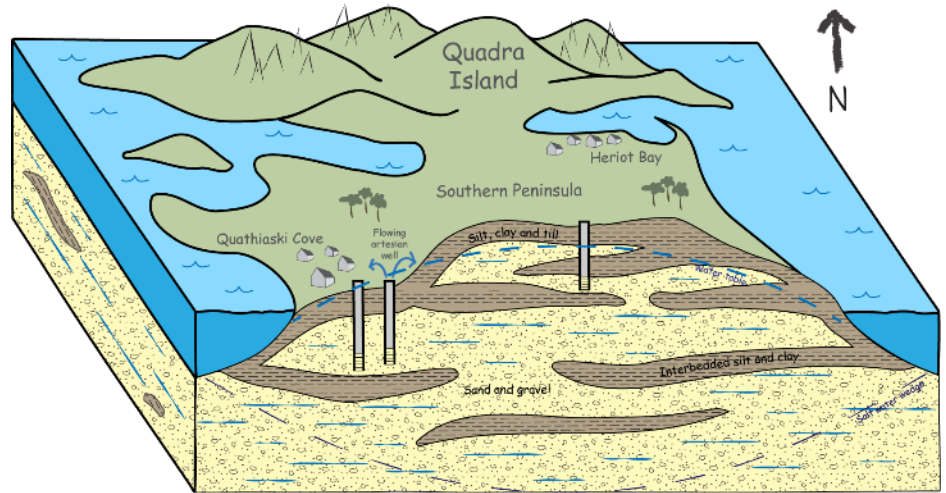
Unconsolidated sediments
Quaternary - Recent

Groundwater on Quadra Island

Artesian wells

- known artesian conditions on south island

- Quathiaski Cove
- Heriot Bay



Not to scale

Quadra Sand Aquifer Conceptual Model

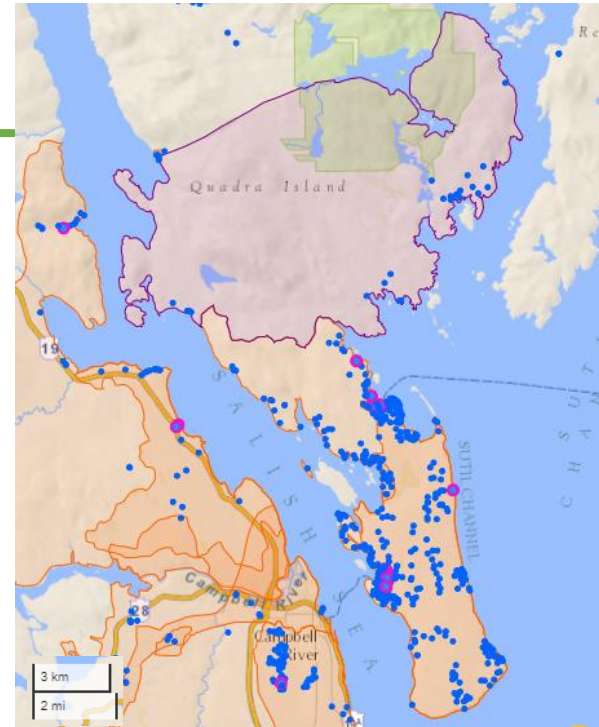
Groundwater on Quadra Island

Water supply

- Ground water major source for private homes, water systems, agriculture and commercial use
- Southern island has large sand and gravel aquifer (Quadra Sand)
- Fractured bedrock wells/limestone
- Precipitation only source of recharge

Ecosystems - wetlands and fish-bearing streams

- GW base flow in periods of low rainfall
- Cool stream temperatures in summer



<https://apps.nrs.gov.bc.ca/gwells/aquifers>

Quadra Island Aquifers

Unmapped – 12 wells -
Aq1240?

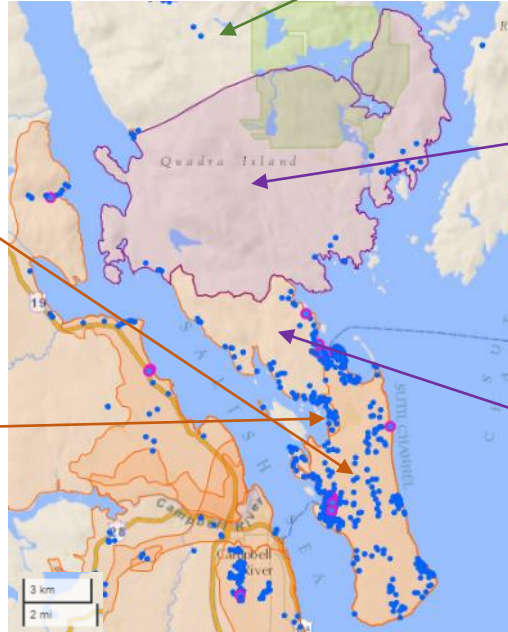
Unconsolidated

Aquifer 751

- **Unconfined**
- Glacial sand & gravel
- Area: 34 km²
- # wells: 226
- Obs. Well 383

Aquifer 974

- **Confined**
- Glacial sand & gravel
- Area: 0.7 km²
- # wells: 8



Bedrock

Aquifer 1240^{speculative}

- **Unconfined**
- Fractured crystalline and meta-sedimentary
- Area: 107.7 km²
- # wells: 18

