

# ISLANDS TRUST AREA GROUNDWATER SUSTAINABILITY SCIENCE PROGRAM

## North Pender Island Community Information Meeting

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Island Planner

September 7, 2021



Islands Trust

# ISLANDS TRUST AREA GROUNDWATER SUSTAINABILITY SCIENCE PROGRAM

Islands Trust Area Aquifer Conceptualization Project

Islands Trust Area Groundwater Recharge Mapping Project

Southern Gulf Islands Groundwater Availability Project

North Pender Island Groundwater Sustainability Implementation Project



Islands Trust

*To preserve and protect the trust area  
and its unique amenities and environment for the benefit  
of residents of the trust area and of the province generally,  
  
in cooperation with municipalities, regional districts,  
improvement districts, other persons and organizations  
and the Government of British Columbia*



Islands Trust

# Global Groundwater Sustainability: A Call to Action





# Global Groundwater Statement

A global group of scientists, practitioners, and experts calling for action to ensure groundwater benefits society now and into the **future.**

[GroundwaterStatement.ORG](http://GroundwaterStatement.ORG)





**Put the spotlight on  
global groundwater  
sustainability**



**Manage and govern  
groundwater sustainability  
from local to global scales**



**Invest in groundwater  
governance and  
management**

## GroundwaterStatement.ORG

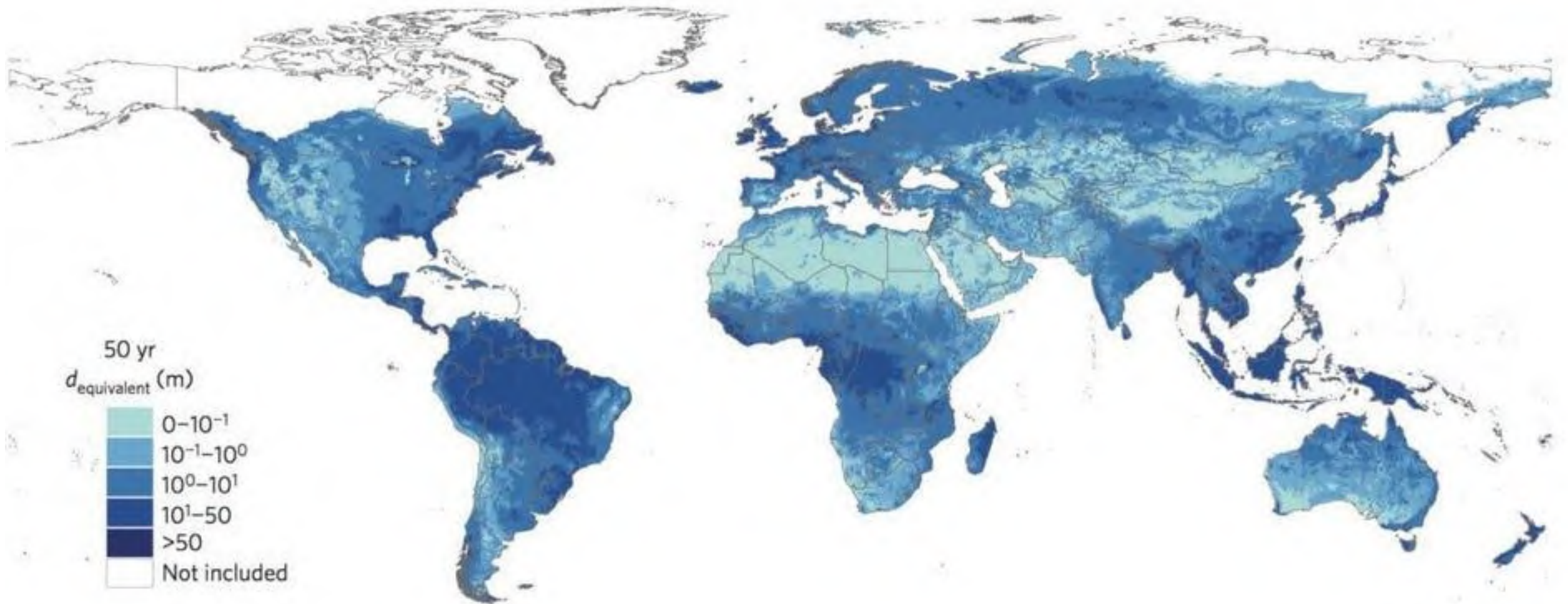


[www.groundwatervisible.org](http://www.groundwatervisible.org)

# MAKING GROUNDWATER VISIBLE

— A STORIES PHOTO BOOK —





Gleeson, T., Wada, Y., Bierkens, M. et al. ***Water balance of global aquifers revealed by groundwater footprint.*** Nature 488, 197–200 (2012). <https://doi.org/10.1038/nature11295>



An Ecosystem Approach to Groundwater  
Management in the Gulf Islands

James D. Henderson

1998



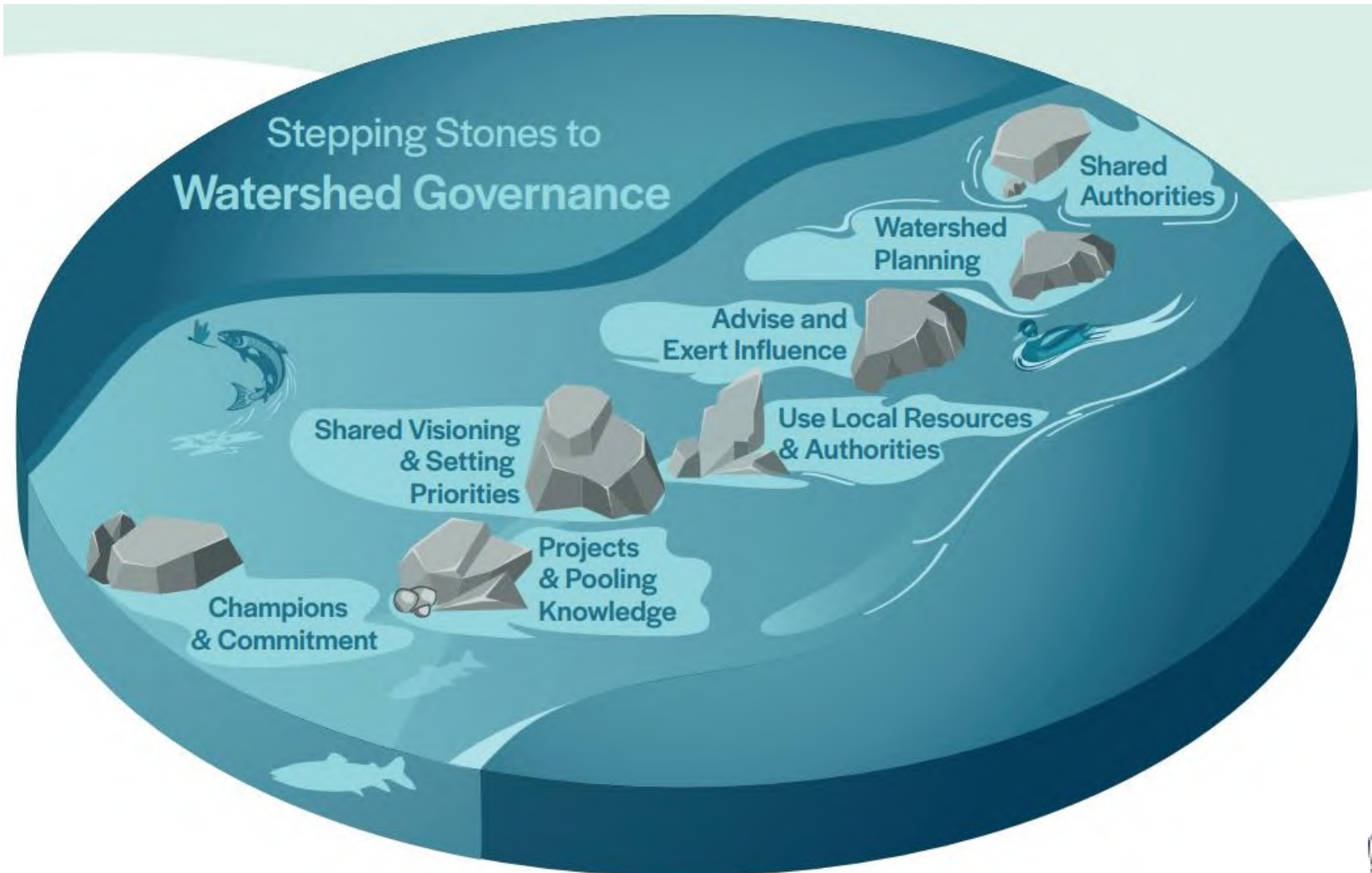


Establishing the *Groundwater Footprint* of the Islands Trust Area is a giant leap in evidence-based sustainability planning.

Historically, precautionary principles aided planning through a lack of knowledge of groundwater recharge, availability, and vulnerability.

However, with a changing climate and increasing societal stresses, increasing science and knowledge strengthens the precautionary principle.....

*We cannot use the past to plan for the future.*



**Water Champions are freshwater stewards that hold governments accountable**

**POLIS**

the root of word of "politics"  
*a term that represents a rootedness in place and community.*

the highest of human ideals  
the ability to make decisions collectively for the greater good



POLIS Project on Ecological Governance

**watersustainabilityproject**

POLIS (2019) *A Handbook for Water Champions: Strengthening Decision-Making and Collaboration for Healthy Watersheds*. [www.poliswaterproject.org](http://www.poliswaterproject.org)



# Mapping is Art.

matthewgoodbandtheaudioofbeing



Understanding freshwater from community values and traditional knowledge through storytelling and lived experience supports quantitative science.

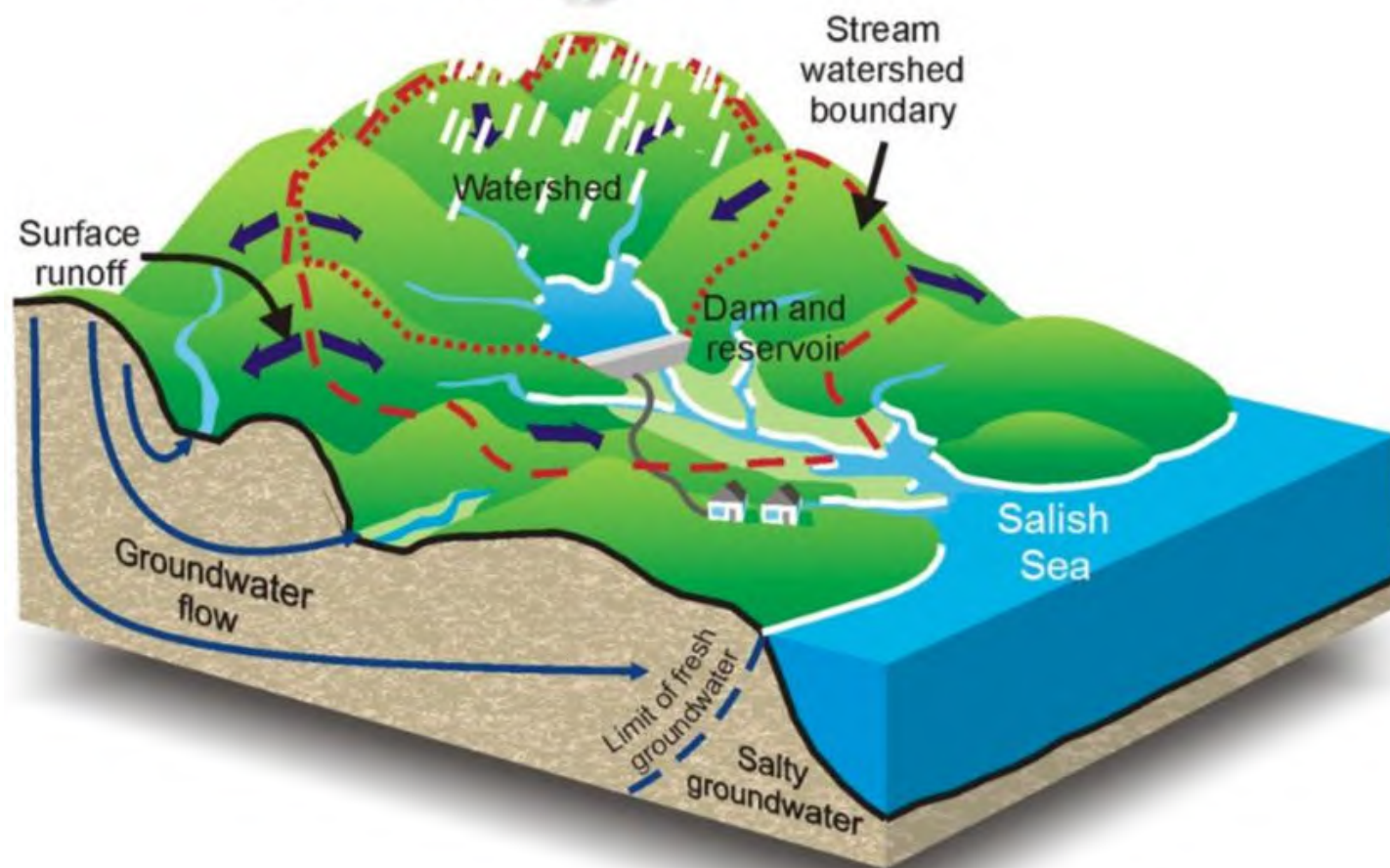
Exploring groundwater resources is at the nexus of science, technology, and art.

# ISLANDS TRUST AREA AQUIFER CONCEPTUALIZATION PROJECT

Groundwater Sustainability Science Program



## Groundwater is a unique amenity in the Islands Trust Area



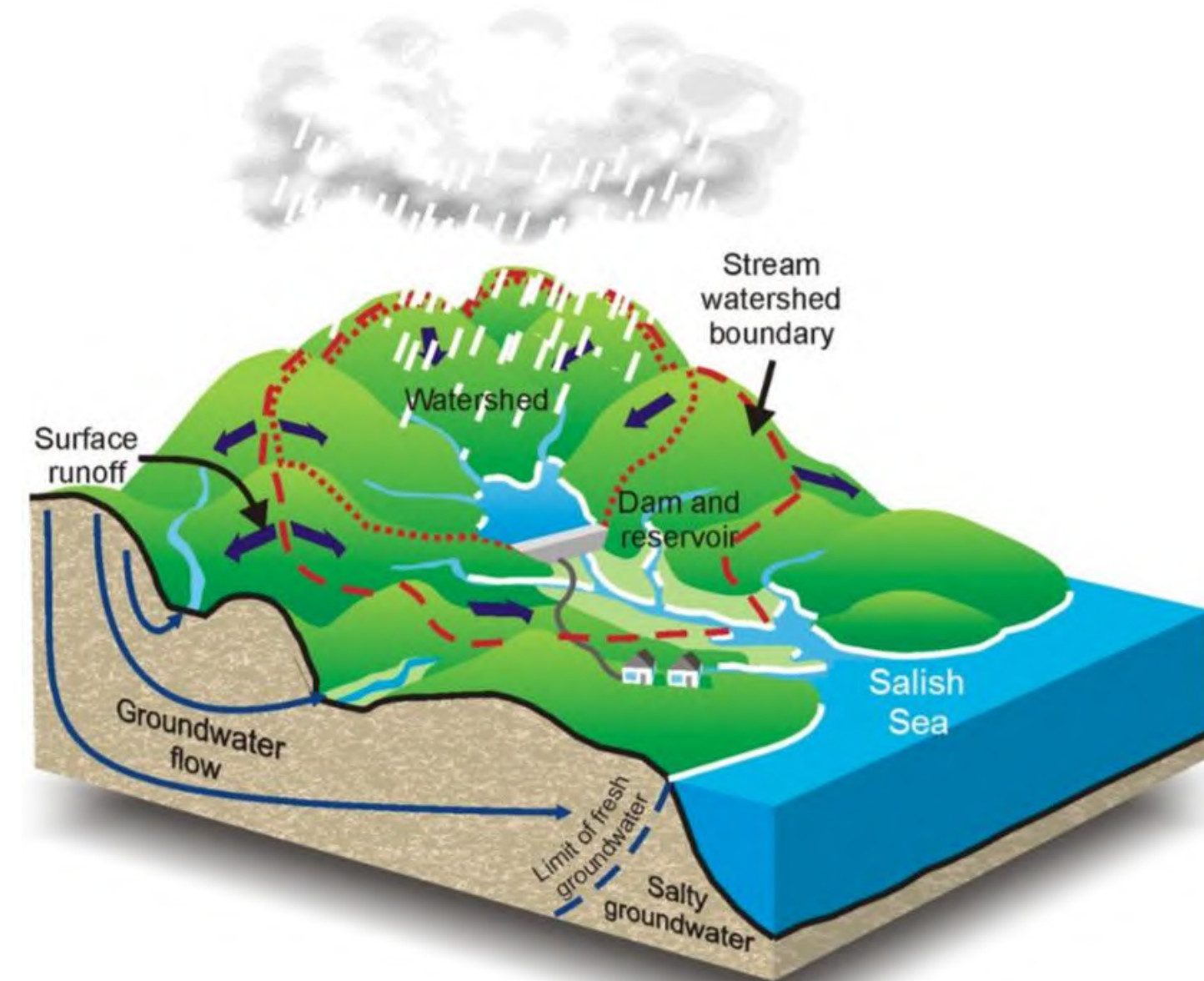
All groundwater comes from **meteoric** water.

Rain, snow, and fog provide all essential freshwater for island life.



## What is an Aquifer?

A subterranean geological unit that can store and transmit water in useful quantities for domestic, industrial, and ecological use.

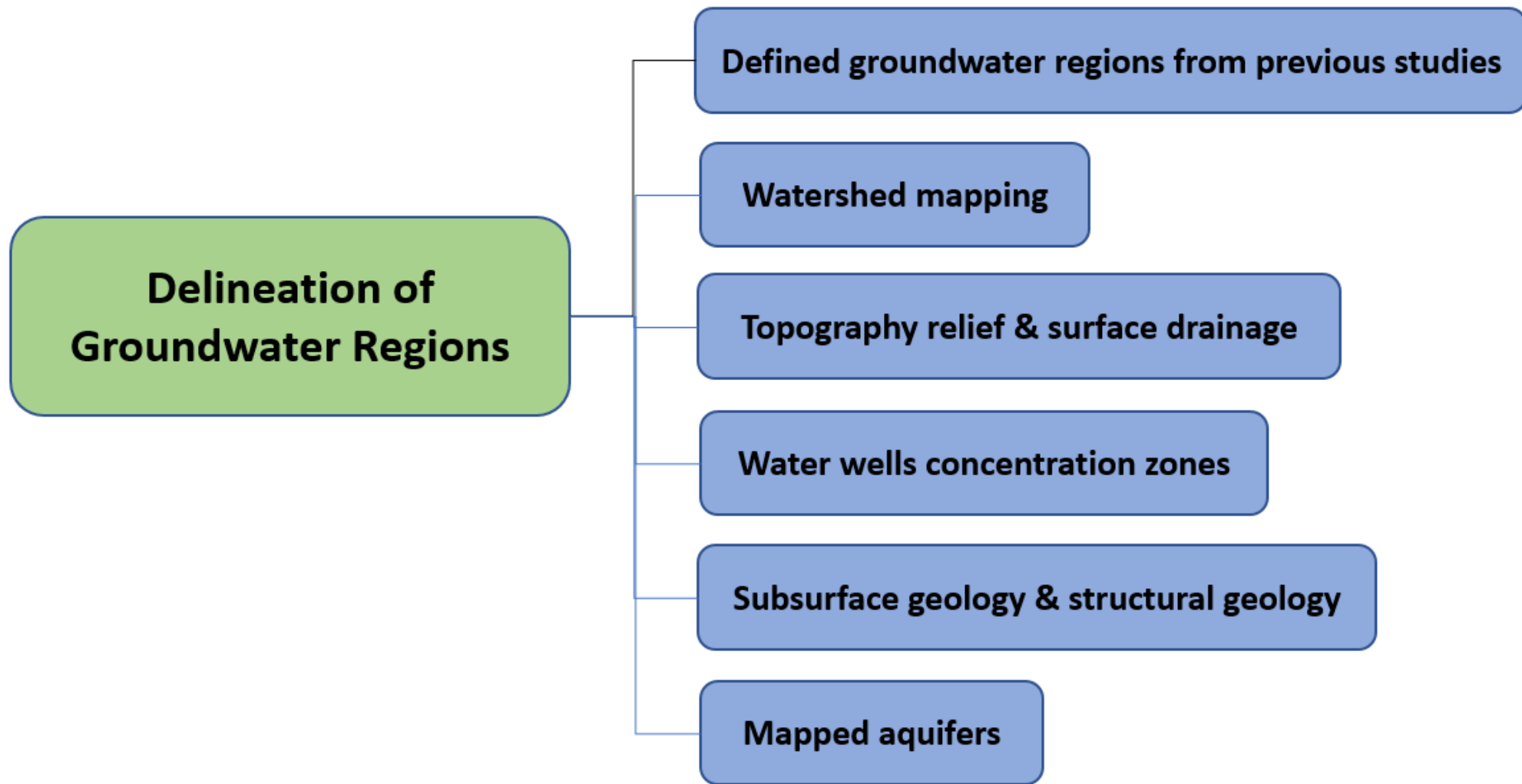






Groundwater regions are *Water Management Units* for land-use planning and water authorizations.





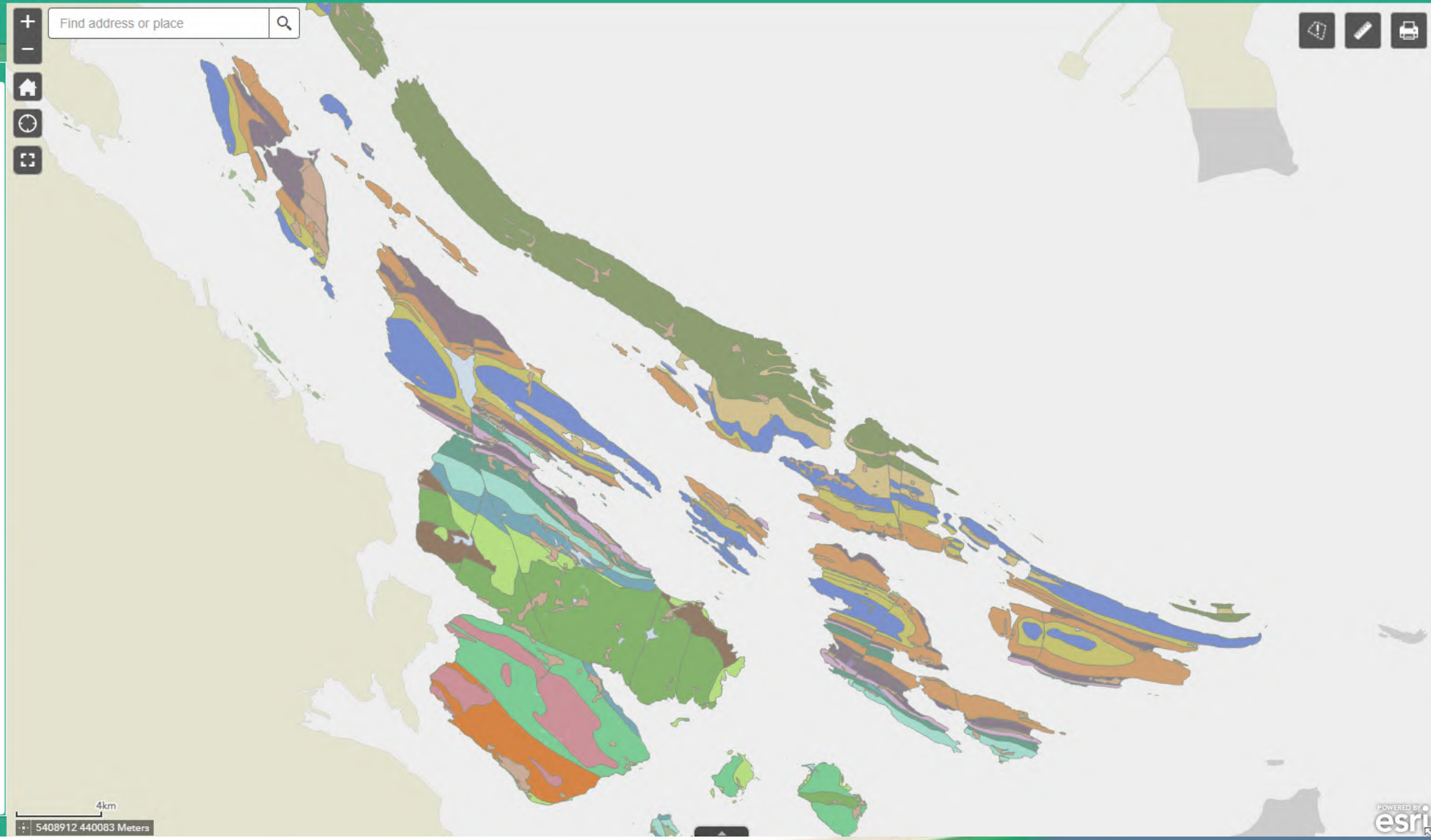
### GEOLOGY AND SOIL

#### Geology

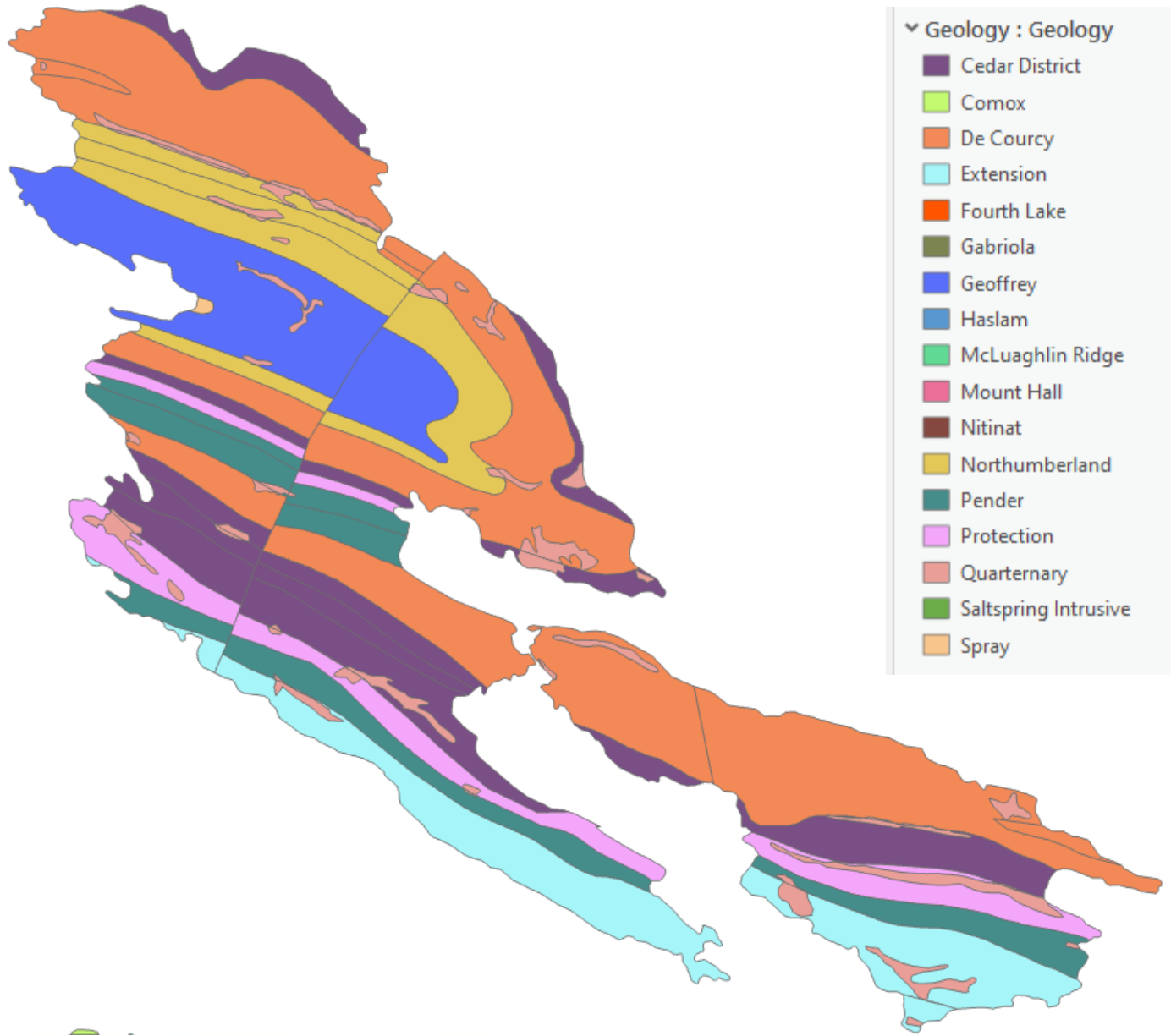
- Cedar District
- Comox
- De Courcy
- Extension
- Fourth Lake
- Gabriola
- Geoffrey
- Haslem
- McLuaghlin Ridge
- Mount Hall
- Nitinat
- Northumberland
- Pender
- Protection
- Quaternary
- Saltspring Intrusive
- Spray

#### Basemap

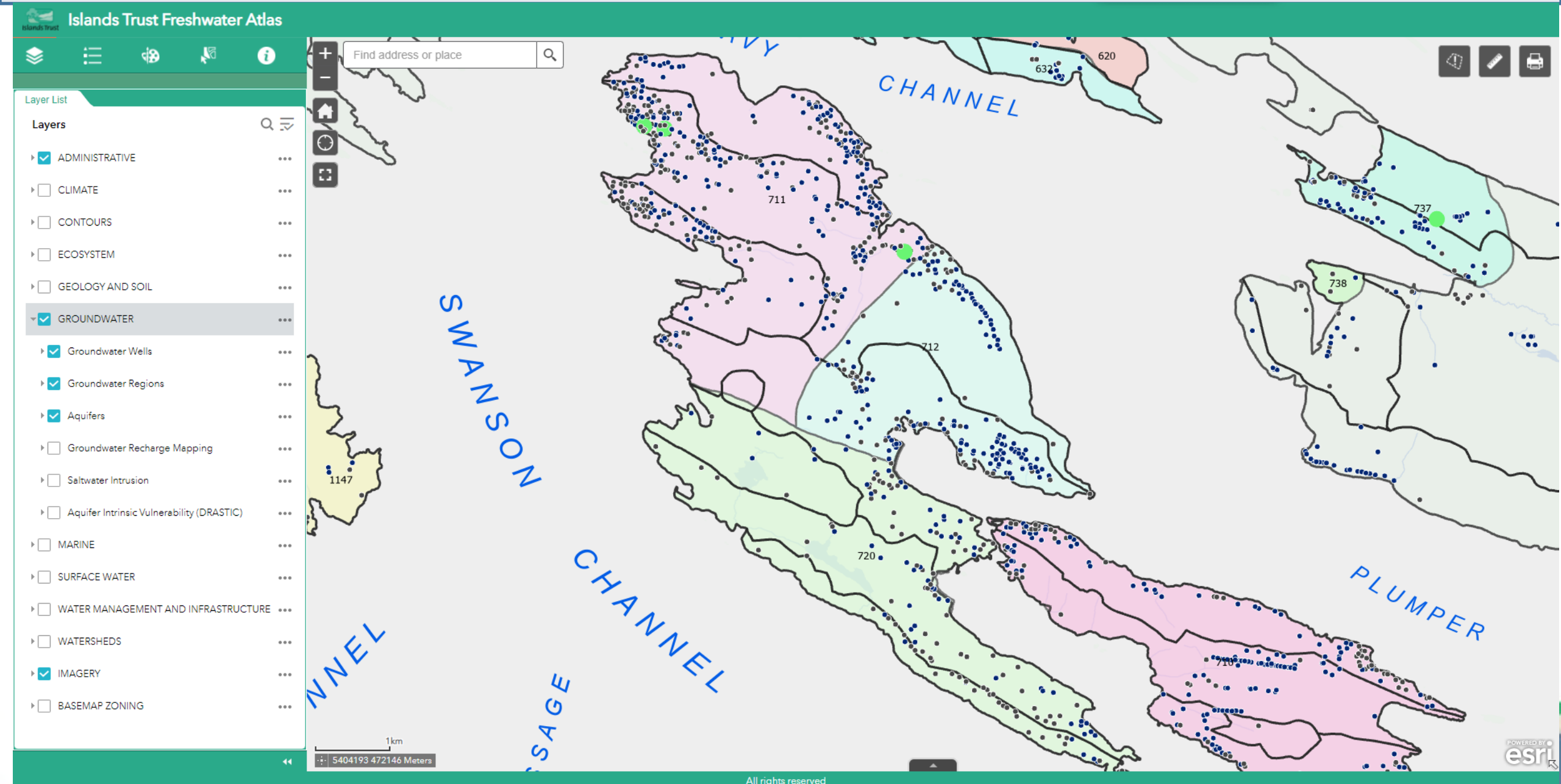
- Lakes
- Land
- USA
- ISLANDS 150-250k
- Mainland Shoreline





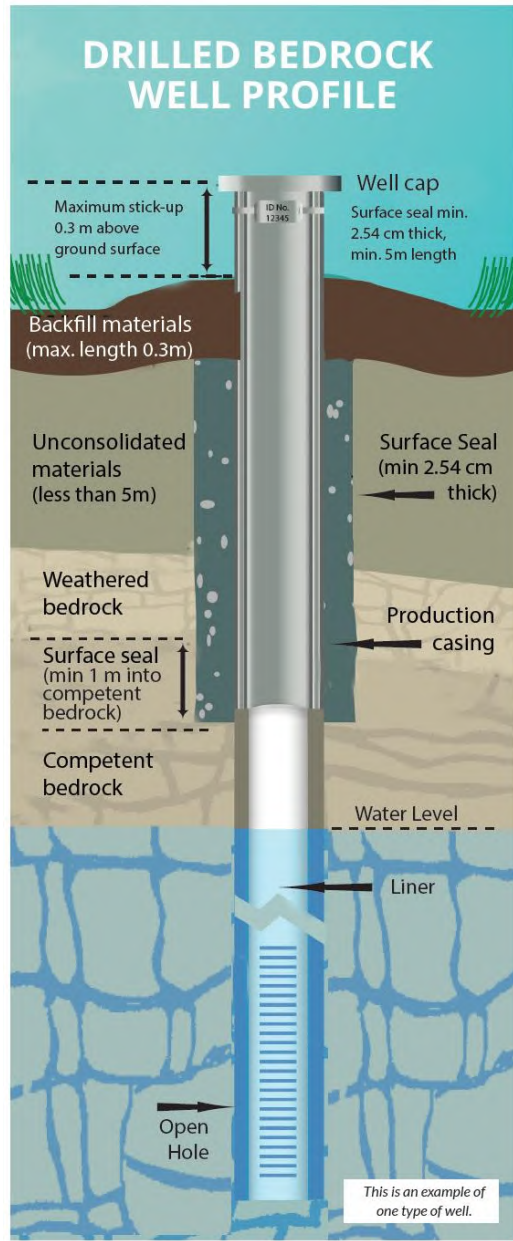


## Geology of North Pender





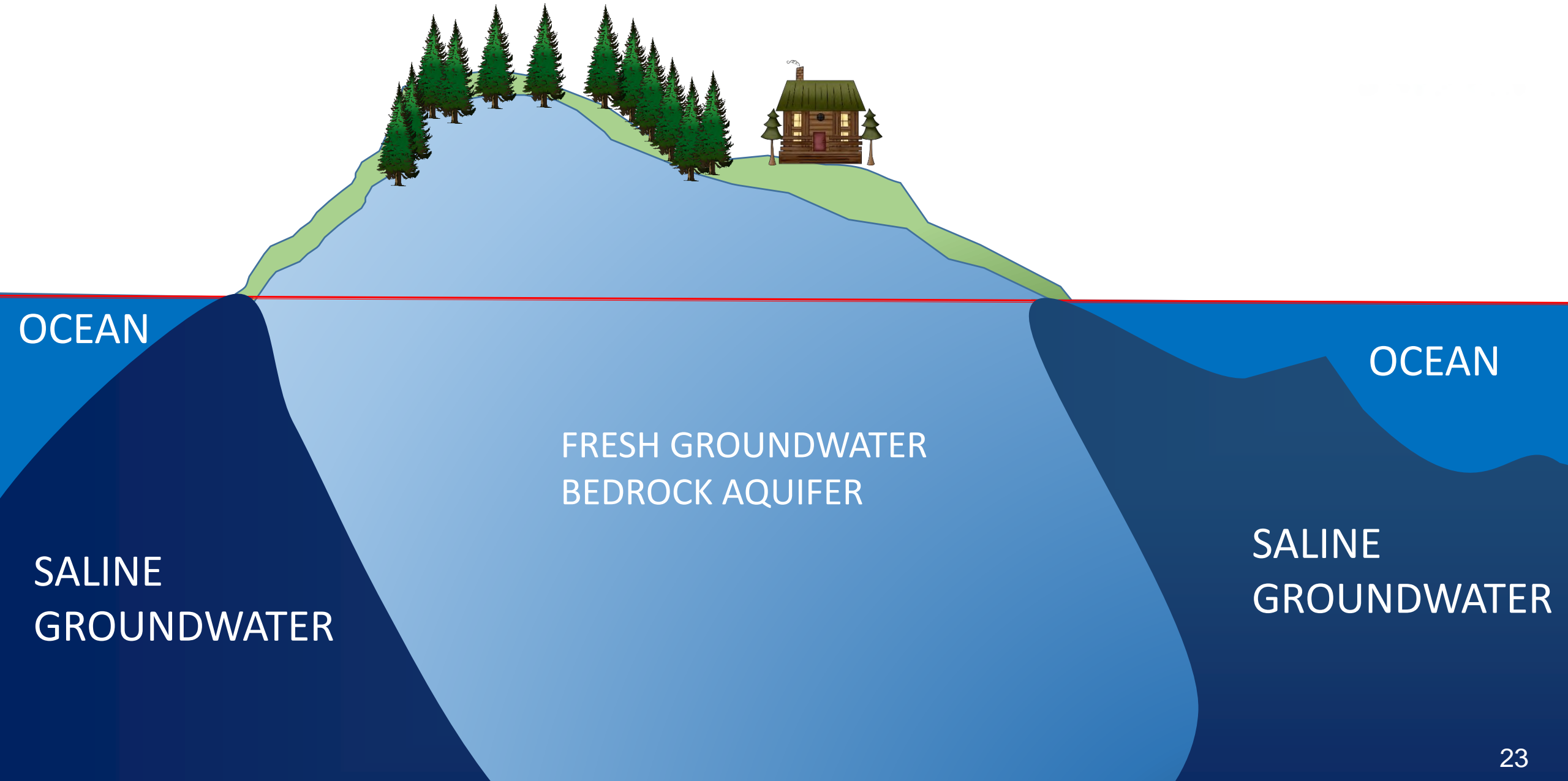
# WELL LOCATION



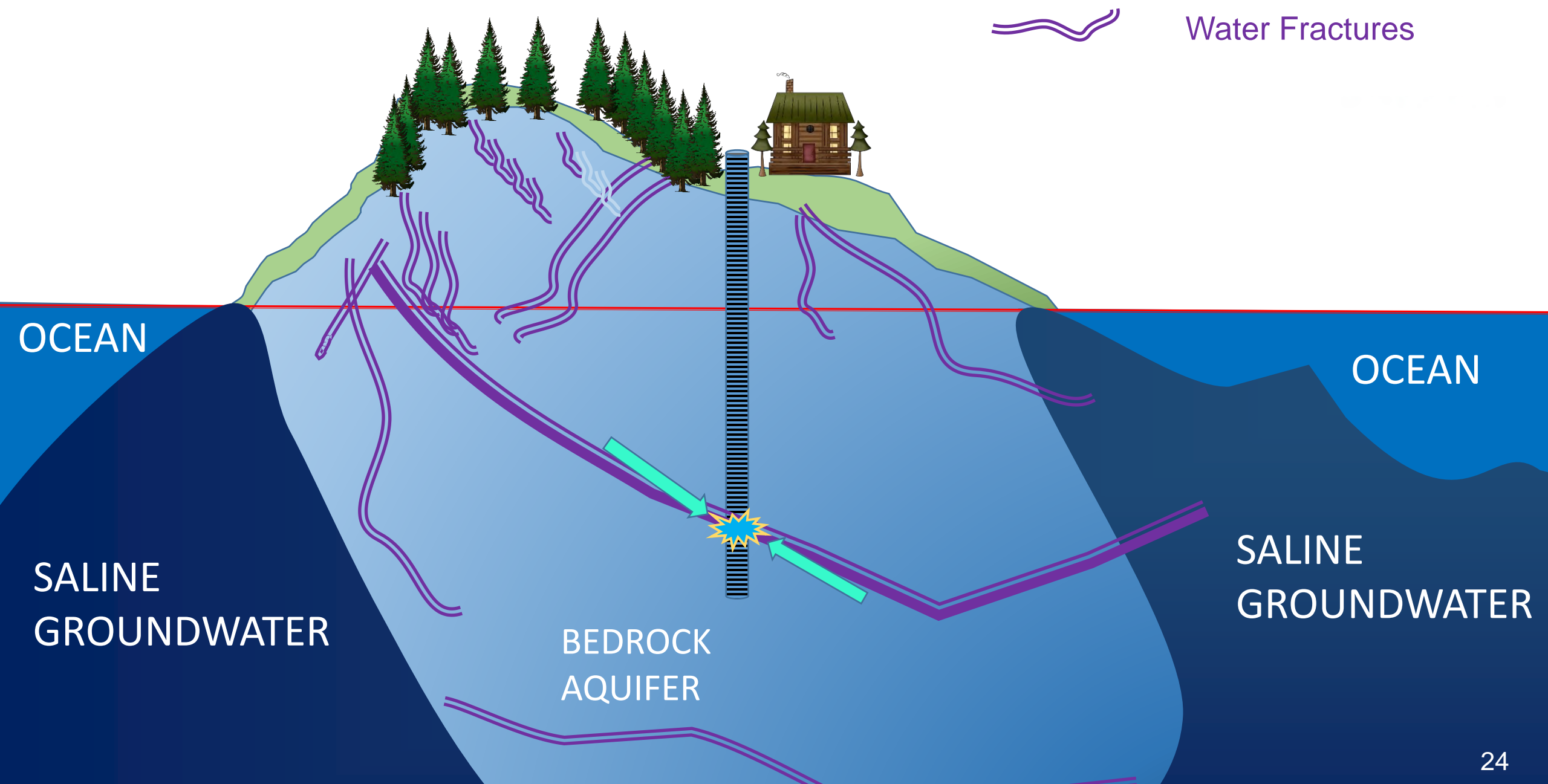
# What is a well?