Aquifer 754

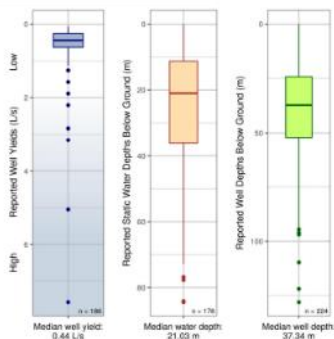
- **Partly confined**
- Fractured crystalline
- Area: 54.3 km²
- # wells: 113



Aquifer Description (Mapping Report - 2020):
Unconfined glacio-fluvial outwash or ice contact sand and gravel aquifers generally formed near or at the end of the last period of glaciation (sub-type = 4a).

Aquifer Details	
Region	West Coast
Water District	Nanaimo
Aquifer Area	34 km ²
No. Wells Correlated to Aquifer	229
Vulnerability to Contamination	Moderate
Productivity	Unknown
Aquifer Classification	Unknown
Hydraulic Connectivity ¹	Liberty
Aquifer Stress Index	Method not applicable - confined aquifer
No. Water Licences Issued to Wells	Unknown
Observation Wells (Active, Inactive)	383

¹ Based on broad regional assessment



Disclaimer: Use of information from Aquifer factsheets (accessed by BC government website) is subject to limitation of liability provisions (further described on that website). That information is provided by the BC government as a public service on an "as is" basis, without warranty of any kind, whether express or implied, and its use is at your own risk. Under no circumstances will the BC government, or its staff, agents and contractors, be responsible or liable to any person or business entity, for any direct, indirect, special, incidental, consequential or any other loss or damages to any person or business entity based on this factsheet or any use of information from it.

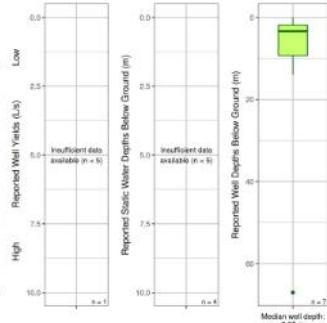
Detailed methods for all figures are described in the companion document (Aquifer Factsheet - Companion Document.pdf)
Factsheet generated: 2020-08-06. Aquifers online: <https://apps101.nrs.gov.bc.ca/govinfo/aquifers/>



Aquifer Description (Mapping Report - 2012):
Confined Glacio-fluvial sand and gravel aquifers underneath till, in between till layers, or underlying glacio-lacustrine deposits (sub-type = 4b).

Aquifer Details	
Region	West Coast
Water District	Nanaimo
Aquifer Area	9.7 km ²
No. Wells Correlated	0
Vulnerability to Contamination	Moderate
Productivity	Moderate
Aquifer Classification	IB
Hydraulic Conductivity *	Unknown
Transmissivity *	Unknown
Storativity *	Unknown
No. Water Licences Issued to Wells	Unknown
Observation Wells (Active, Inactive)	None

* min - max
For Hydraulic Connection see [guidance document](#)



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Detailed methods for all figures are described in the companion document (Aquifer Factsheet - Companion Document.pdf)
Factsheet generated: 2022-07-27. Aquifers online: <https://apps101.nrs.gov.bc.ca/govinfo/aquifers/>

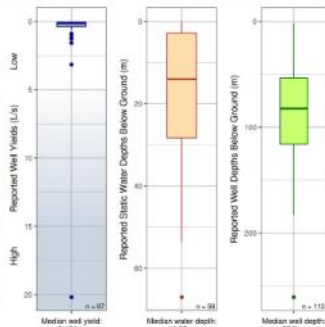


Aquifer Description (Mapping Report - 2020):

Fractured crystalline (igneous intrusive or metamorphic, meta-sedimentary, meta-volcanic, volcanic) rock aquifer (subtype = 6b).

Aquifer Details	
Region	West Coast
Water District	Nanaimo
Aquifer Area	54.3 km ²
No. Wells Correlated	113
Vulnerability to Contamination	Moderate
Productivity	Unknown
Aquifer Classification	Unknown
Hydraulic Conductivity *	Unknown
Transmissivity *	Unknown
Storage ¹ *	Unknown
No. Water Licences Issued to Wells	Unknown
Observation Wells (Active, Inactive)	None

* min - max
For Hydraulic Connection see guidance document



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Detailed methods for all figures are described in the companion document (Aquifer Factsheet - Companion Document.pdf).
Factsheet generated: 2022-07-27. Aquifers online: <https://apps101.gov.bc.ca/pub/aquifers/>.

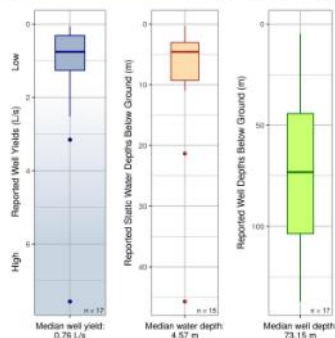


Aquifer Description (Mapping Report - 2020):

Fractured crystalline (igneous intrusive or metamorphic, meta-sedimentary, meta-volcanic) rock aquifer (subtype = 6b).

Aquifer Details	
Region	West Coast
Water District	Nanaimo
Aquifer Area	107.7 km ²
No. Wells Correlated to Aquifer	39
Vulnerability to Contamination	High
Productivity	Unknown
Aquifer Classification	Unknown
Hydraulic Conductivity ¹	Not Likely
Aquifer Stress Index	Unknown
No. Water Licences Issued to Wells	Unknown
Observation Wells (Active, Inactive)	None

¹ Based on broad regional assessment

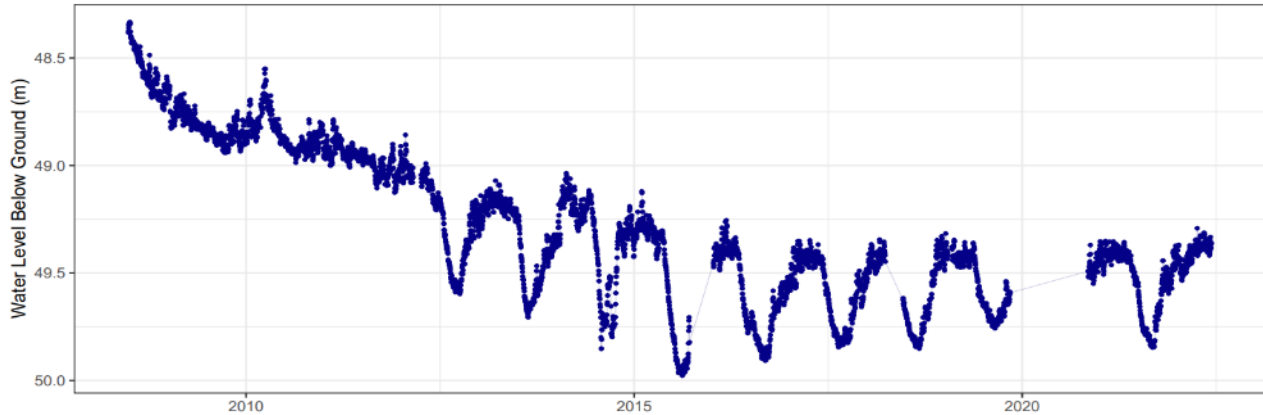


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Detailed methods for all figures are described in the companion document (Aquifer Factsheet - Companion Document.pdf).
Factsheet generated: 2020-08-06. Aquifers online: <https://apps101.gov.bc.ca/pub/aquifers/>.

Provincial Groundwater Observation Well Network

OBS WELL 383

Water Level Snapshot



- OW383 Quadra Island
- Aquifer: **751**
- Aquifer type: **Unconsolidated, confined (4b)**
- Well depth: **79 m (258 ft)**
- Period of record: **March 2008 - present**



References

- Groundwater wells & aquifers database (GWELLS)
 - [Aquifer search](https://apps.nrs.gov.bc.ca/gwells/aquifers) - <https://apps.nrs.gov.bc.ca/gwells/aquifers>
 - Aquifer summaries & worksheets
 - AQ751 - <https://apps.nrs.gov.bc.ca/gwells/aquifers/751>
 - AQ974 - <https://apps.nrs.gov.bc.ca/gwells/aquifers/974>
 - AQ754 - <https://apps.nrs.gov.bc.ca/gwells/aquifers/754>
 - AQ1240 - <https://apps.nrs.gov.bc.ca/gwells/aquifers/1240>
- [Water Science Series publications](https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-science-data/water-science-series) - <https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-science-data/water-science-series>
- [Ecological reports catalogue](https://a100.gov.bc.ca/pub/acat/public/welcome.do) - <https://a100.gov.bc.ca/pub/acat/public/welcome.do>

Question: Why be concerned about water now?

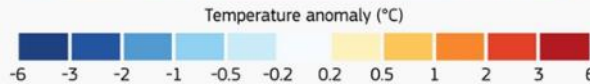
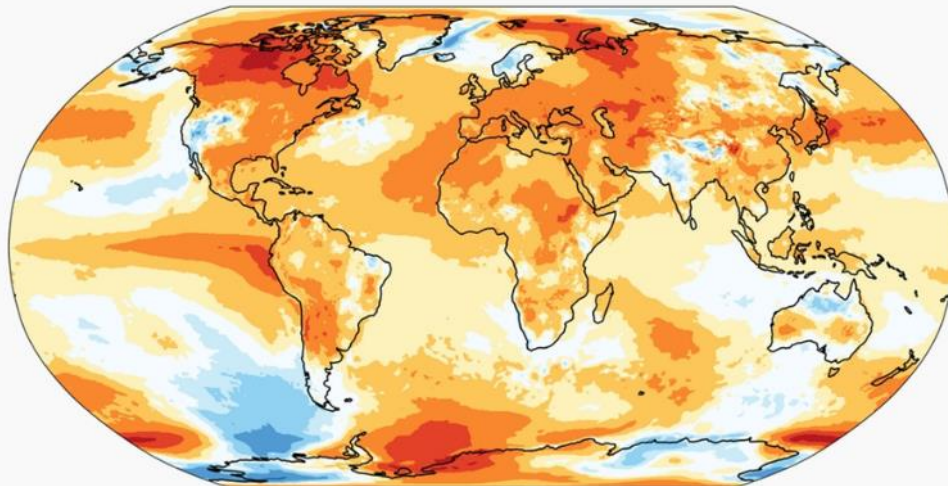
Answer: Water may become less available in the future.