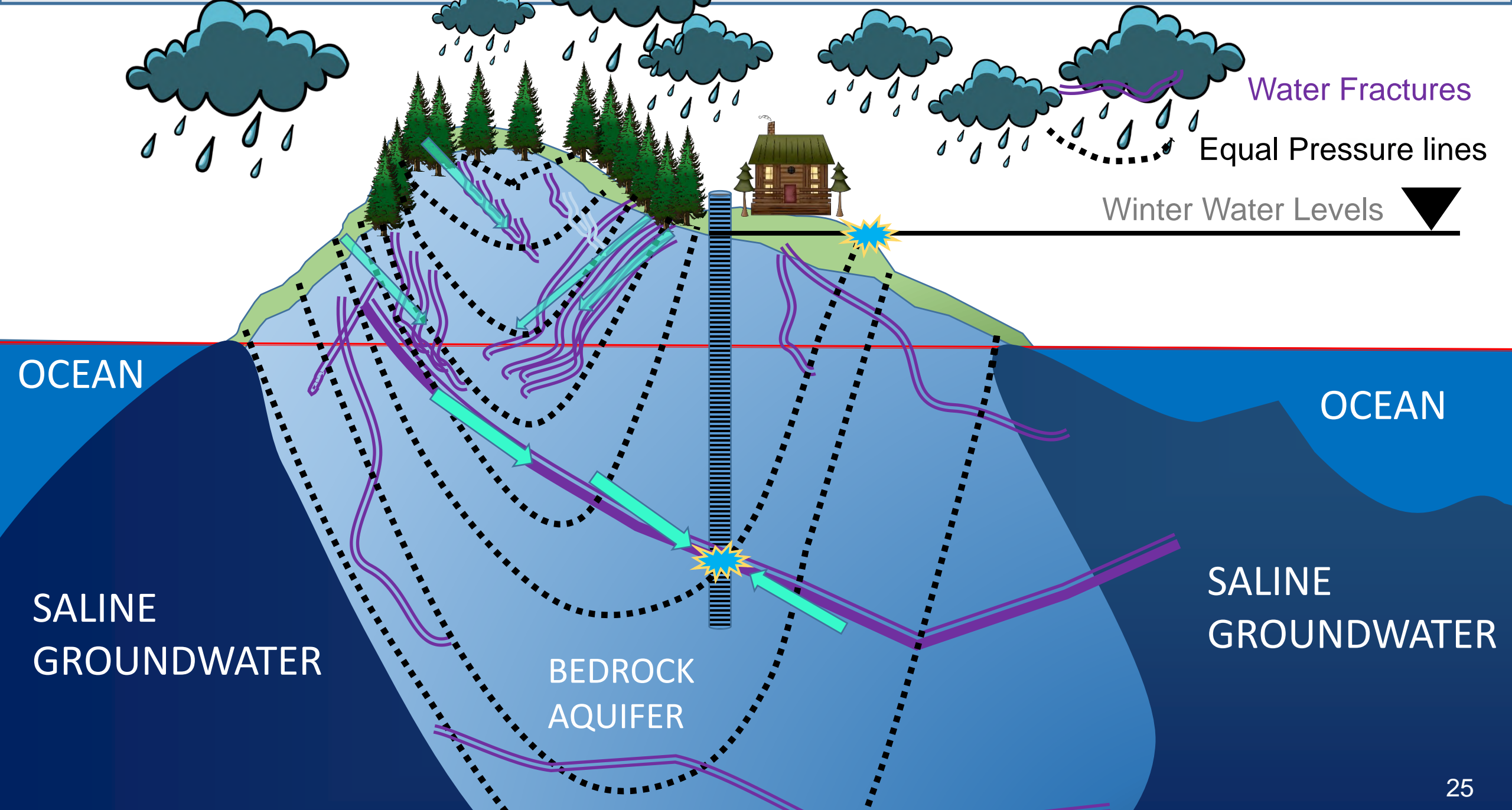
Provides homeowners, municipalities, industry, and farms access to water stored underground