Why?

1) Climate Change

The world is getting warmer.

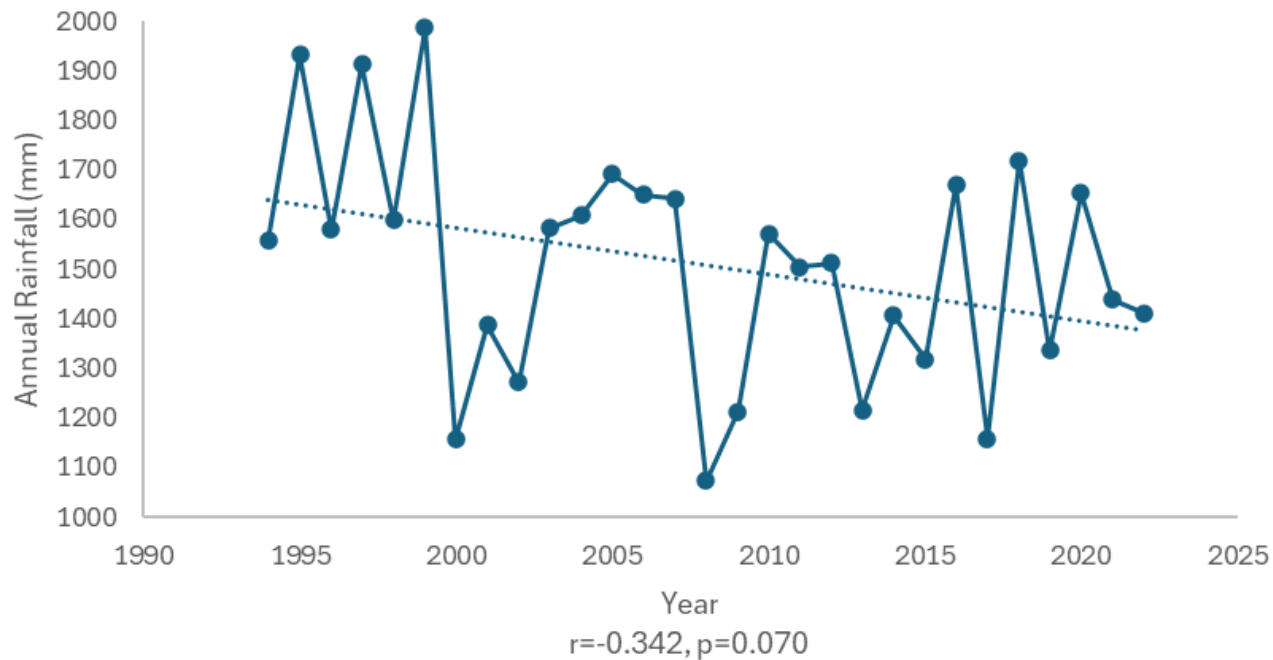
Last year was about 1.48 C° warmer than the long-term average before humans started burning fossil fuels



Climate predictions suggest BC will have hotter, drier summers and warmer, wetter winters.

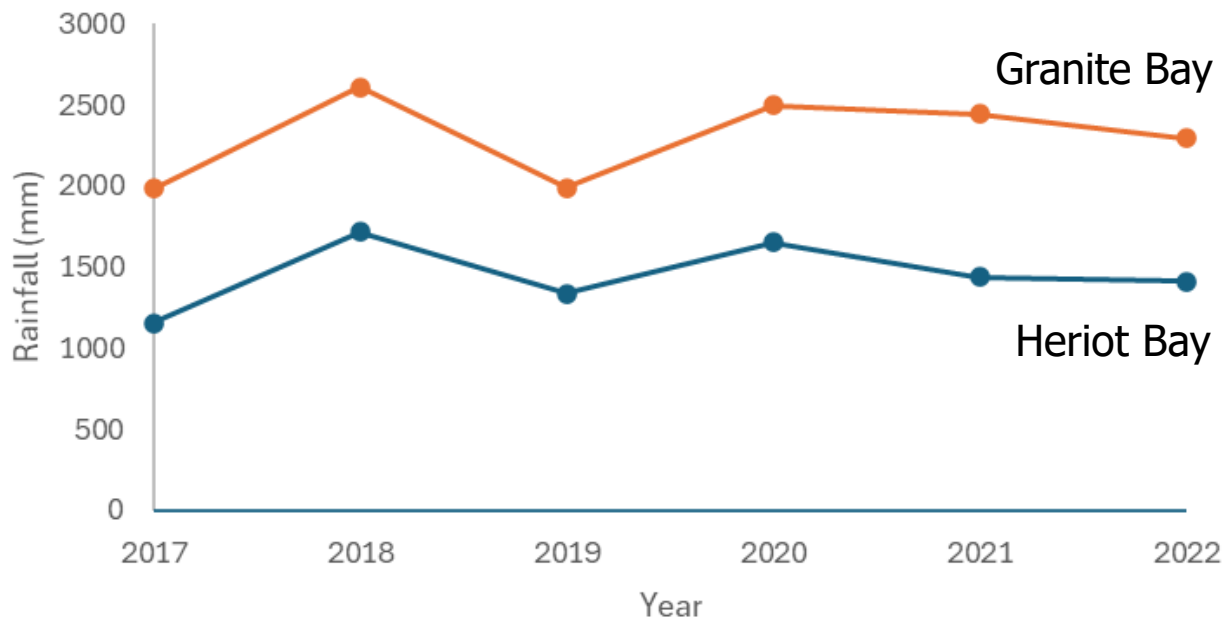
So, water availability will decline, particularly in the summers.