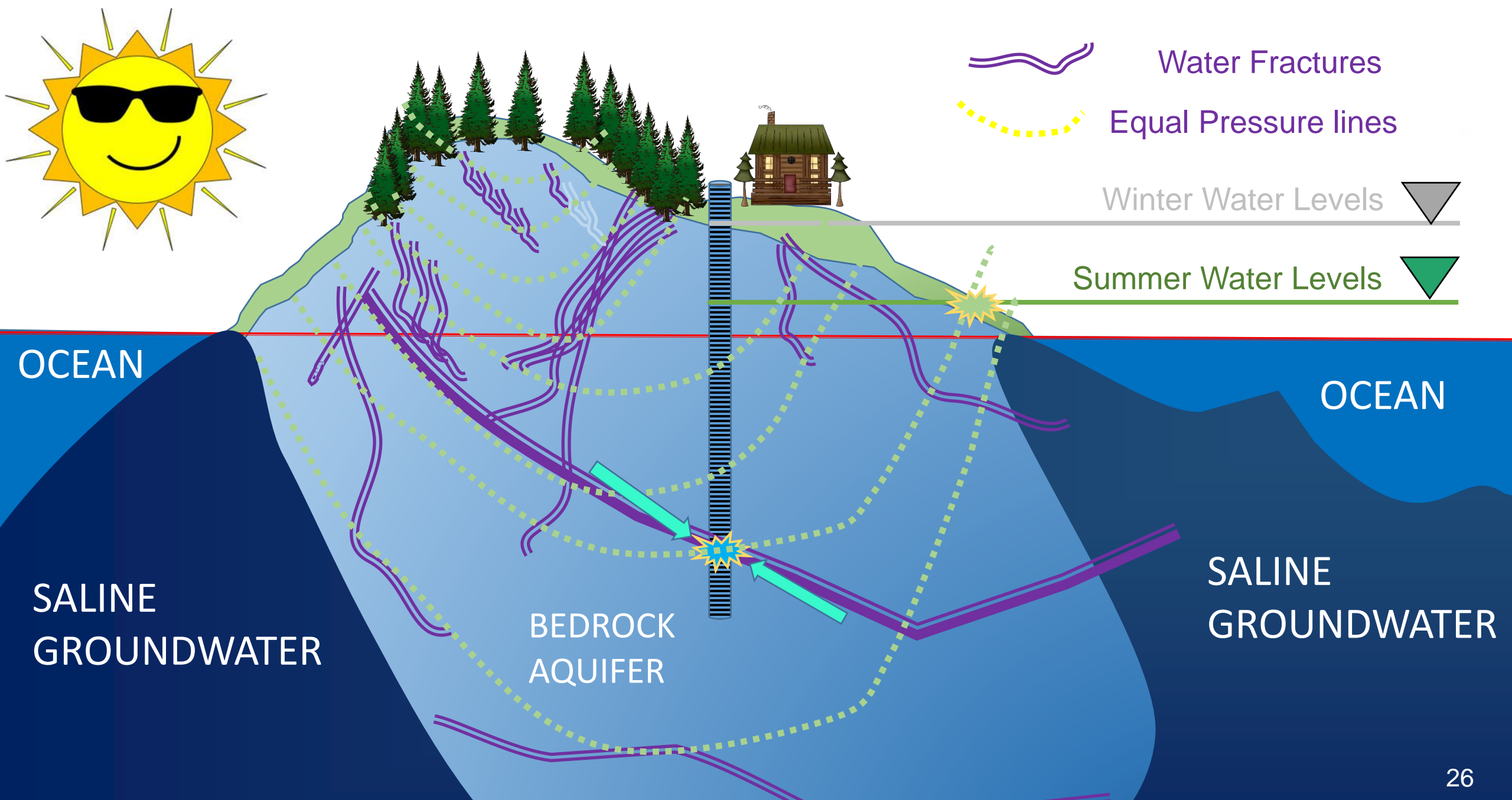




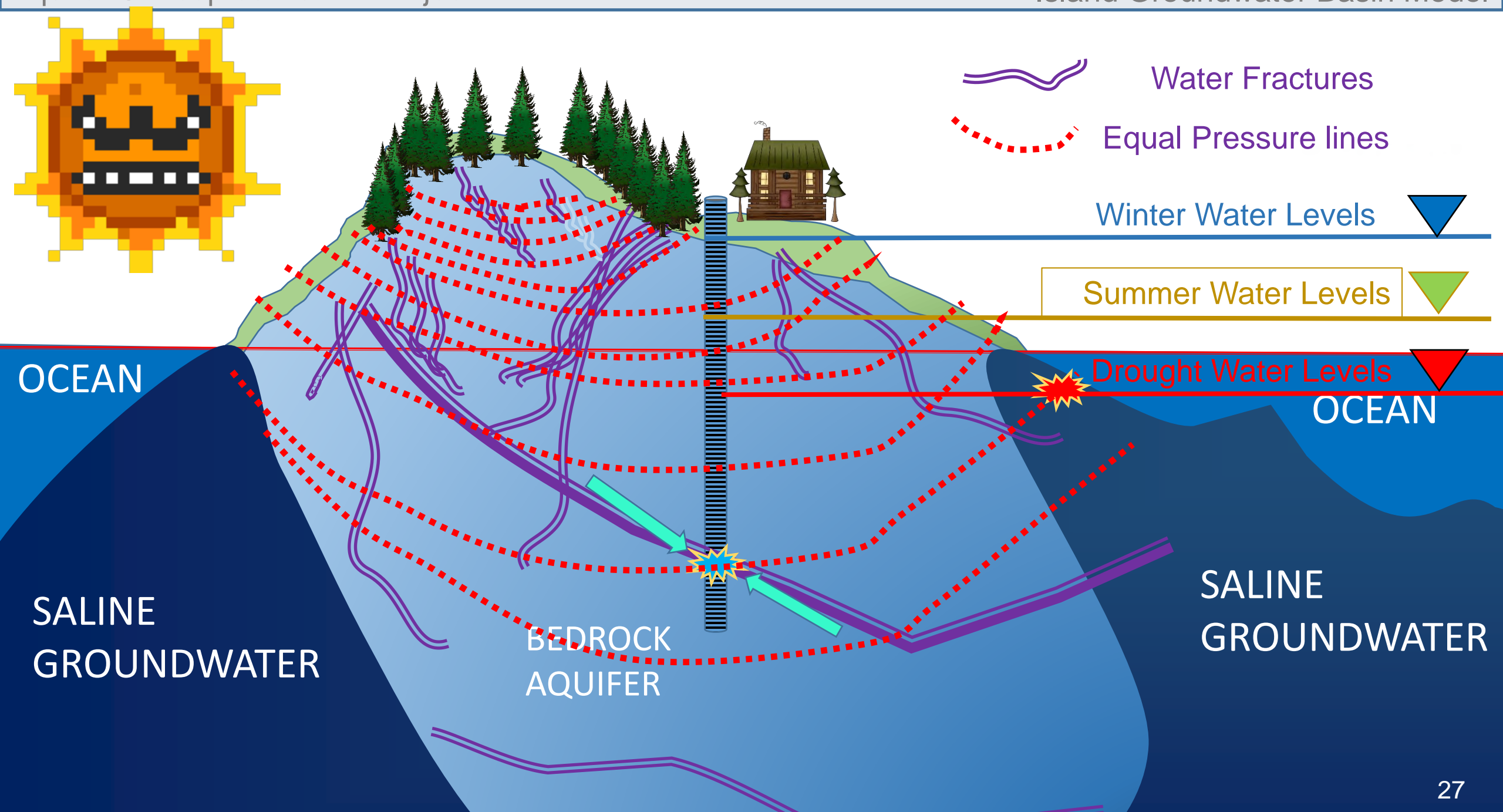


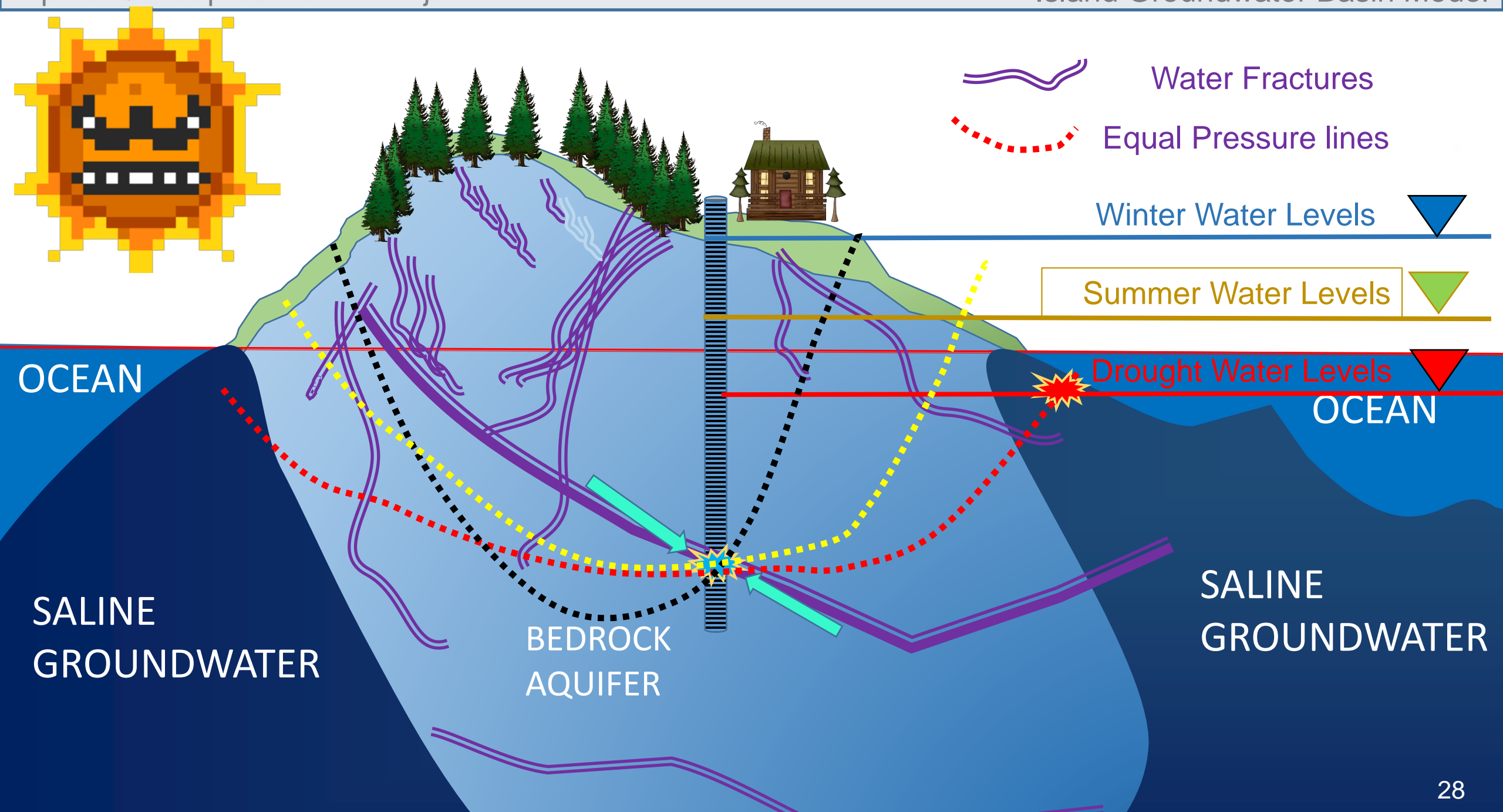




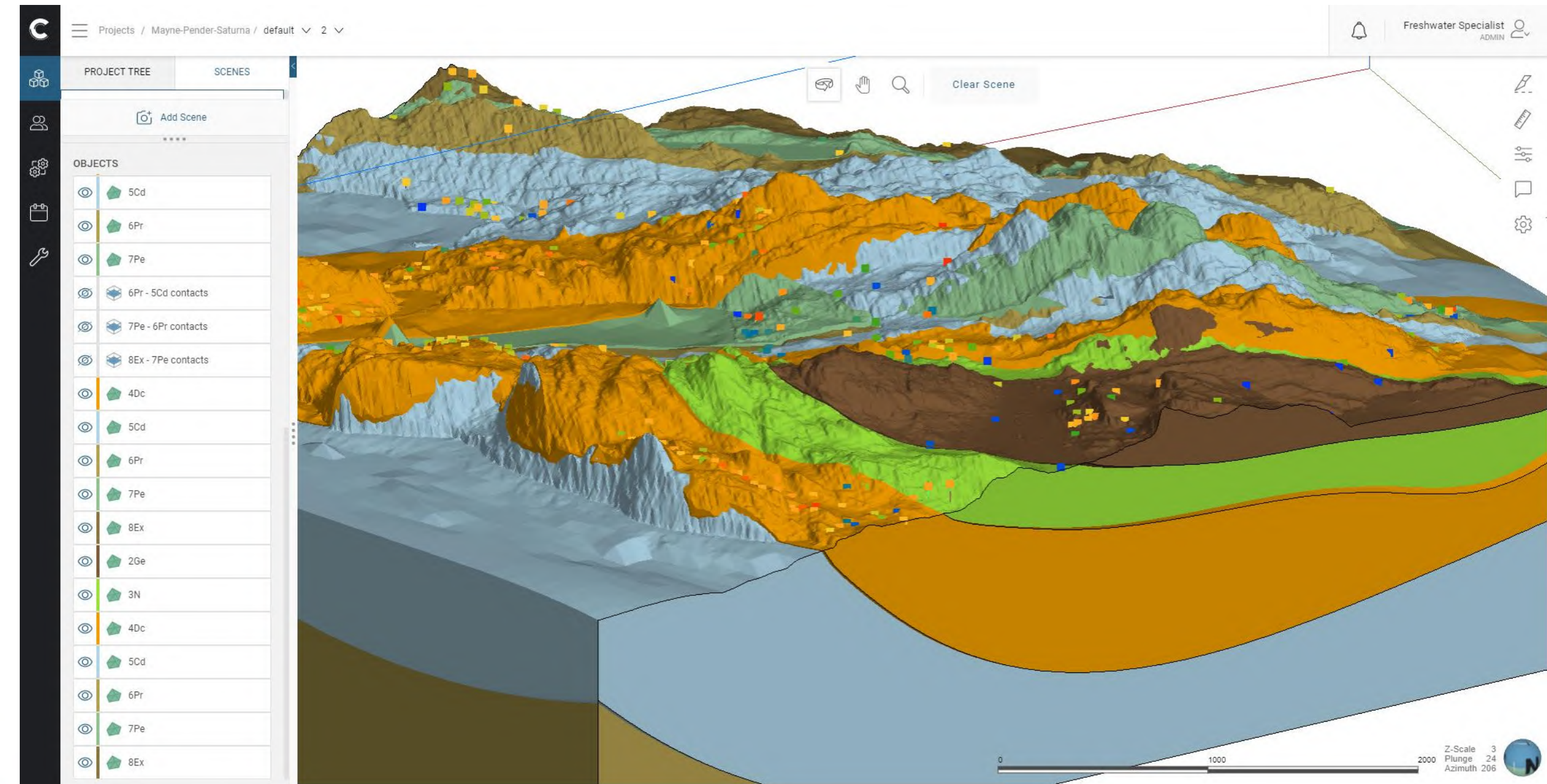






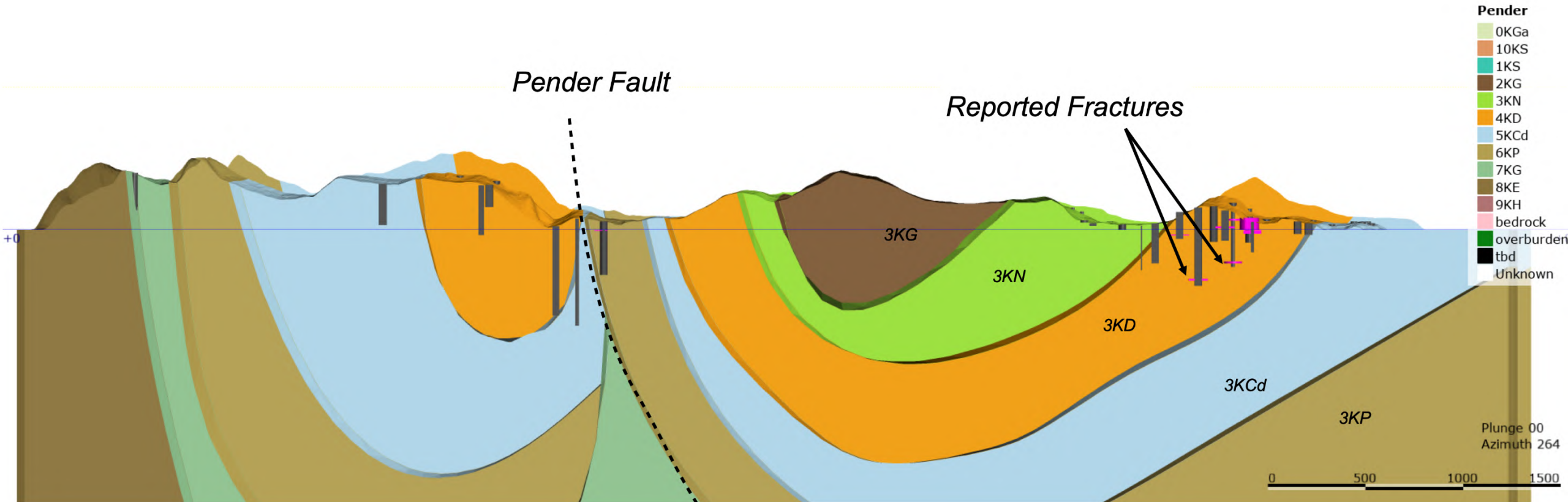








4000 Wells  
7000 Fractures  
Machine Learning

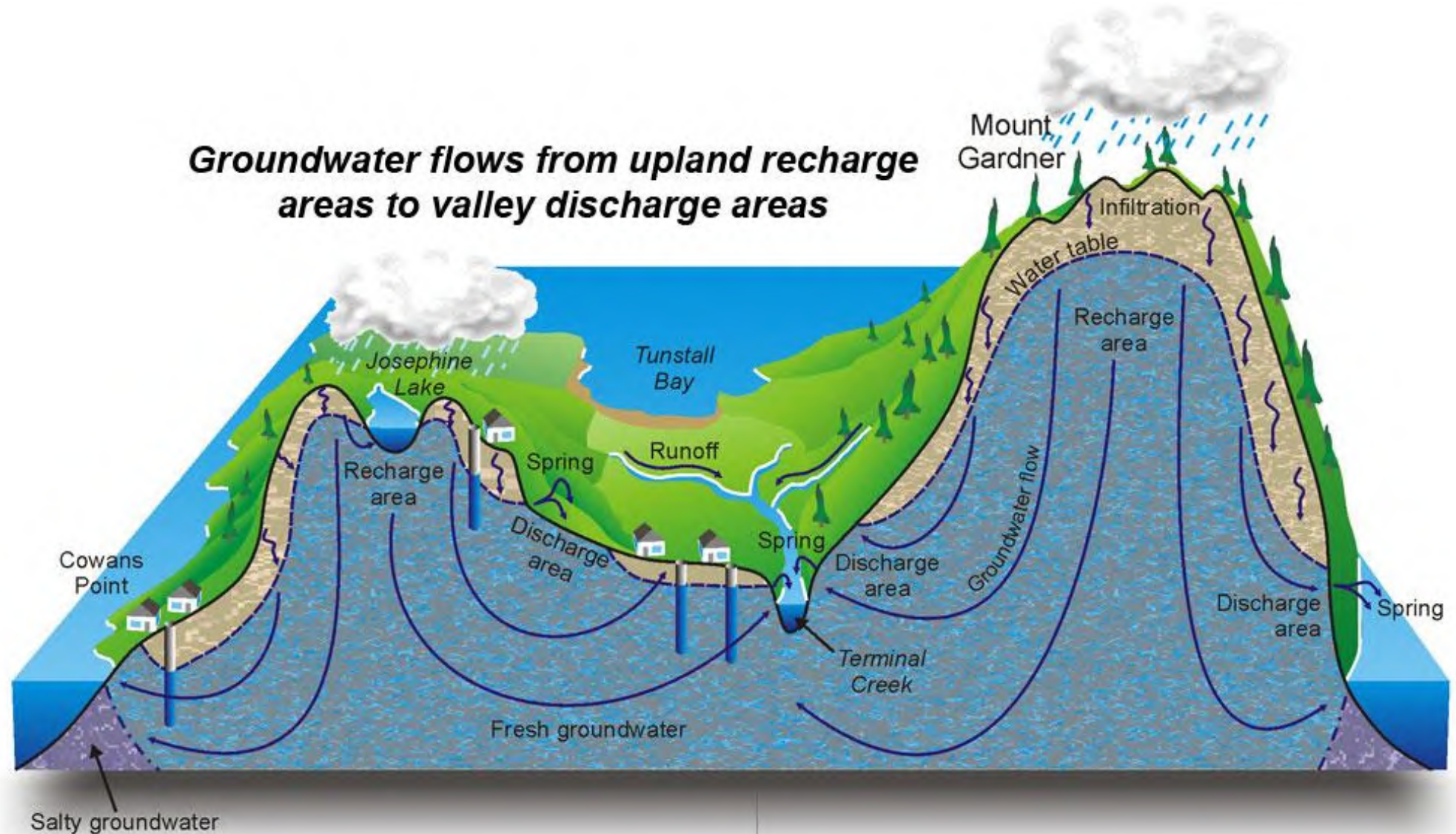


# ISLANDS TRUST AREA GROUNDWATER RECHARGE MAPPING PROJECT

Groundwater Sustainability Science Program



Islands Trust



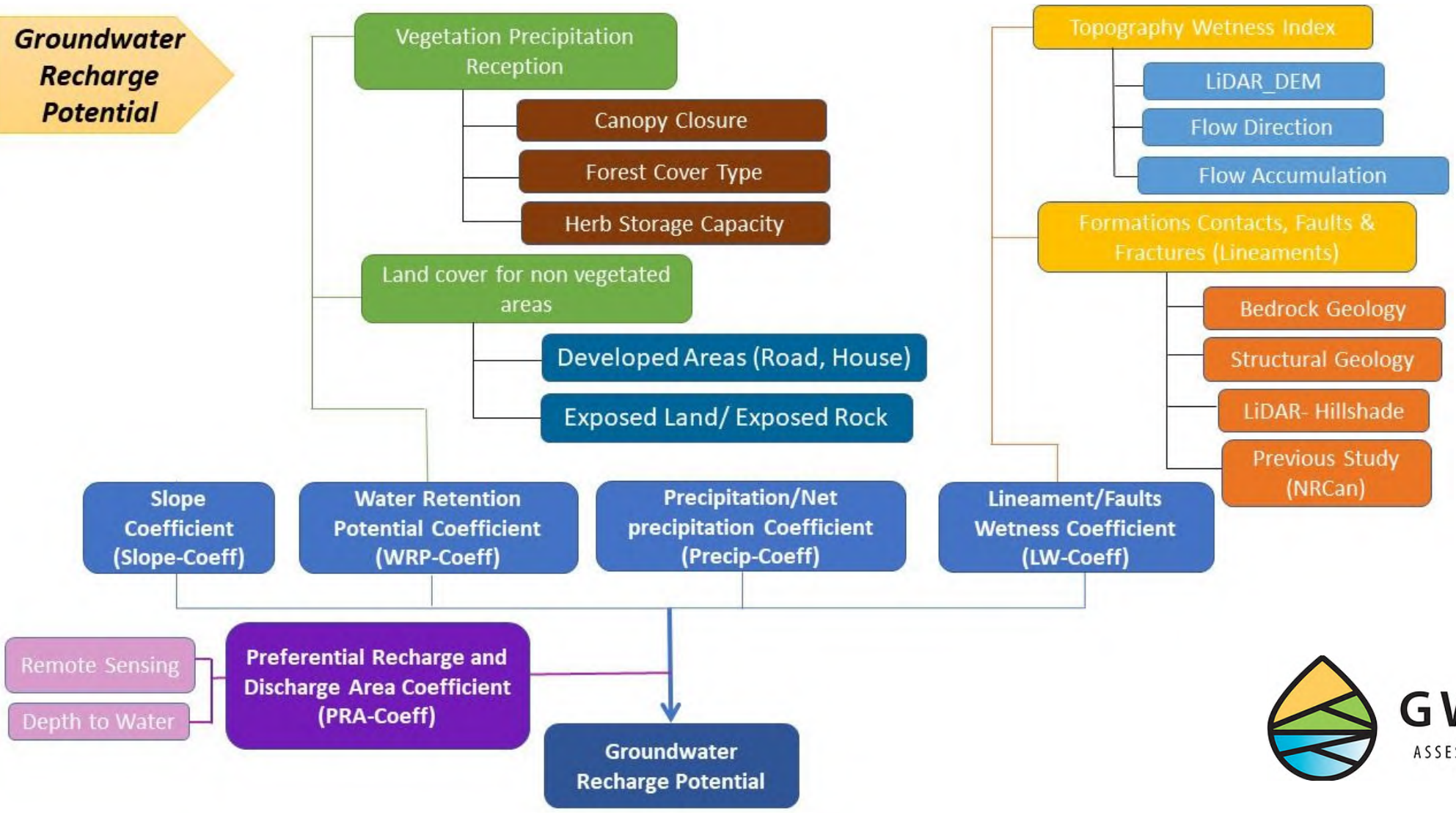




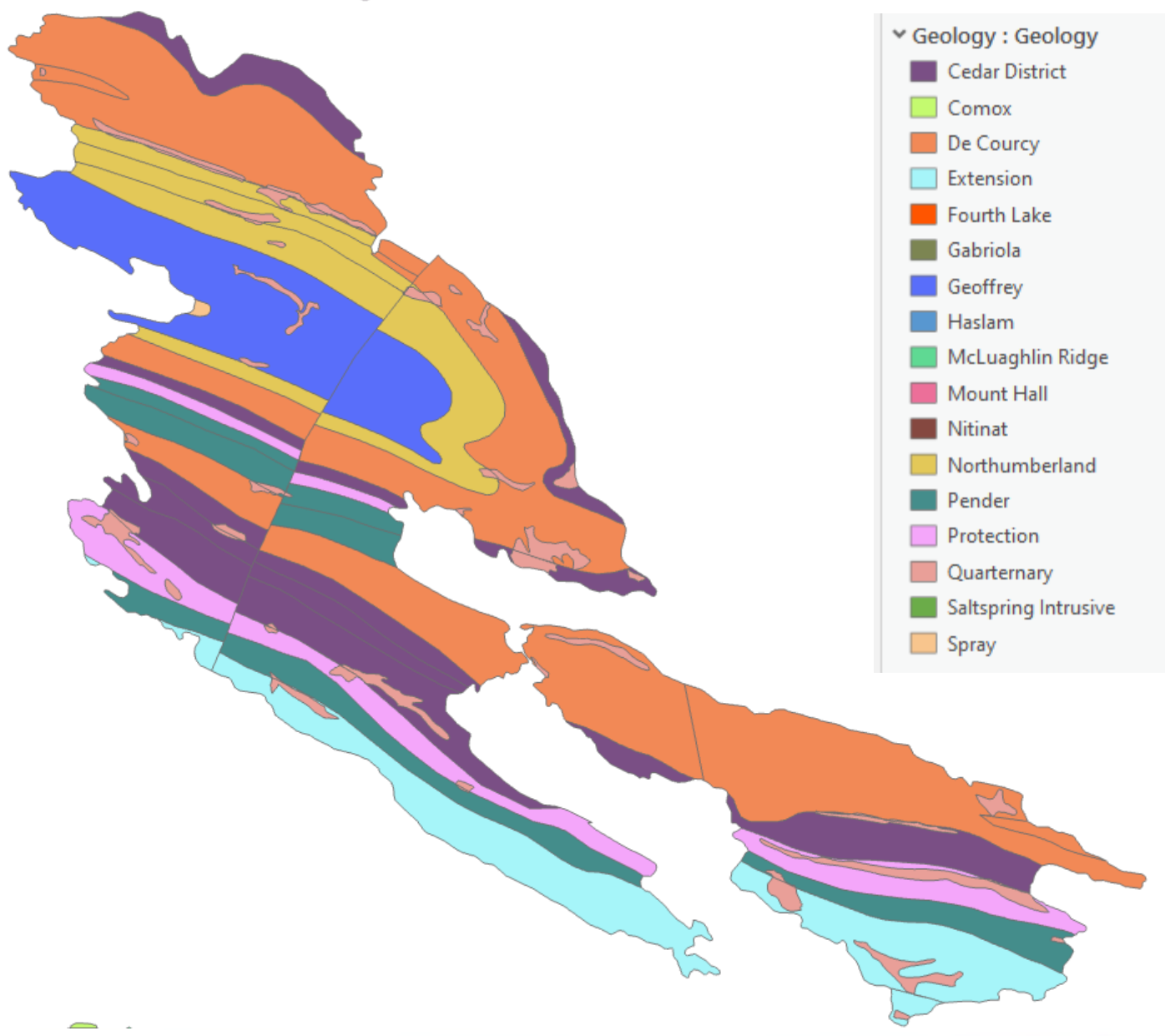
## Mapping Wet Areas... from Space with Sentinel



**Groundwater Recharge Potential**

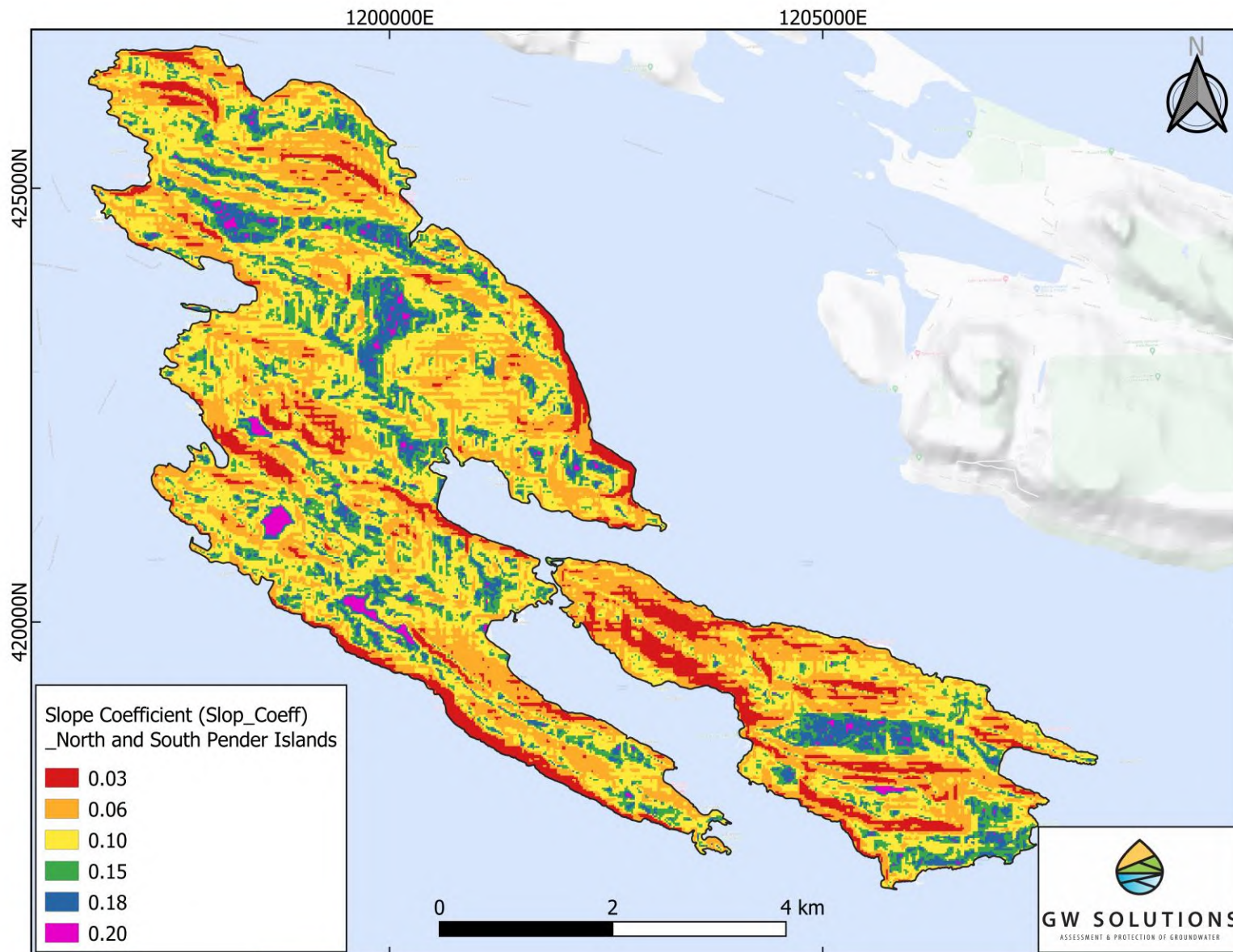


**GW SOLUTIONS**  
ASSESSMENT & PROTECTION OF GROUNDWATER



## Geology of North Pender





Slope and Recharge

*Steep areas do not  
promote recharge*

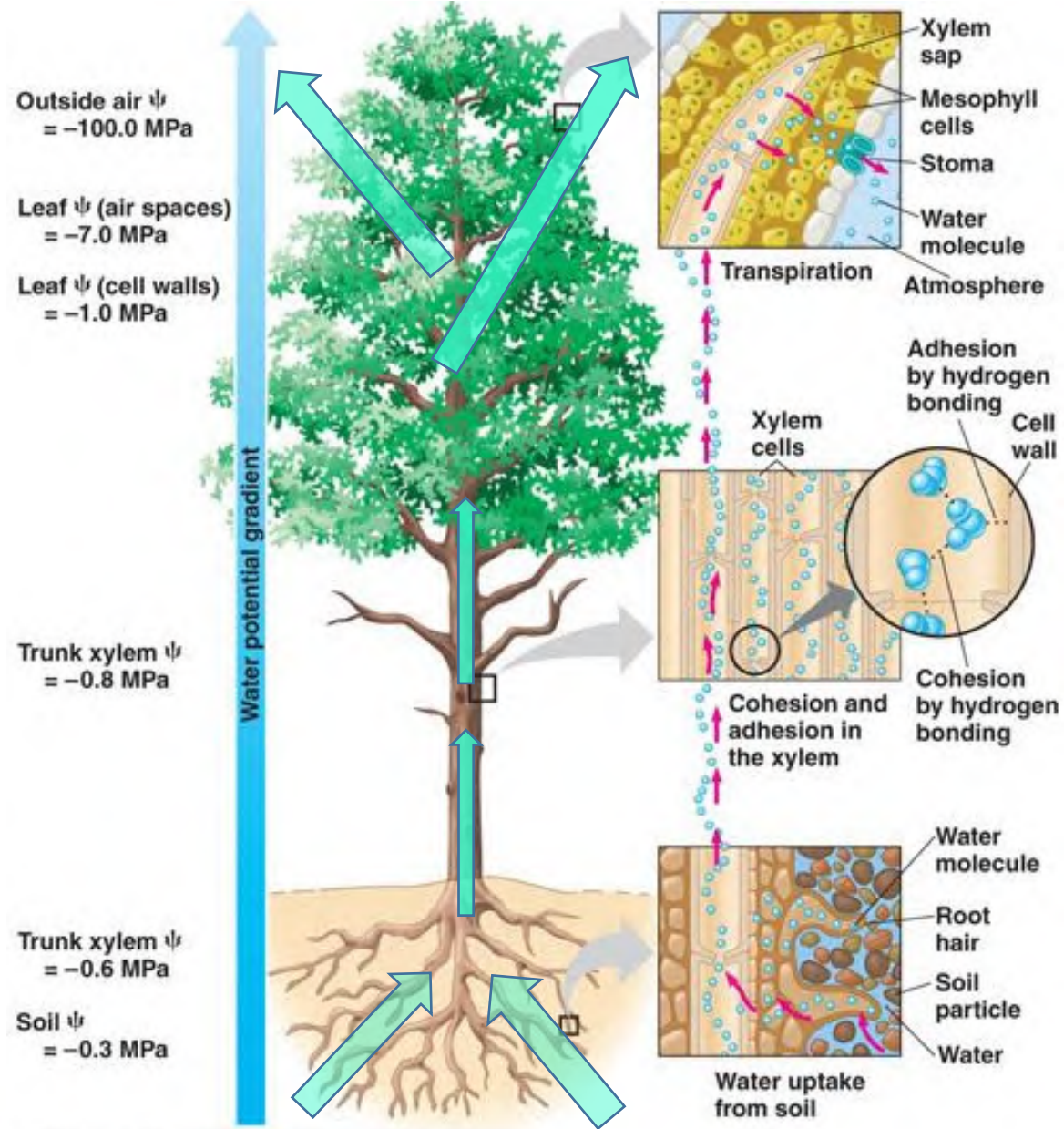


Healthy watersheds and thirsty trees support groundwater recharge and support soil moisture through *capillary pressure*.

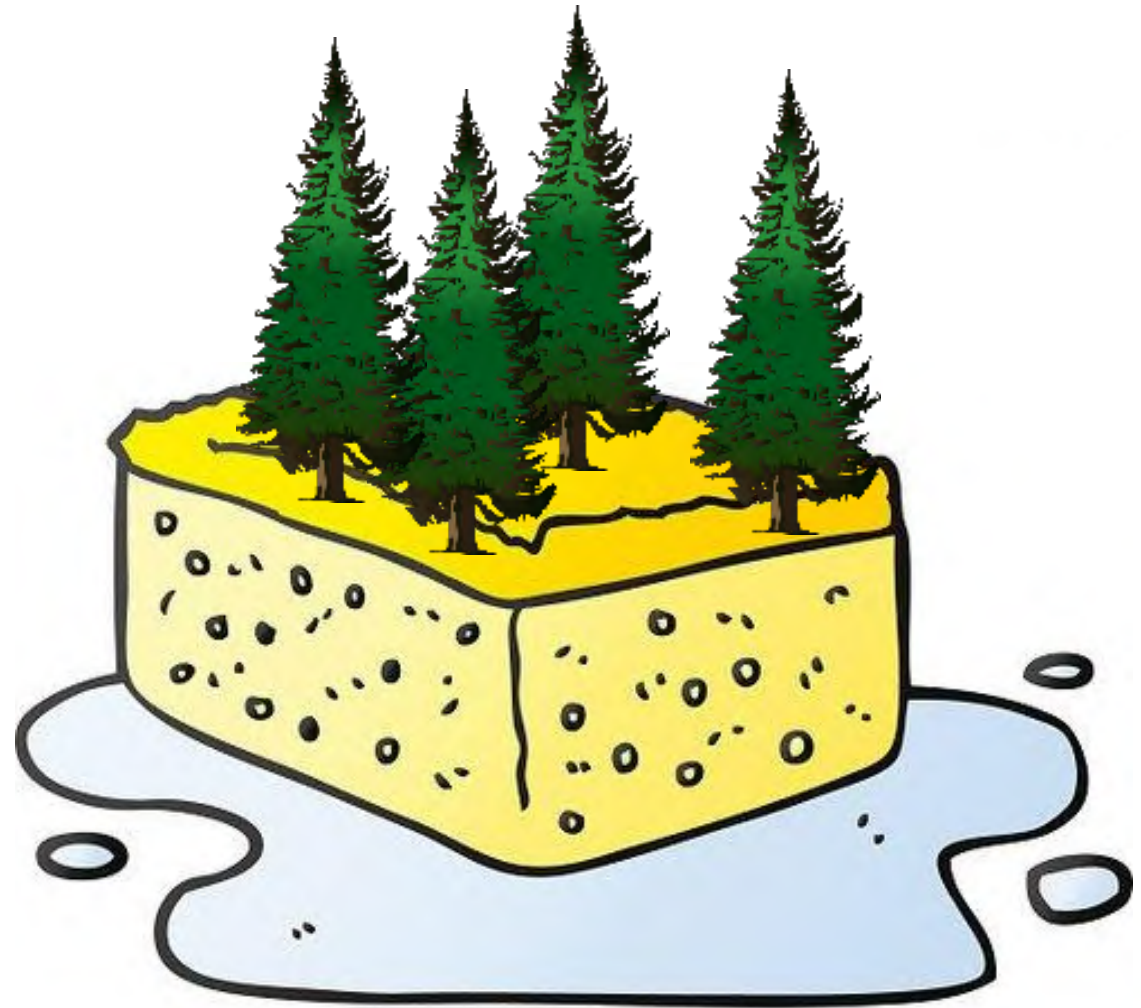
Forests are Freshwater Stewards.





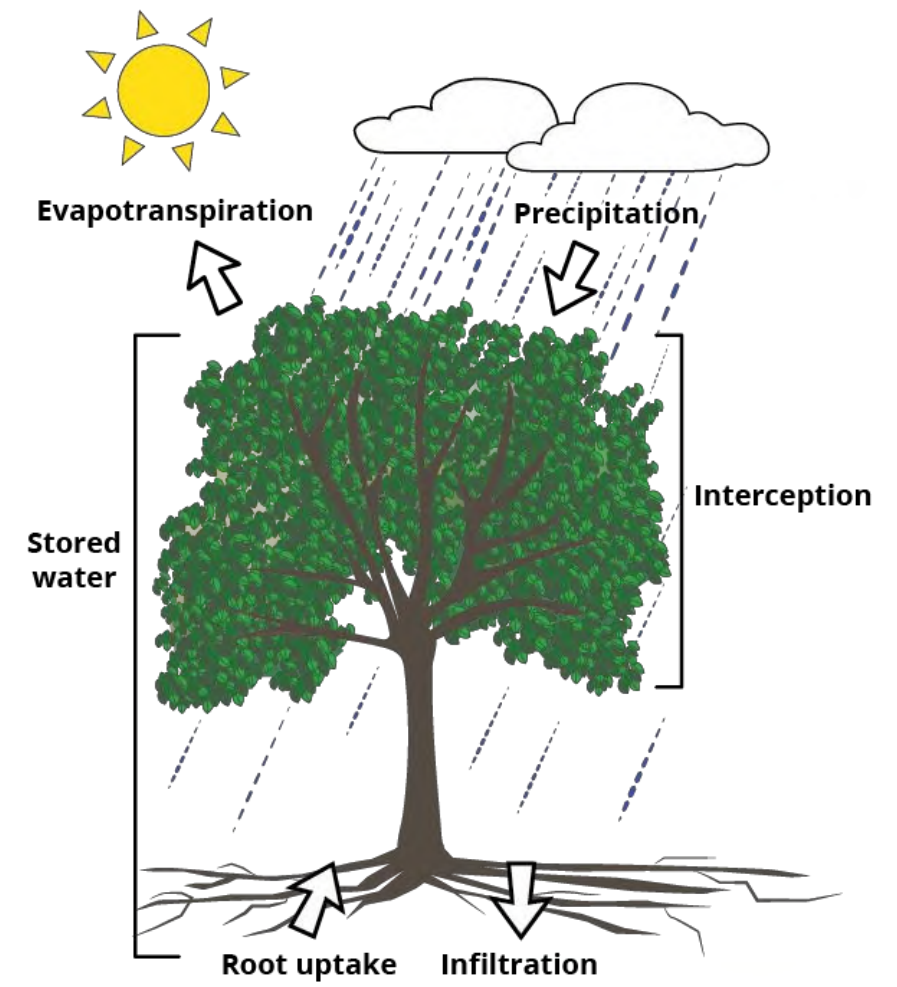
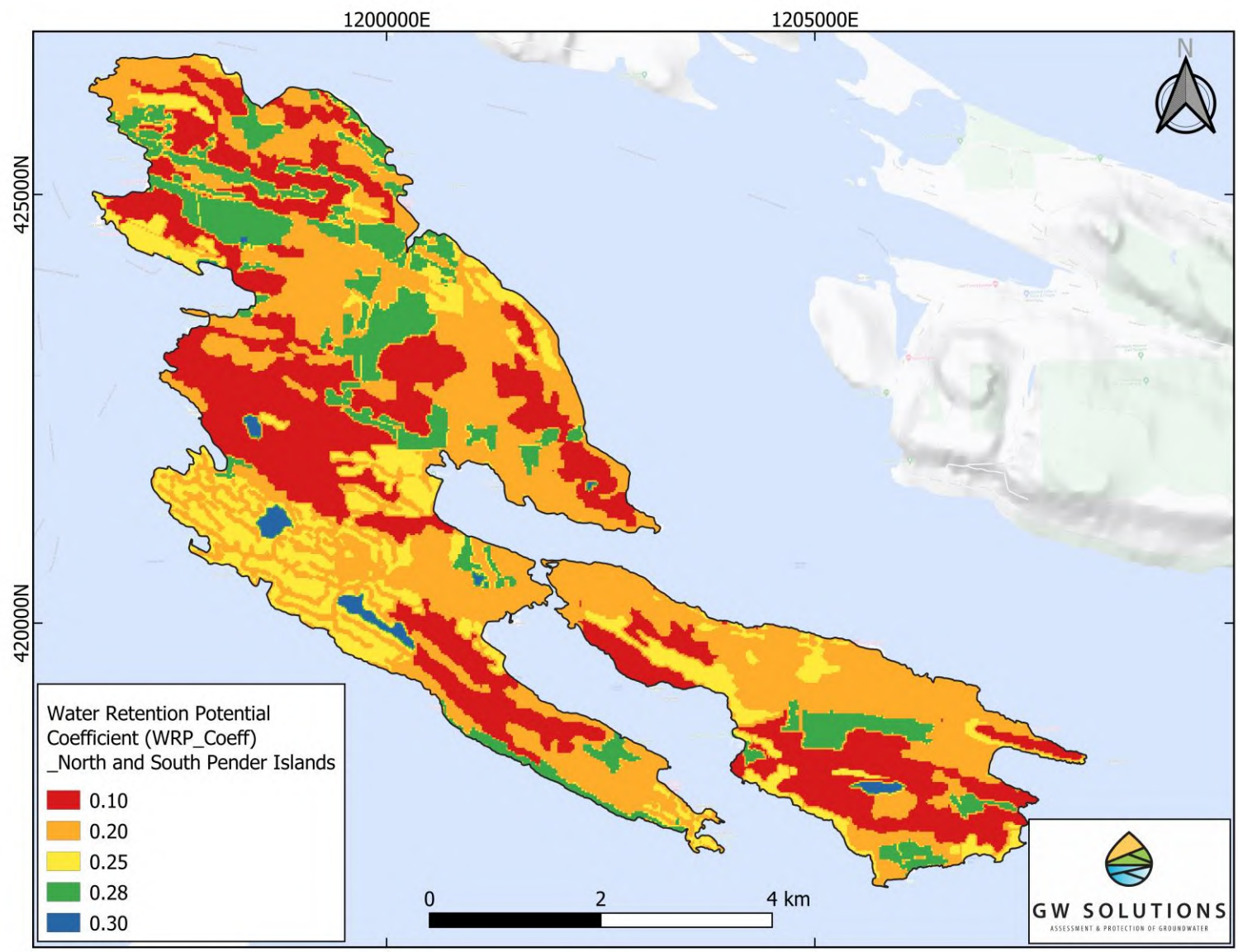


### Thirsty forests make healthy soils

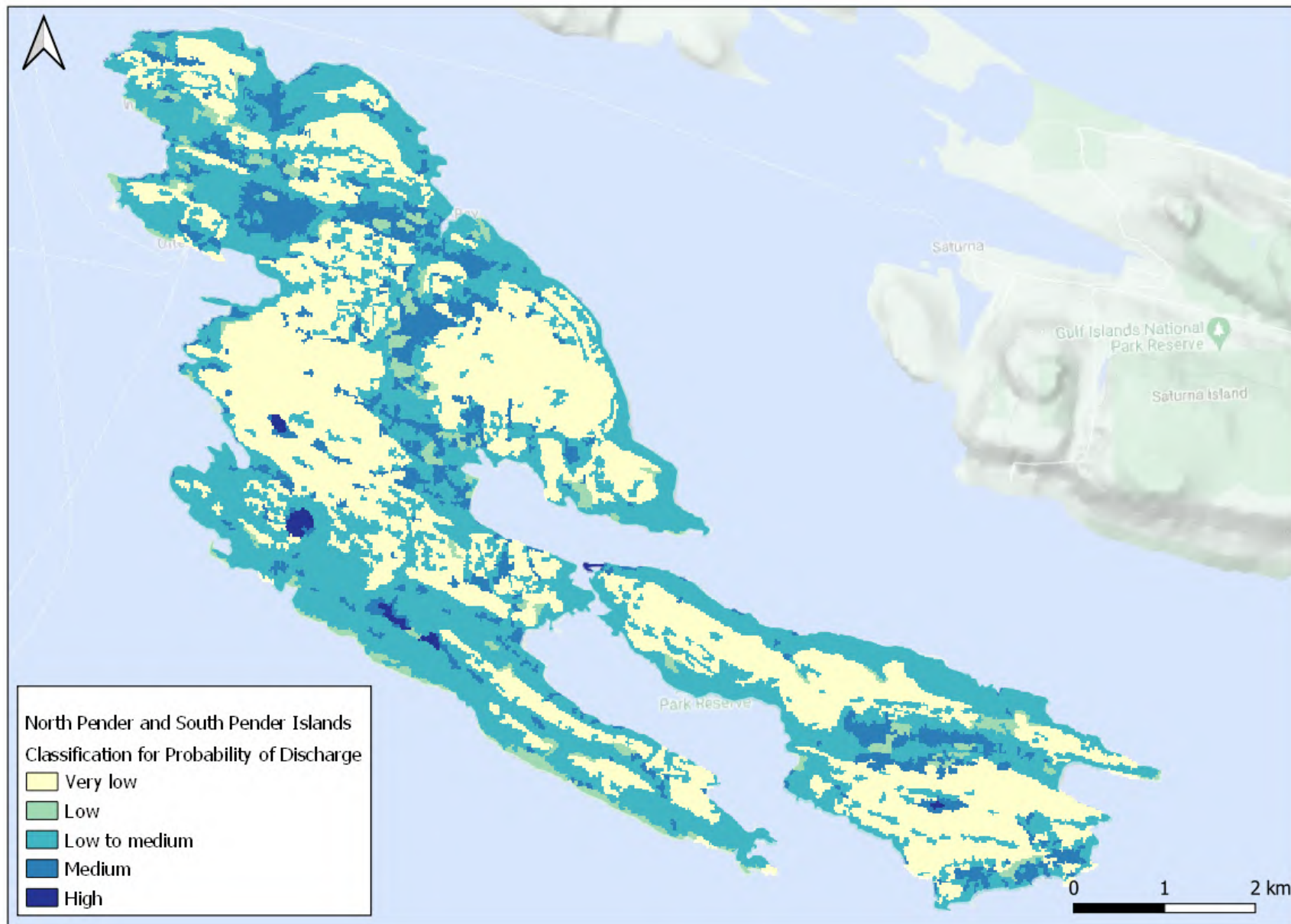


Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings.



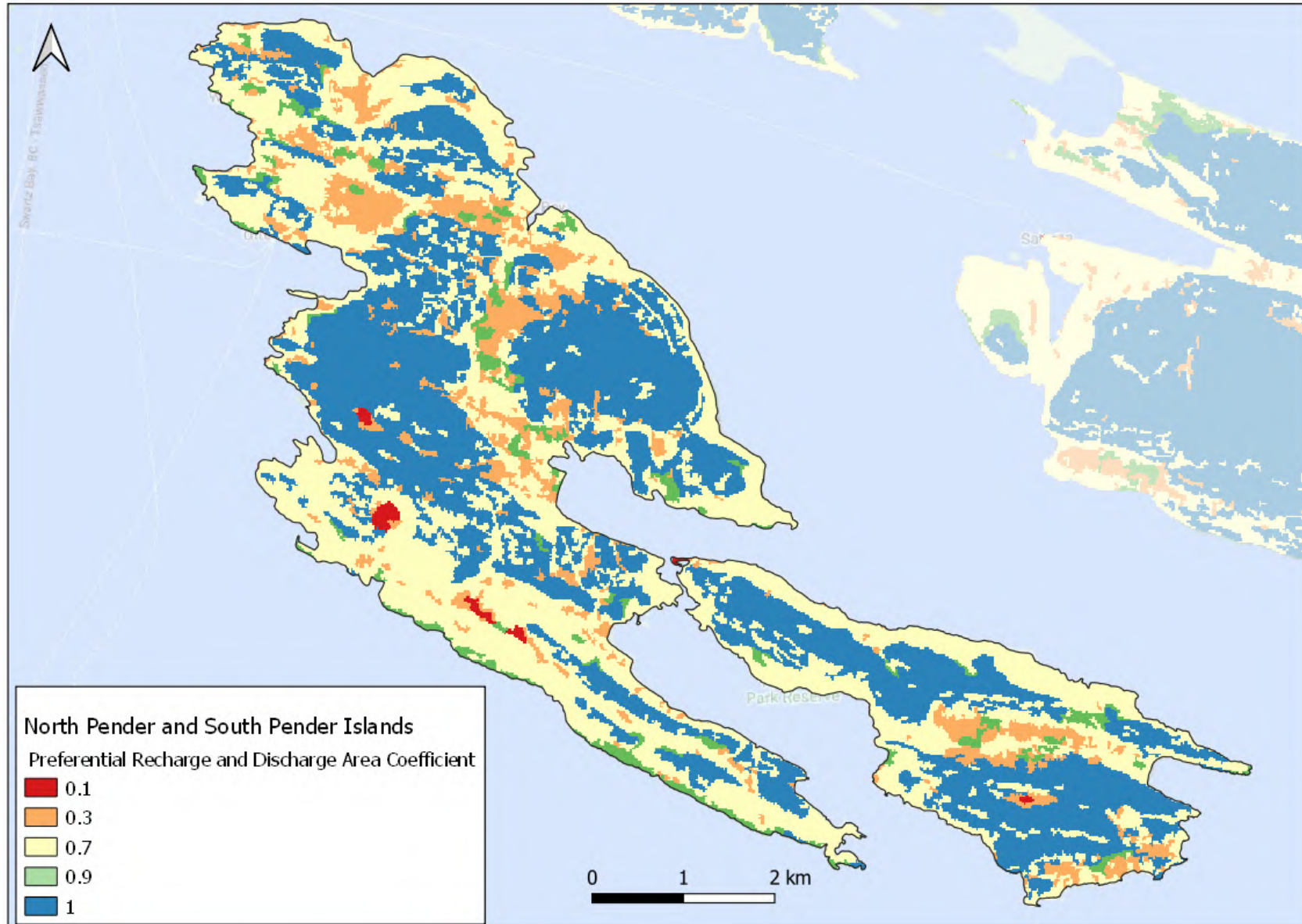


How much rain does not make it to the ground?



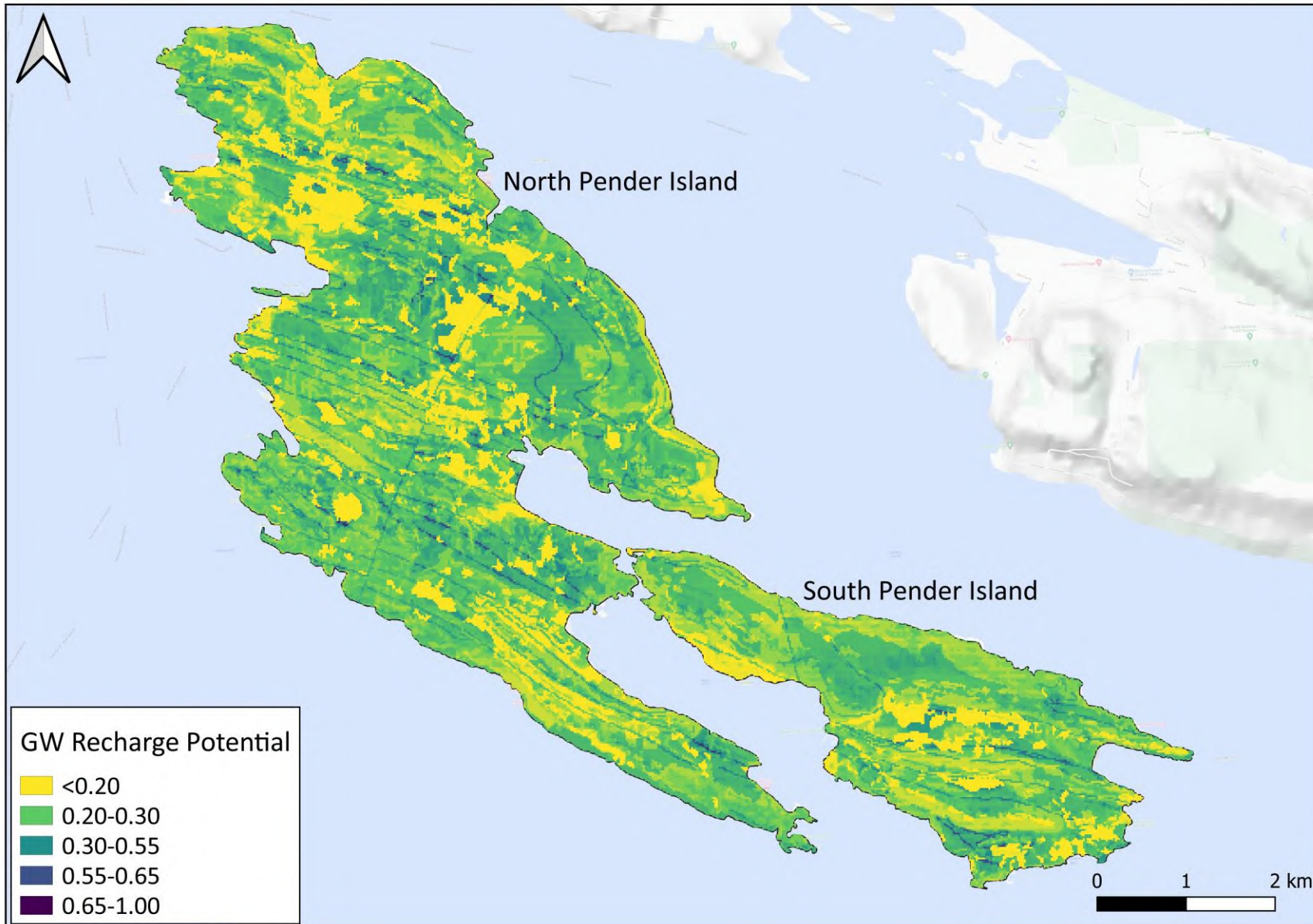
**Discharge Probability...**  
*The wet areas on the island*