Heriot Bay Rainfall



Ted Hayes

Heriot Bay Vs Granite Bay



2) Quadra Island will experience increased development, which means we draw more water from our aquifers.



3) The provincial observation well on Quadra is listed as having a large rate of decline, but long term trends are not clear.

Our Driving Question:

Given different scenarios of climate change and development, will the water systems on Quadra be able to meet people's needs and those of nature?

This is a complex issue.

We have a large vision with multiple steps over several years.

At each step we will inform and involve the community.

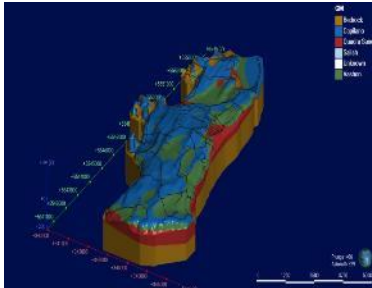
What we are doing right now:

- Monitoring aquifers
- Mapping wetlands
- Monitoring streams



Wells and the increasing demand for groundwater on Quadra Island

- As yet no idea of sustainable water demand for the environment (1st) and inhabitants (2nd) on Quadra



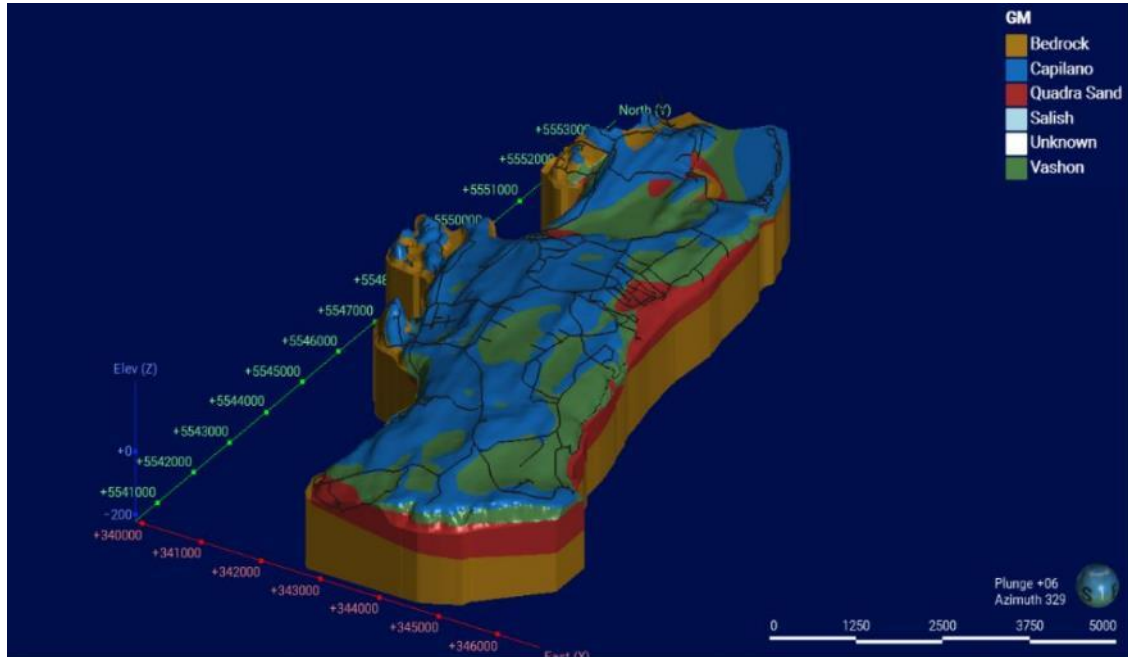
Completed

- Interpret South Island geology
- 13 Domestic wells instrumented (mid Dec '23)

Future

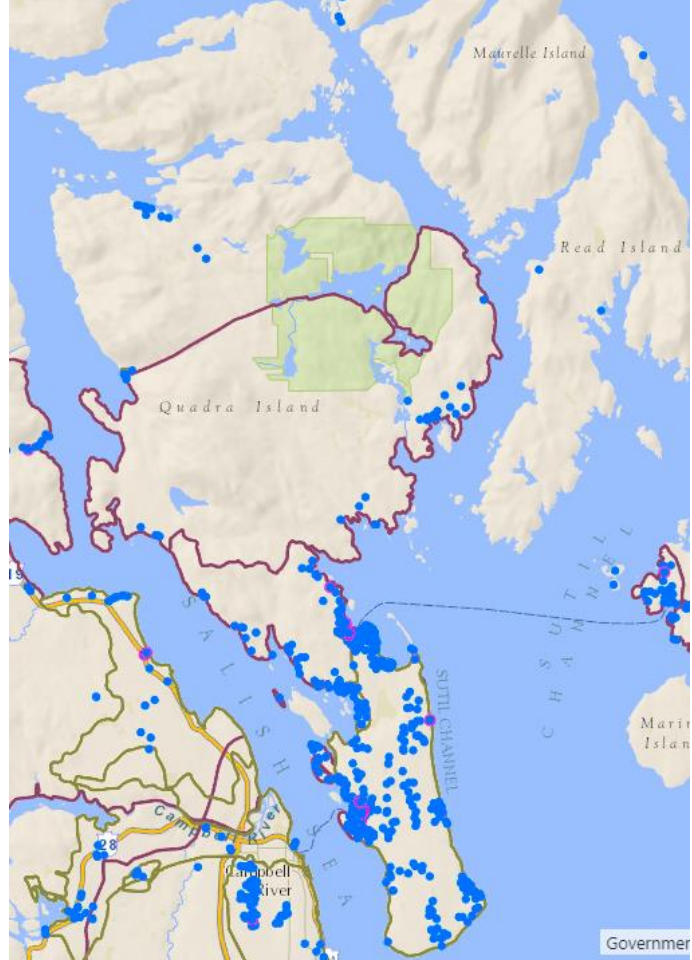
- Instrument shallow wells '24
- Monitoring 3 – 4 years
- Interpretation
- Groundwater model to examine impacts of climate change, development, etc., on groundwater availability

Work completed on the South Island by VIU students/Dr. Jerome Lesemann 2022

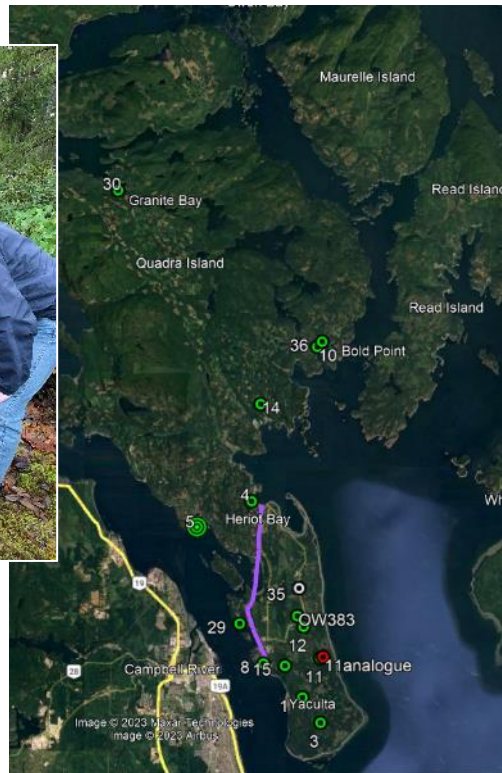
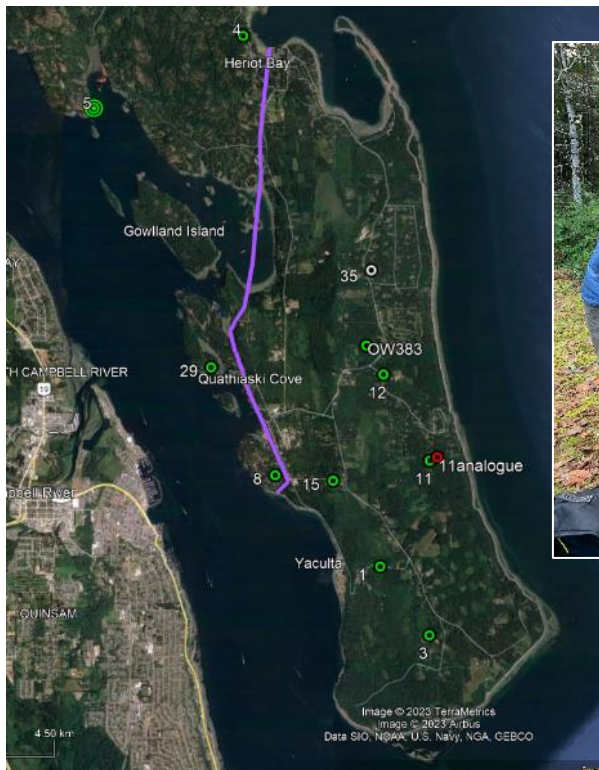