Discharge/Recharge  
Coefficient





## Groundwater Recharge Potential



**GW SOLUTIONS**

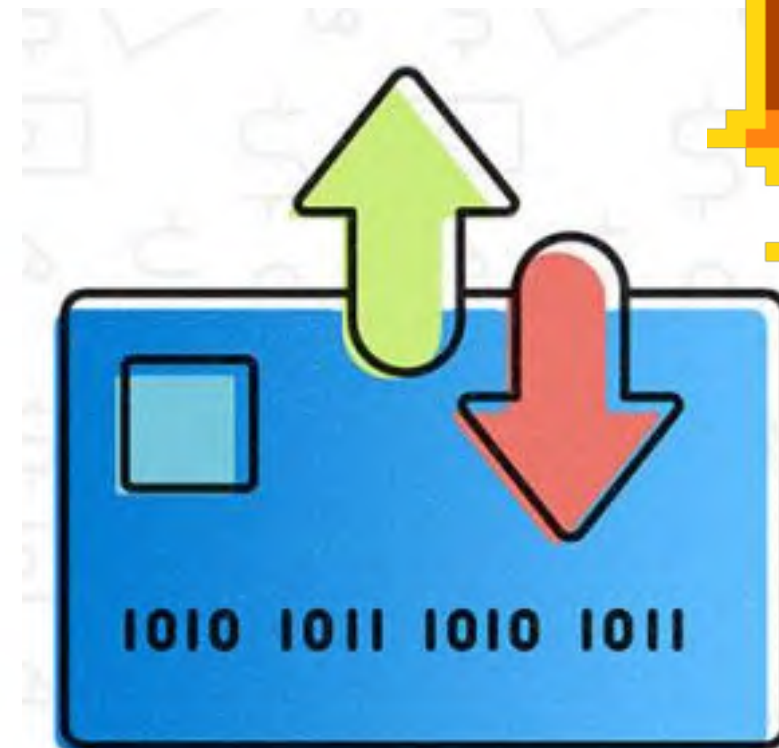
ASSESSMENT & PROTECTION OF GROUNDWATER

# SOUTHERN GULF ISLANDS REGIONAL GROUNDWATER AVAILABILITY PROJECT

Groundwater Sustainability Science Program

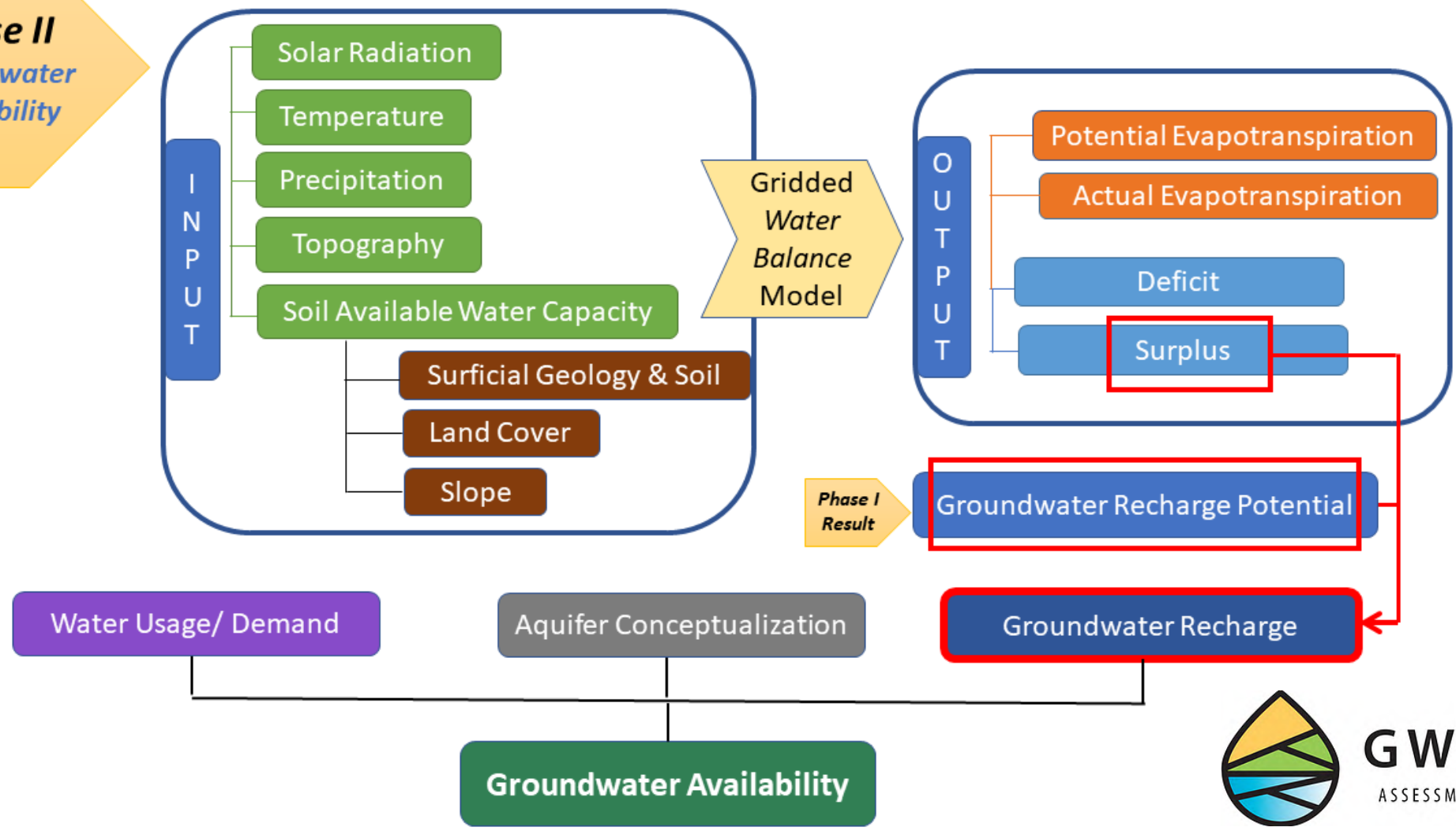


Islands Trust

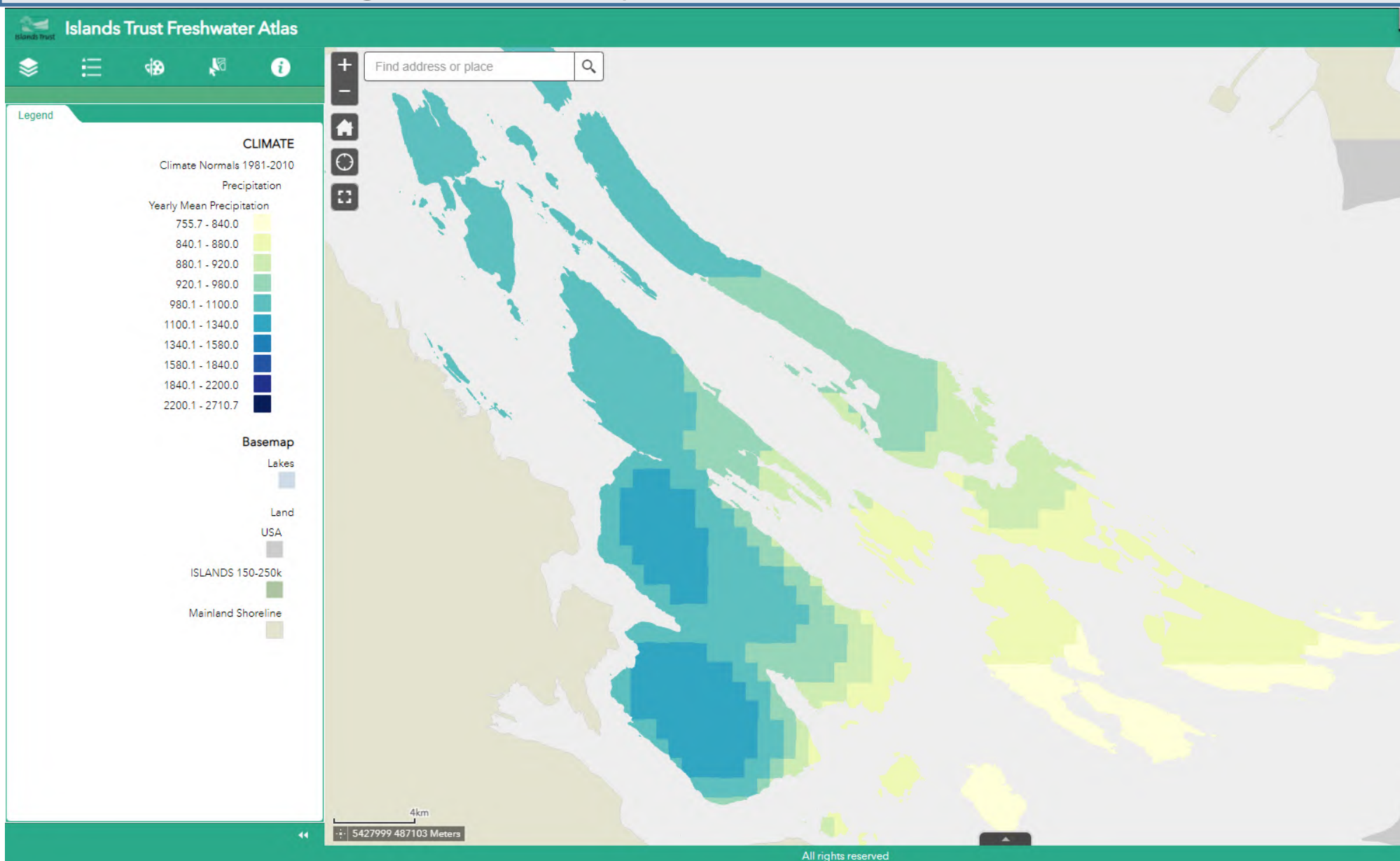




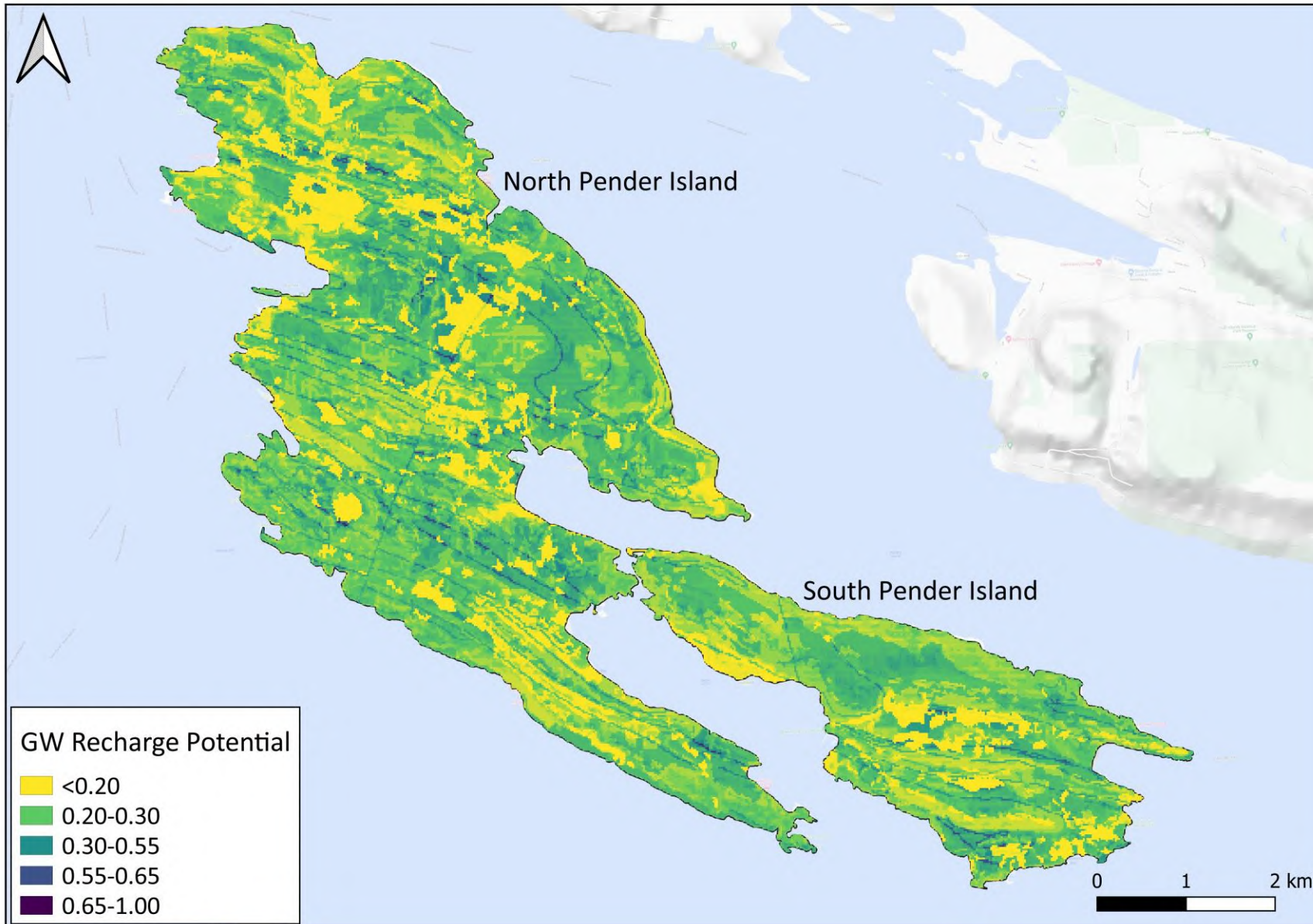
**Phase II**  
Groundwater  
Availability



**GW SOLUTIONS**  
ASSESSMENT & PROTECTION OF GROUNDWATER



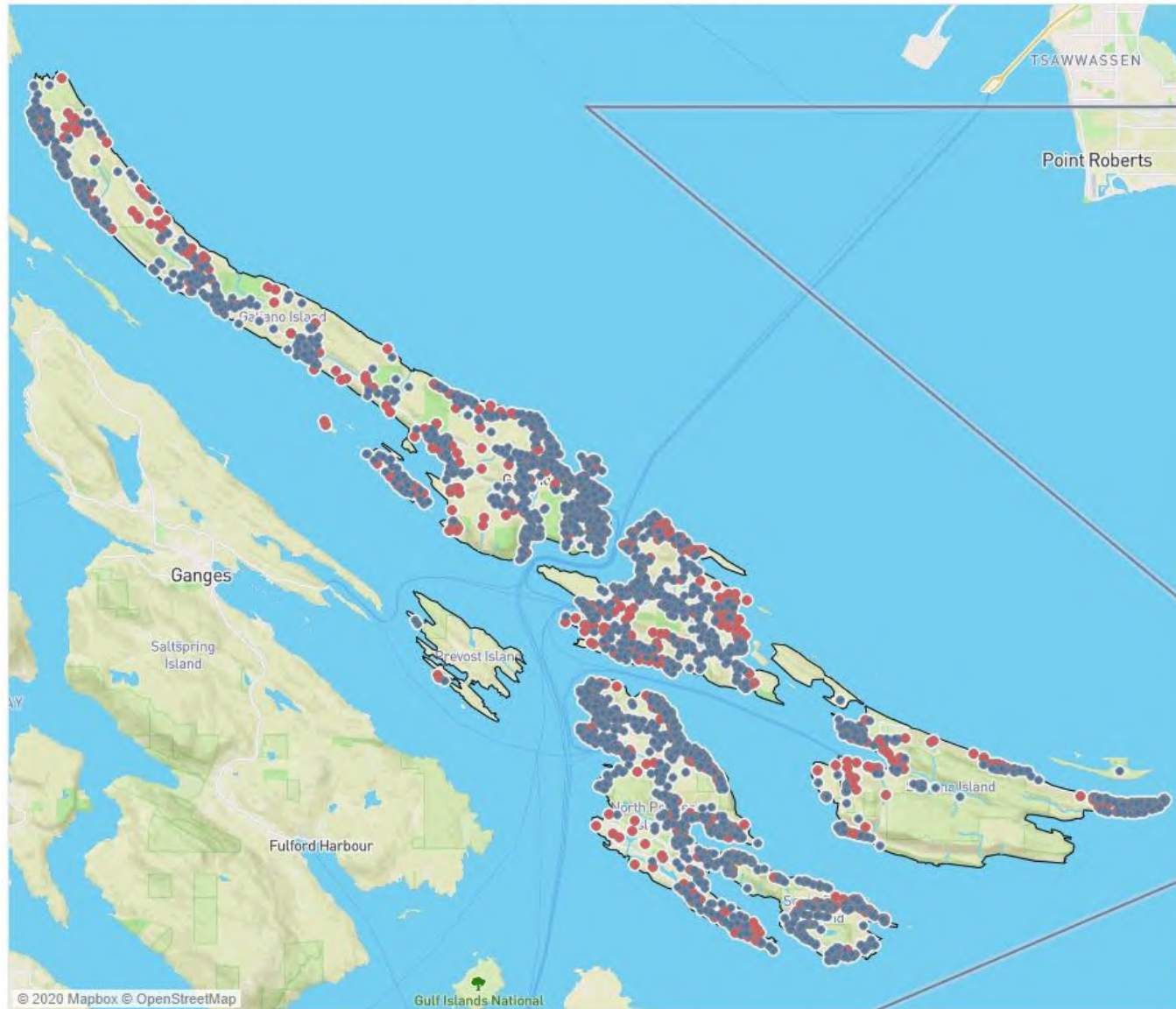
How much does it rain?



## Groundwater Recharge Potential

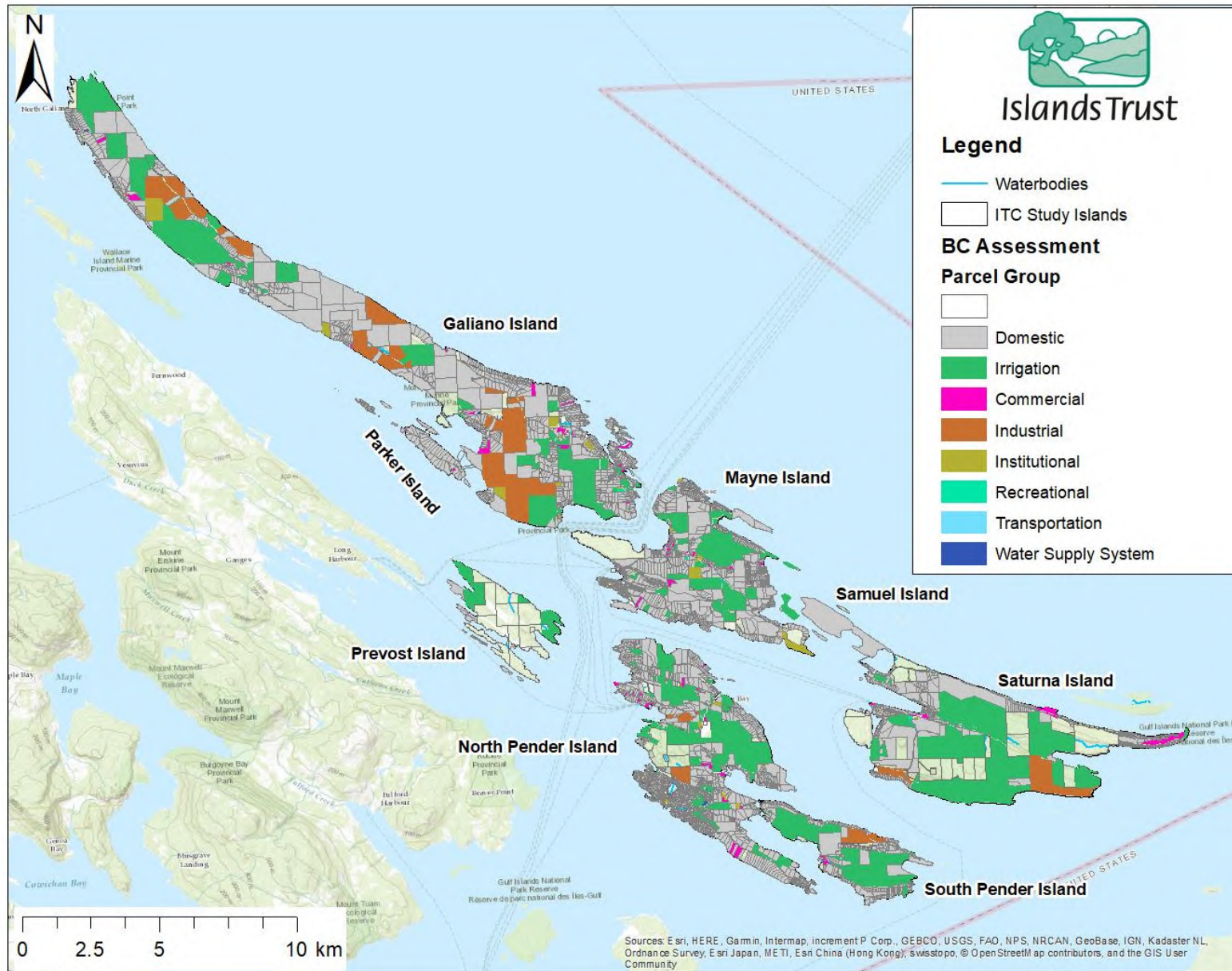


BC Well Database classified based on the use of water (Active and not active)



How much is used?

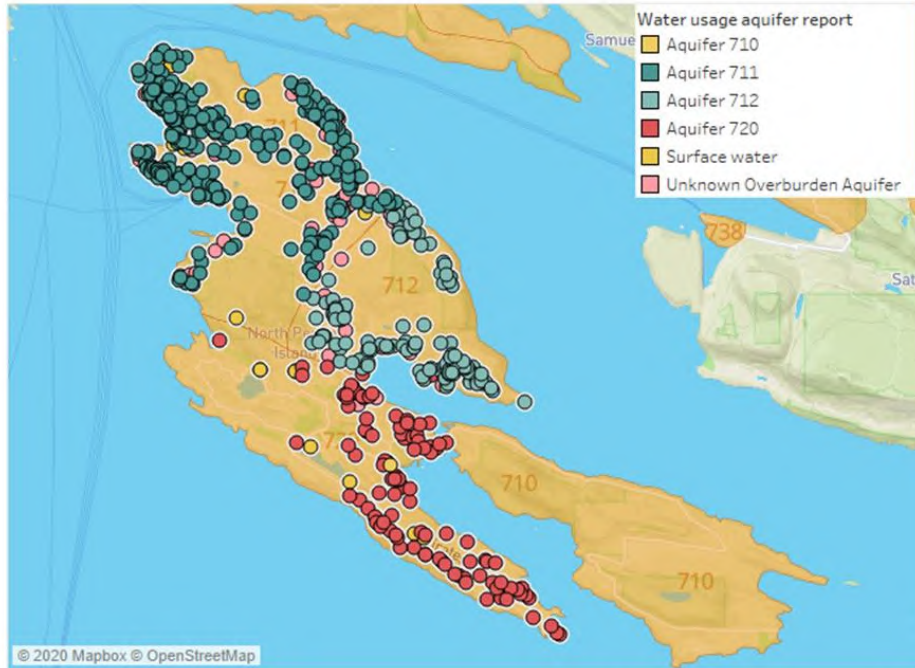




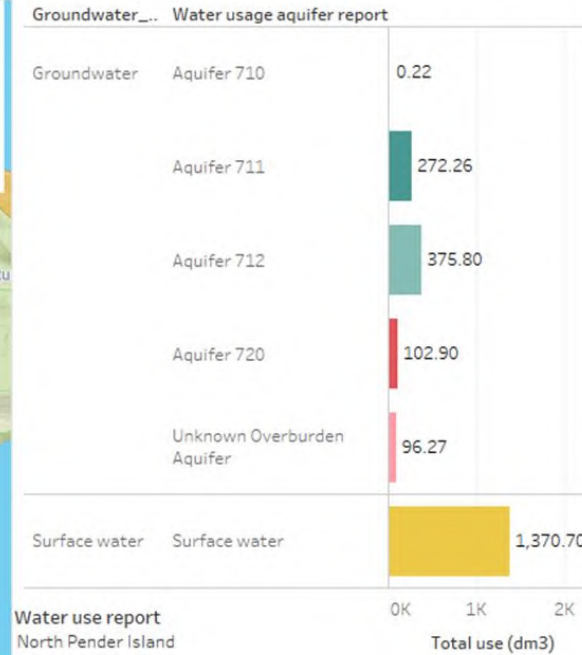
How much is used?



Water Usage for North Pender Island

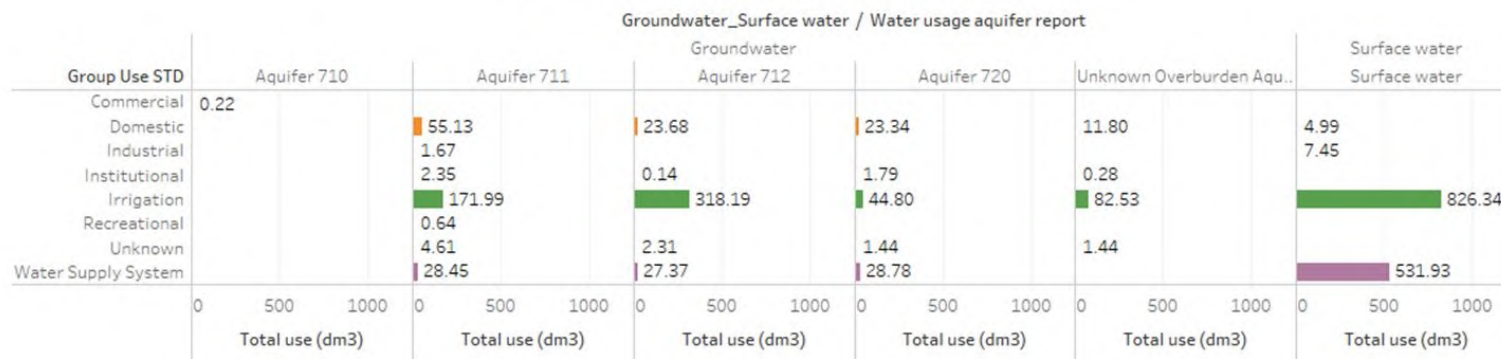


Total water usage by source and aquifer

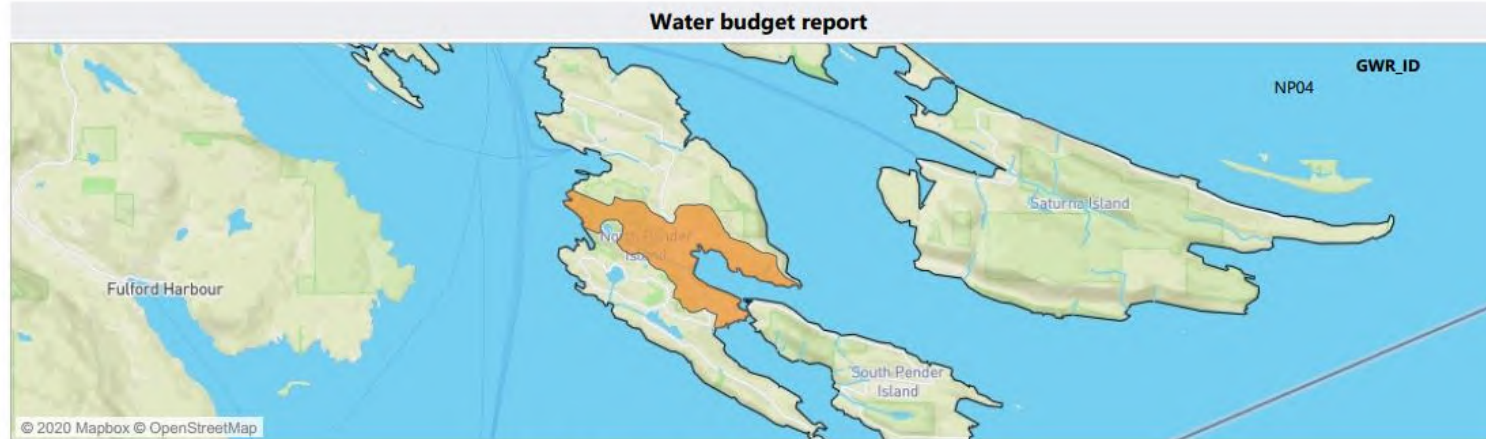


## Island Wide Groundwater Availability DATA DASHBOARD

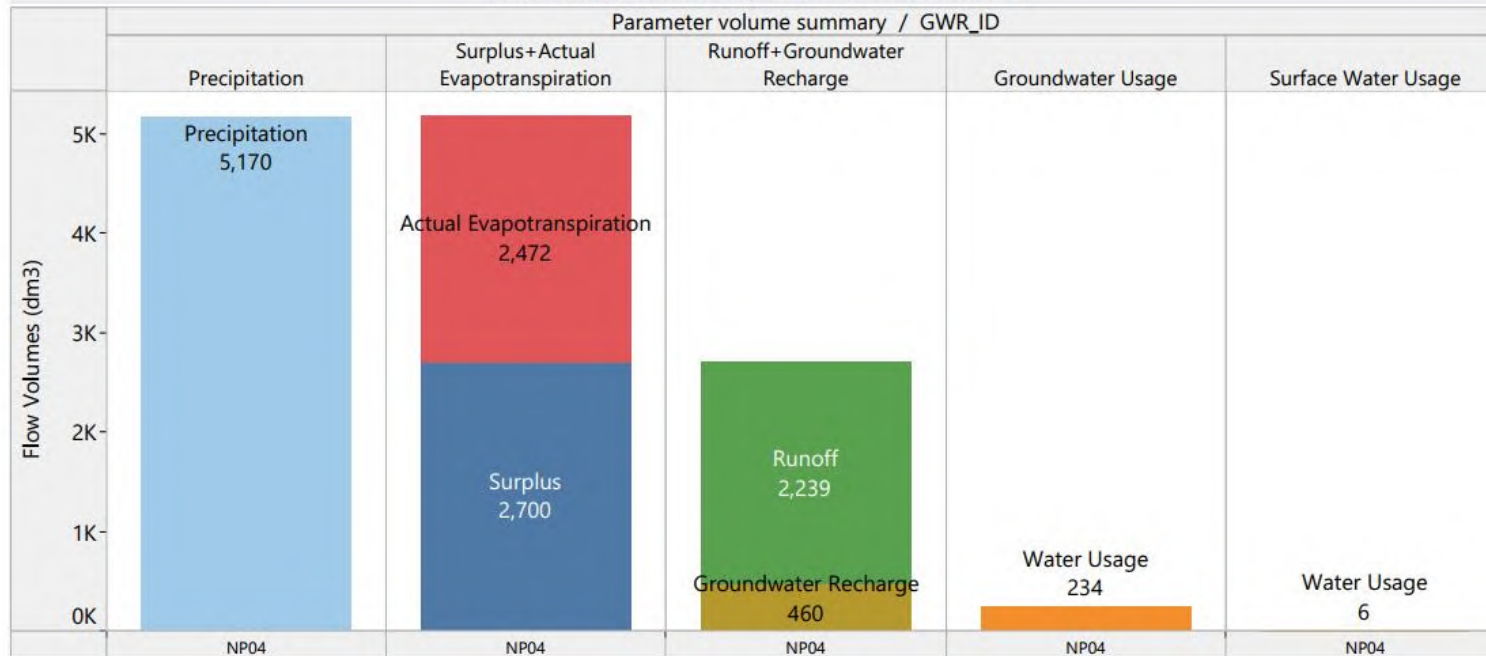
Total water usage by source and aquifer



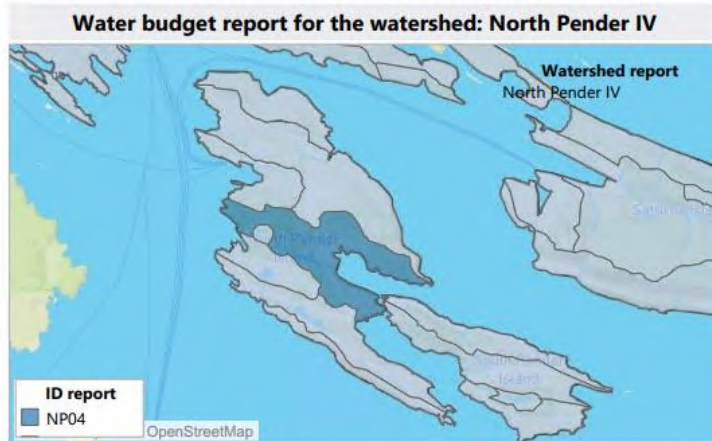




Annual flow volume report for North Pender IV



## Groundwater Region Annual Groundwater Availability DATA DASHBOARD



Water budget summary for North Pender IV watershed

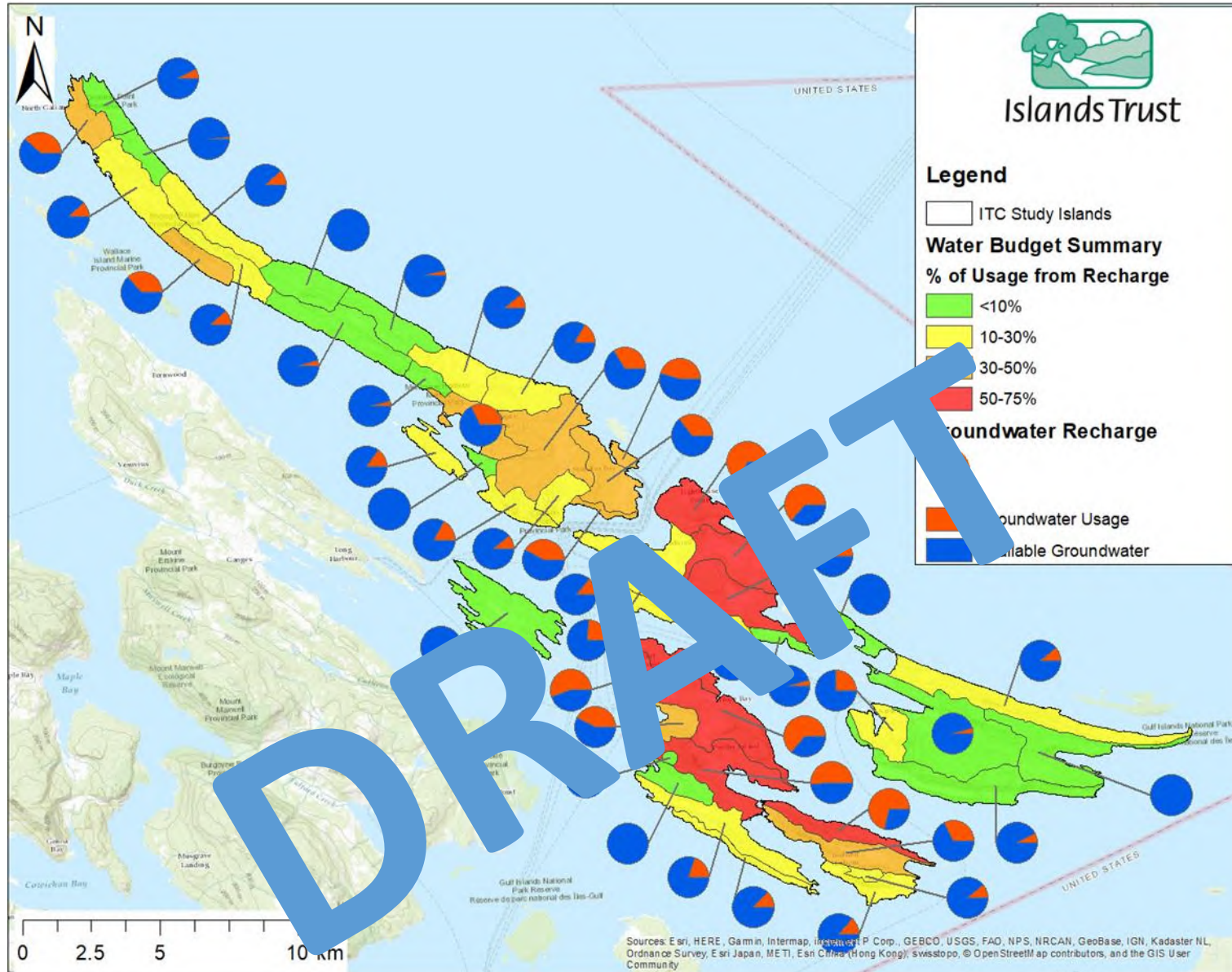


**Water demand by type of use in dm3**

Water use group	ID report / Month	NP04											
		January	February	March	April	May	June	July	August	September	October	November	December
Domestic	50	2.19	1.97	2.19	2.12	2.66	2.62	2.76	2.76	2.64	2.19	2.12	2.19
Industrial and Commercial	50	0.48	0.43	0.48	0.46	0.86	0.85	0.90	0.90	0.86	0.48	0.46	0.48
Irrigation	50	0.50	0.45	0.50	0.48	25.15	34.02	39.16	39.16	32.93	0.50	0.48	0.50
Unknown	50	0.07	0.06	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.07
Water Supply System	50	2.08	1.88	2.08	2.02	2.40	2.52	3.75	3.75	2.42	2.08	2.02	2.08

## Groundwater Region Monthly Groundwater Availability DATA DASHBOARD





## Regional Groundwater Availability

*Only the science and model  
Does not consider vulnerability  
Does not consider "Safe Yield"*



**GW SOLUTIONS**  
ASSESSMENT & PROTECTION OF GROUNDWATER



**ECOLOGY**

**GEOSCIENCE**

**SOCIAL SCIENCE**

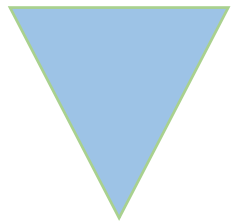
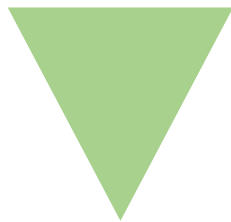
**ENGINEERING**

- Watershed Resiliency
- Sensitive Ecosystems
- Evapotranspiration
- Forestry Impacts
- Ecosystem Drift
- Precip. Interception
- Soil Moisture

- Aquifer Type
- Recharge Potential
- Climate Change
- Precipitation Distrib.
- Well Density
- Saltwater Intrusion
- Intrinsic Vulnerability

- Conservation
- Water Literacy
- Education
- Home Use Change
- Landscaping
- Gardening
- License Limits
- Coordination

- Efficiency
- Appliances
- Storage
- Leak Detection
- Rainwater
- Grey Water
- Stormwater Mgnt
- License Requirements

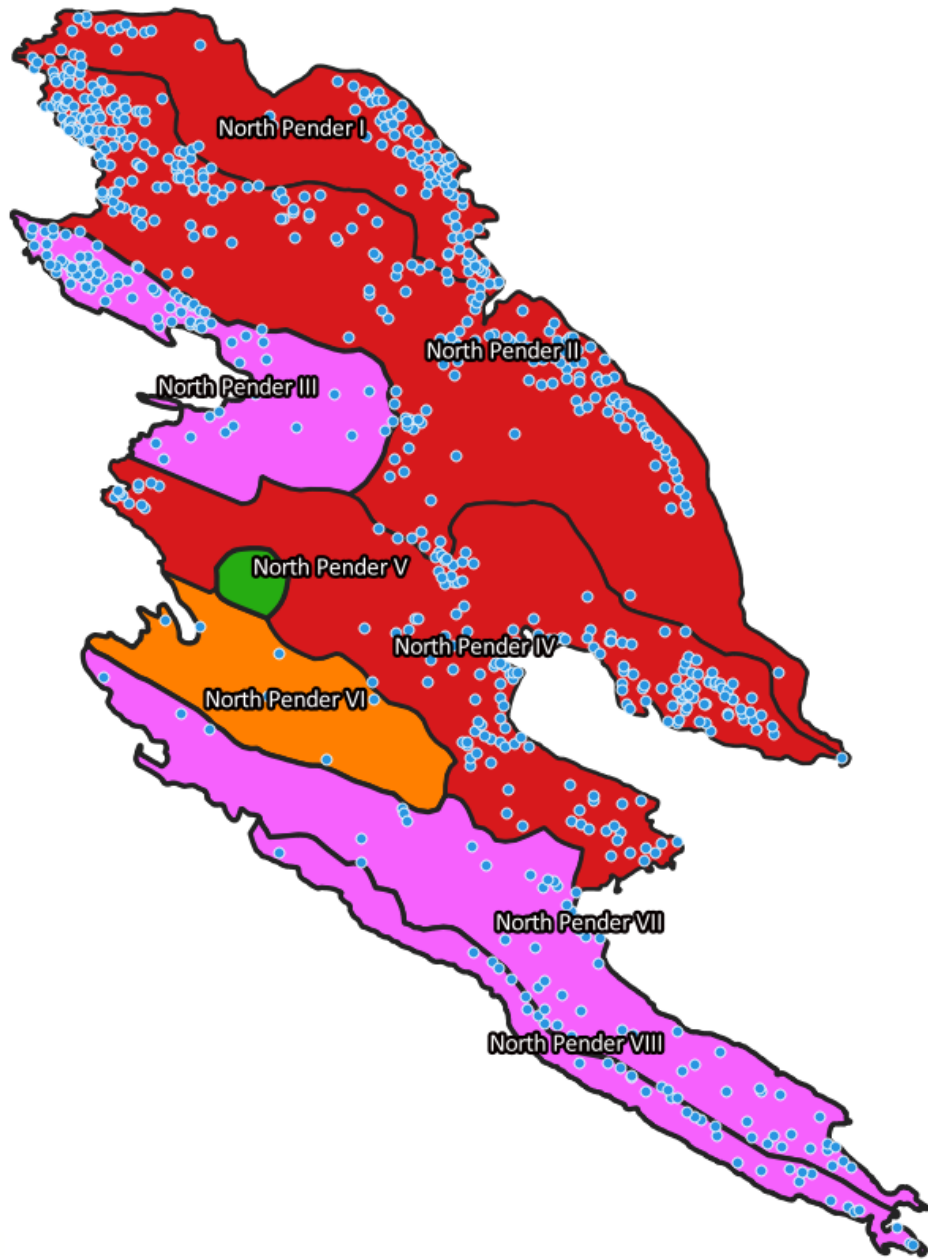


**PRODUCTIVITY**

**DEMAND**

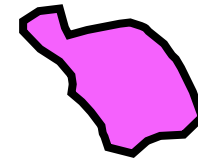


**GROUNDWATER REGION VULNERABILITY**



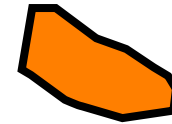
**CLASS I: HIGH VULNERABILITY**

Areas that are in critical need of attention where there is high confidence in existing data



**CLASS II: CRITICAL ASSESSMENT**

Areas where there is a potential for critical attention but some data uncertainty



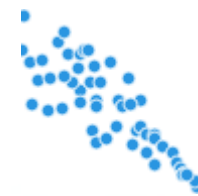
**CLASS III: SUSTAINING**

The level of attention needed is moderate based on existing use but could become critical if buildout or licensed potential is maximized.



**CLASS IV: NOT CRITICAL // UNDERDEVELOPED**

The level of attention needed is not critical. This includes protected areas and forest lots, or areas with limited development potential.

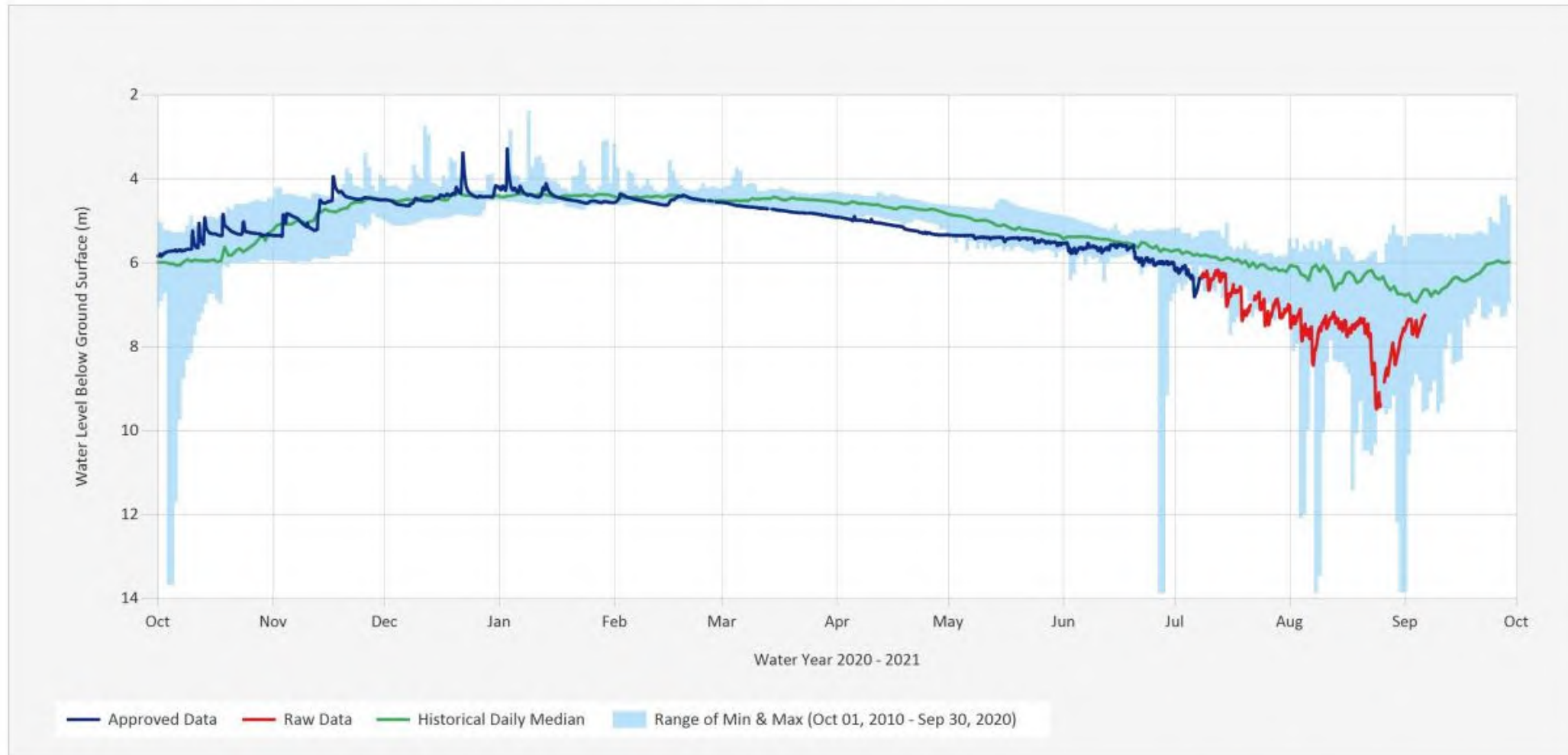


**GROUNDWATER WELLS**

From the BC GWELLS registry

Source Data: SGWL.Working@OW283

Location: OBS WELL 283 - PENDER ISLAND (PAISLEY ROAD), Latitude: 48.815025, Longitude: -123.314468, Elevation: : 0 m



The statistics (median/min/max) are based on the previous 10 years of available data prior to the current Water Year

Data last appended: September 6, 2021 08:00 UTC+00:00

The statistics (median/min/max) are only displayed for wells with at least two years of data