Wells registered on Quadra Island

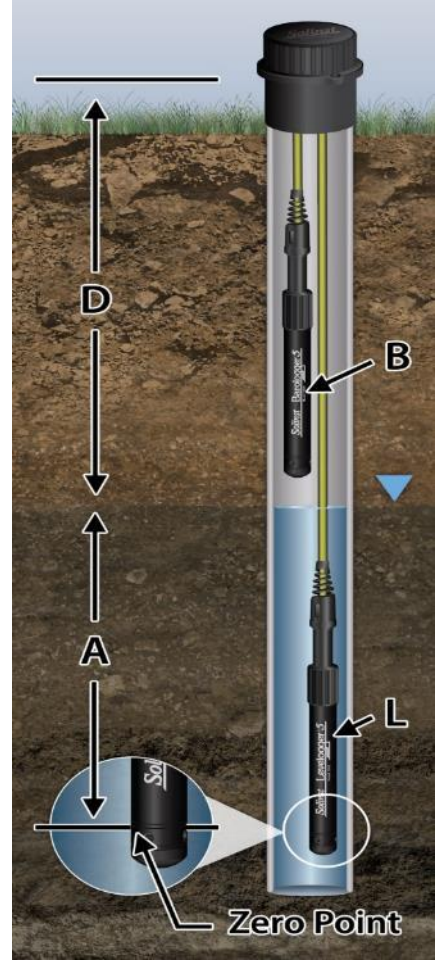
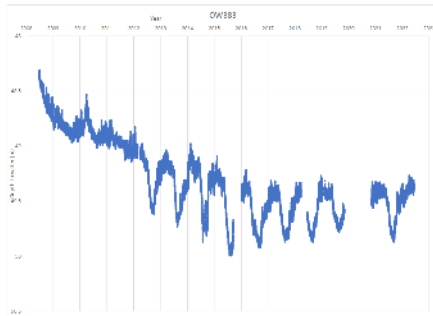
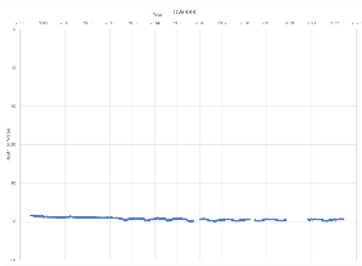
– ~450 in south island alone and increasing



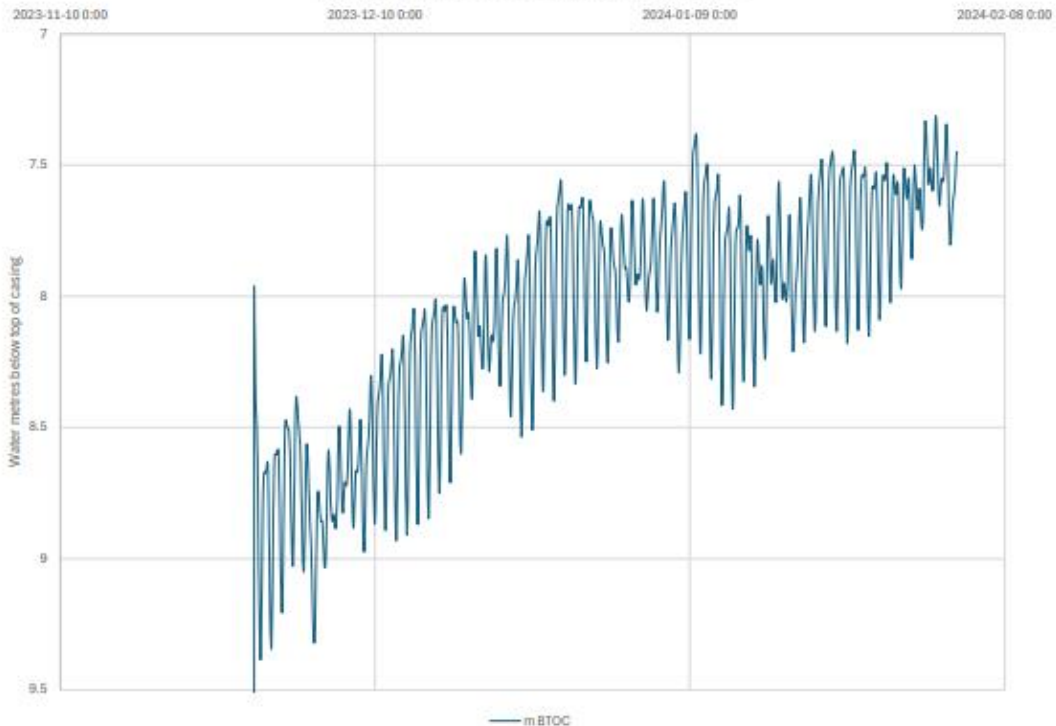
13 wells currently monitored on Quadra



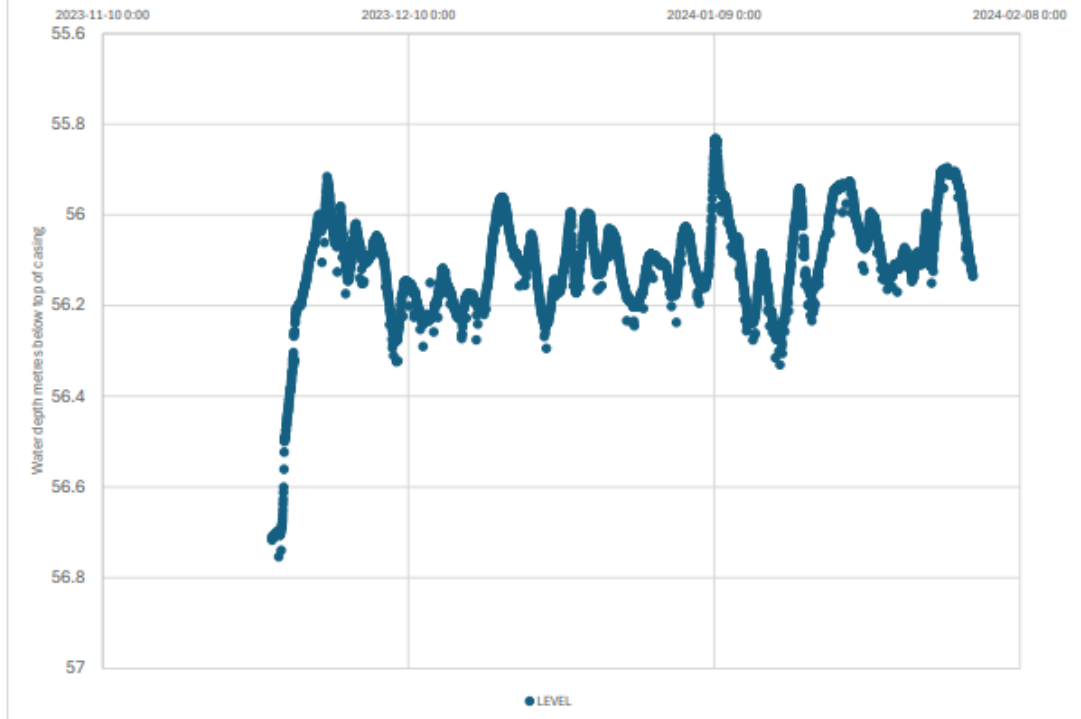
Monitor wells for at least 3 years



April Point Area well, not pumped Nov 28 to Feb 3



Fox Road 26 November to 3 February



Map seasonal and permanent wetlands to determine which may feed water to aquifers and what climate change and land uses may do to these valuable ecosystems.



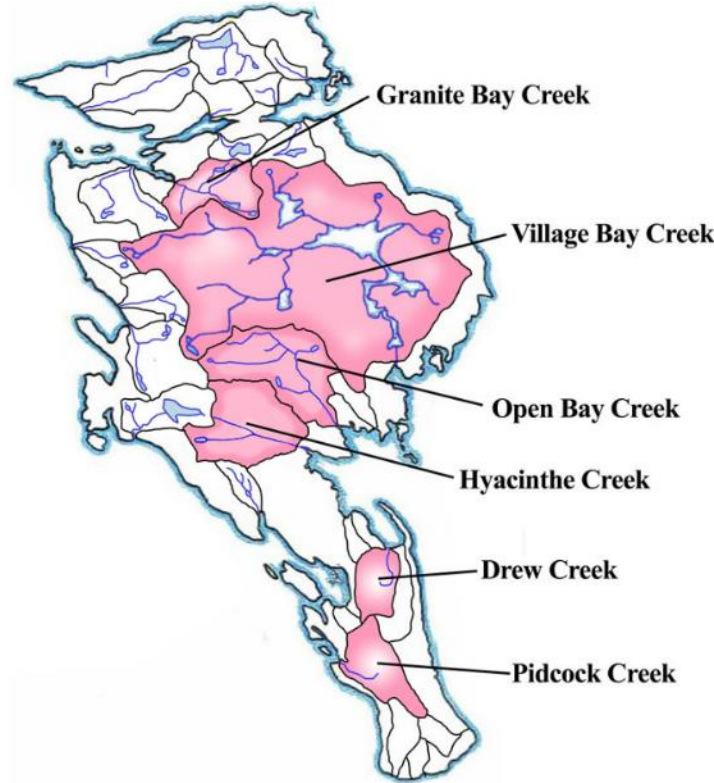
Citizen Science - Identify key plants and terrain features to distinguish among 6 common wetland types found on Quadra Island



Monitor stream
discharge to estimate
water flow off island

Temperature and other
conditions key to
salmon and stream
health

Drought indicator



Stream flow (m³/second)

Date	Drew	Hyacinthe	Open Bay	Granite Bay	Village Creek
Dec-23	0.488	0.771	0.448	0.452	Extreme flow
Jan-24	0.805	0.788		Extreme flow	
Feb-24	0.305	0.257	0.361	0.265	



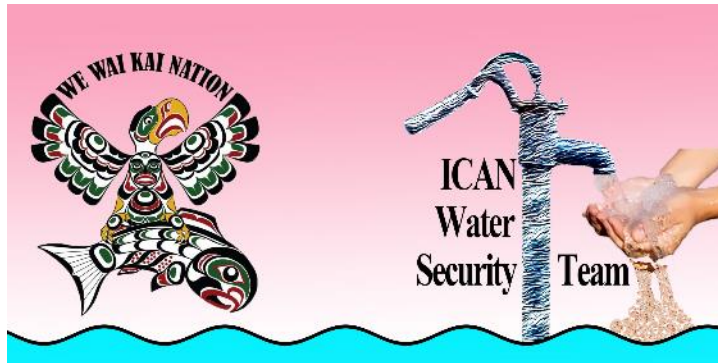
Community engagement

Citizen science

Learning together to prepare for the future



**So, what does this all mean for
preparing for our future**



Feel free to contact us:

← → ↻ <https://www.quadraican.ca/water-security/>



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Our Team

This effort relies on collaborations.

We work with volunteers, We Wai Kai Guardians, Salmon Enhancement Society, faculty and students from Vancouver Island University, Fisheries and Oceans Canada (DFO), and in-kind support from the community and outside groups.

If you want to learn more about any component of our efforts, contact any member of our team:

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