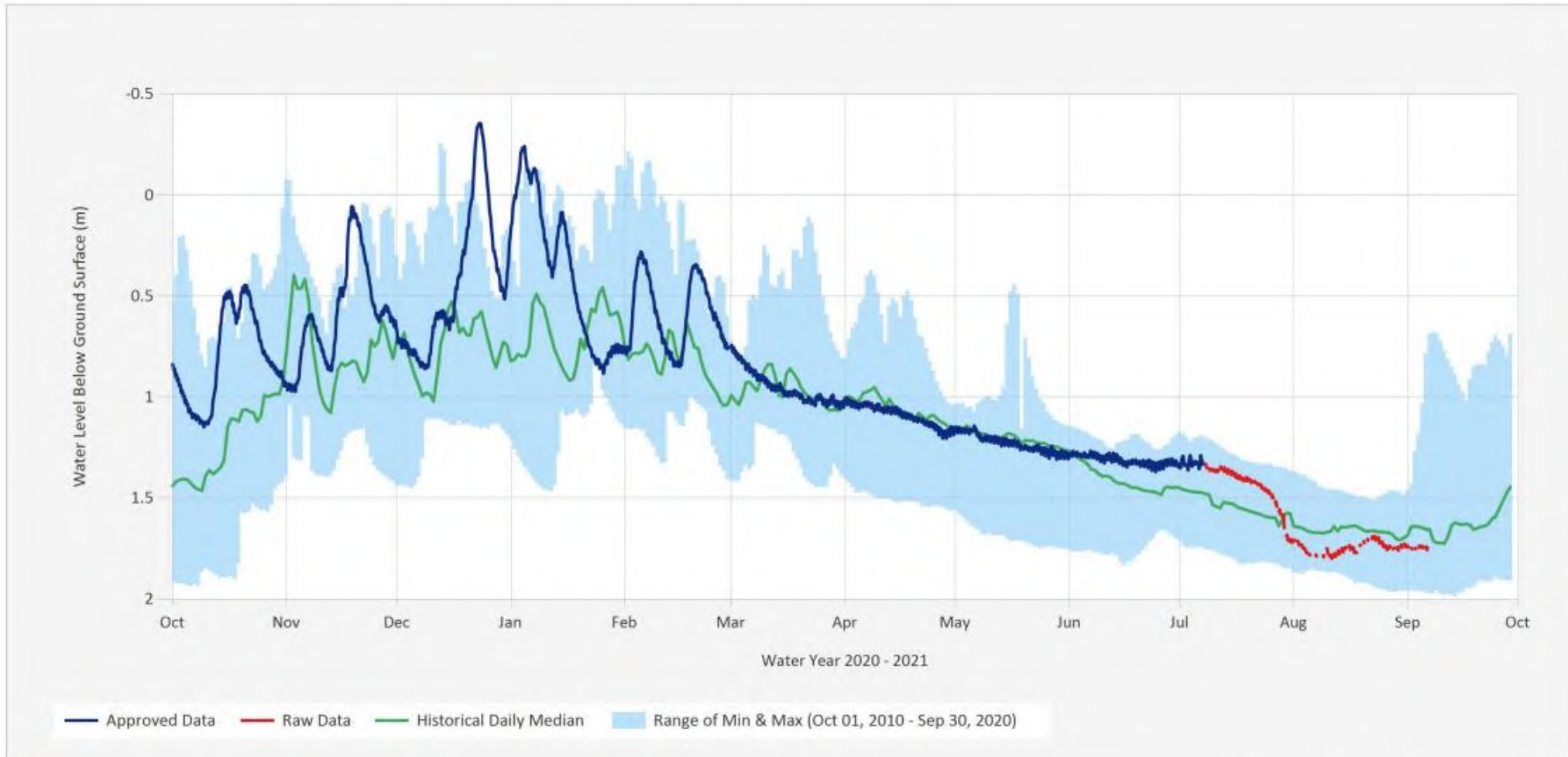
The Groundwater Level Statistics Chart is only available for Active Wells

Status: Active



Source Data: SGWLWorking@OW284

Location: OBS WELL 284 - PENDER ISLAND (PIRATES ROAD), Latitude: 48.748822, Longitude: -123.256864, Elevation: : 0 m



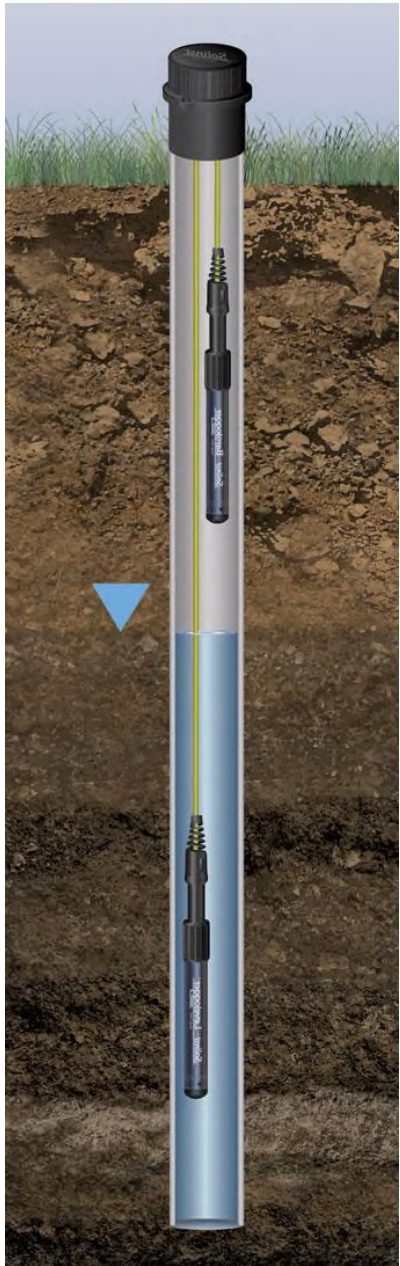
The statistics (median/min/max) are based on the previous 10 years of available data prior to the current Water Year

The statistics (median/min/max) are only displayed for wells with at least two years of data

The Groundwater Level Statistics Chart is only available for Active Wells

Data last appended: September 6, 2021 12:00 UTC+00:00

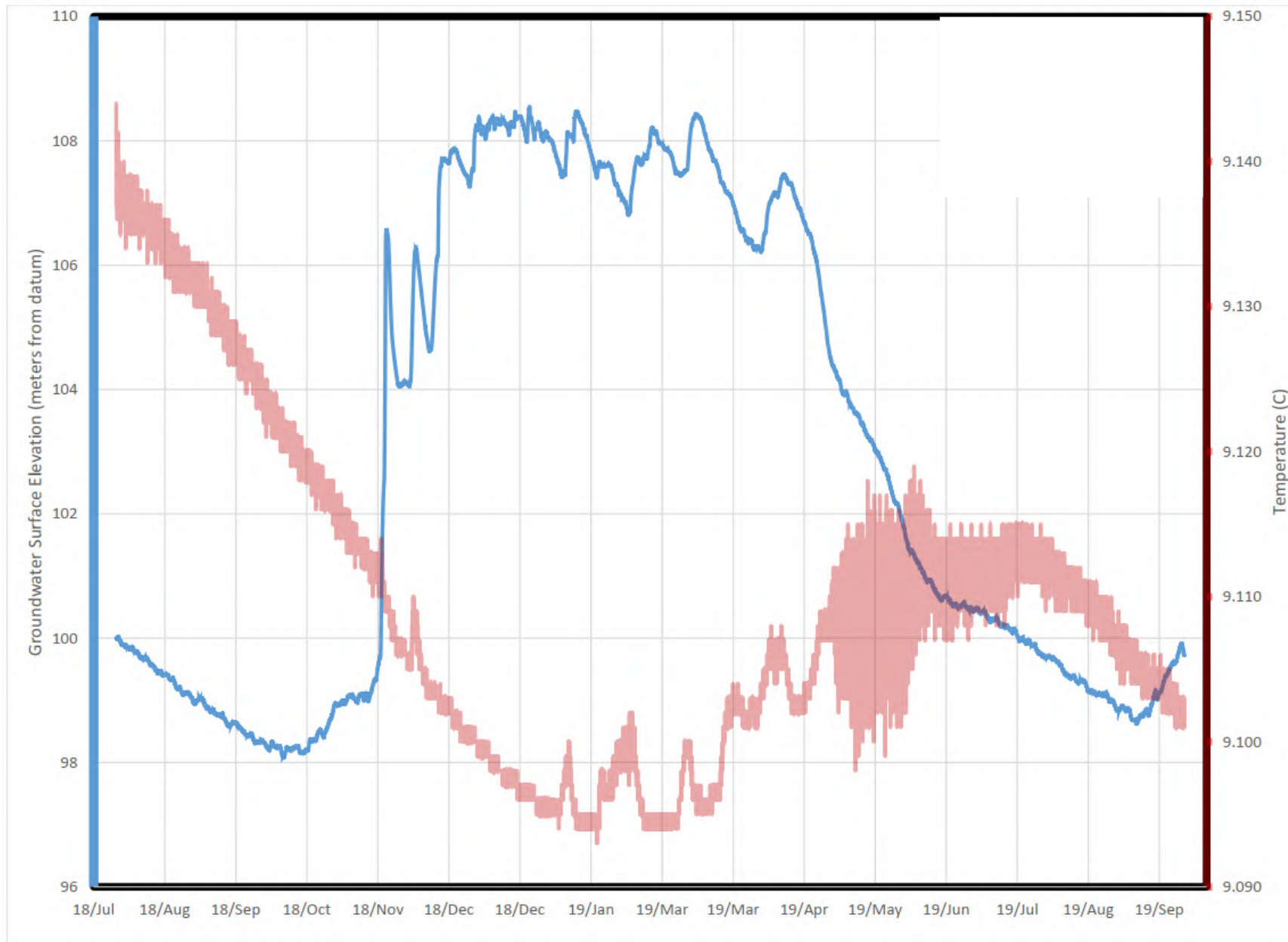
Status: Active





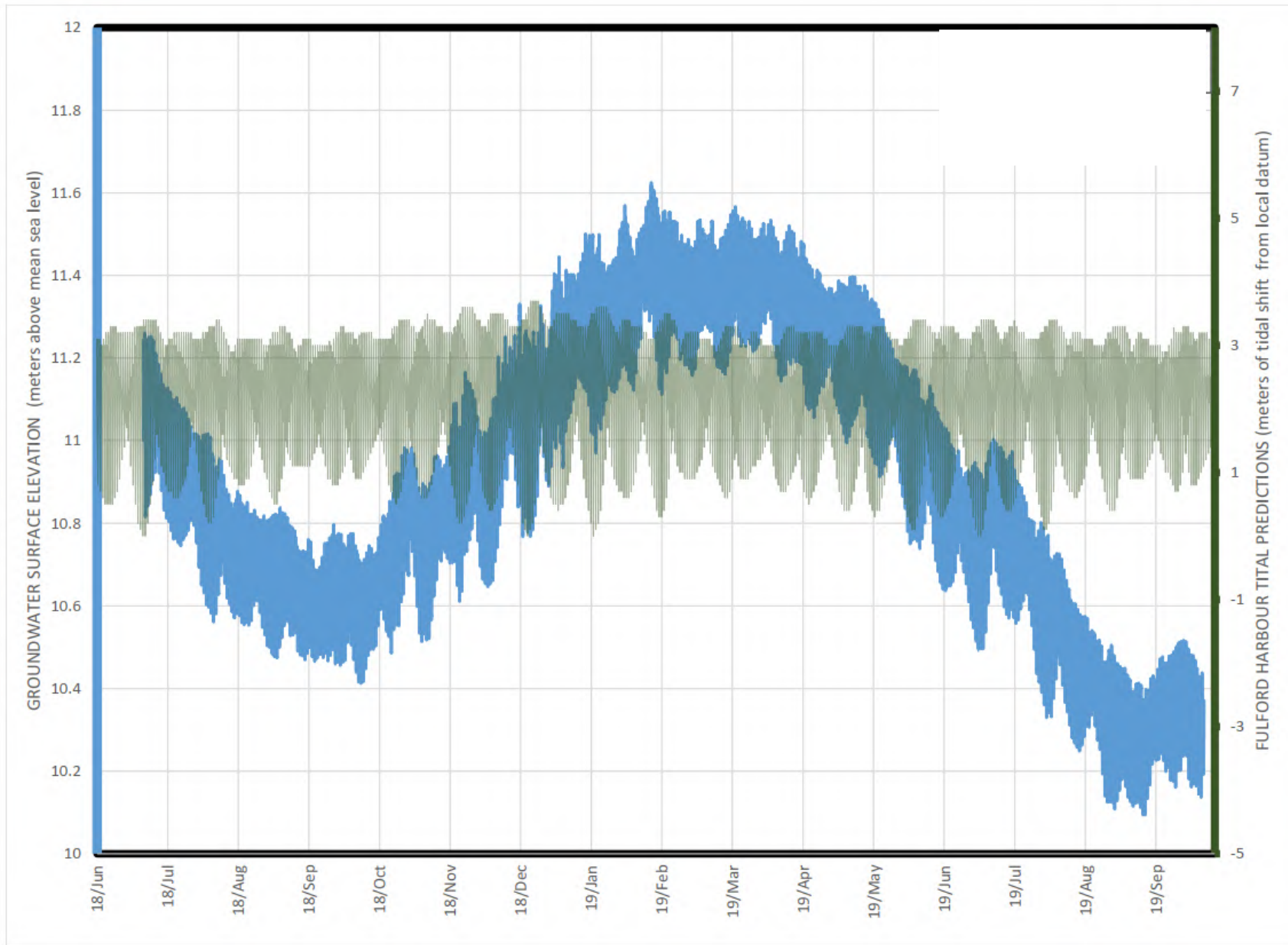






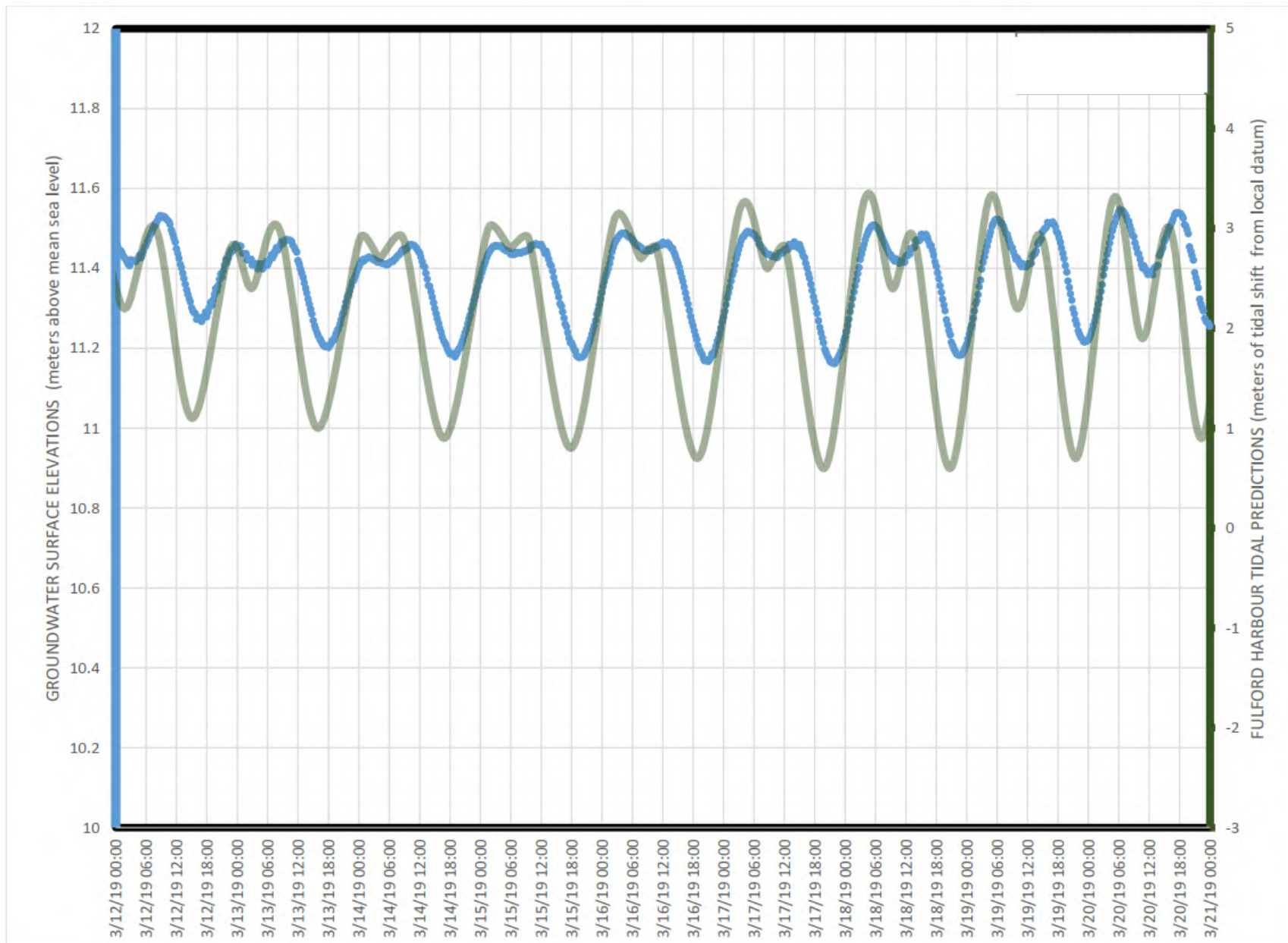
## Well Monitoring Example

Provides a long term view of seasonal groundwater recharge



## Well Monitoring Example

Provides homeowners, farmers, well operators, consultants, and community groups access to information about the health of their water well



## Well Monitoring Example

Can provide early warning of risk of saltwater intrusion and can observe direct connection to the ocean



# NORTH PENDER ISLAND GROUNDWATER SUSTAINABILITY IMPLEMENTATION PROJECT

Groundwater Sustainability Science Program

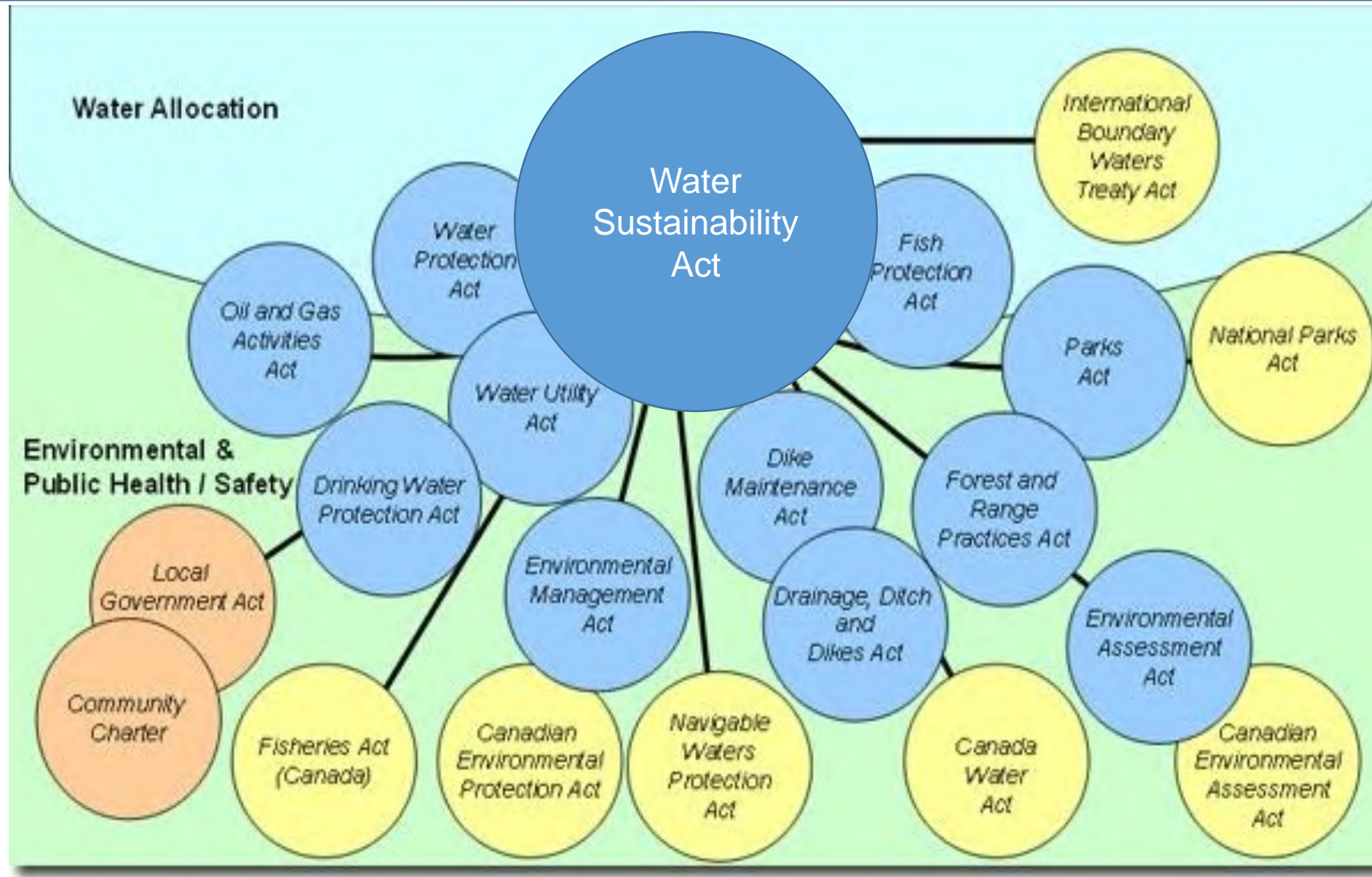


# FRESHWATER SUSTAINABILITY STRATEGY

Focusses on:

- Supporting the Groundwater Sustainability Science Program
- Understanding Indigenous Values
- Encouraging the connection between the science and planning
- Supporting research related to understanding ecosystem needs
- Supporting rainwater use and greywater recycling
- Development of a communication and outreach program
- Development of a monitoring and reporting program







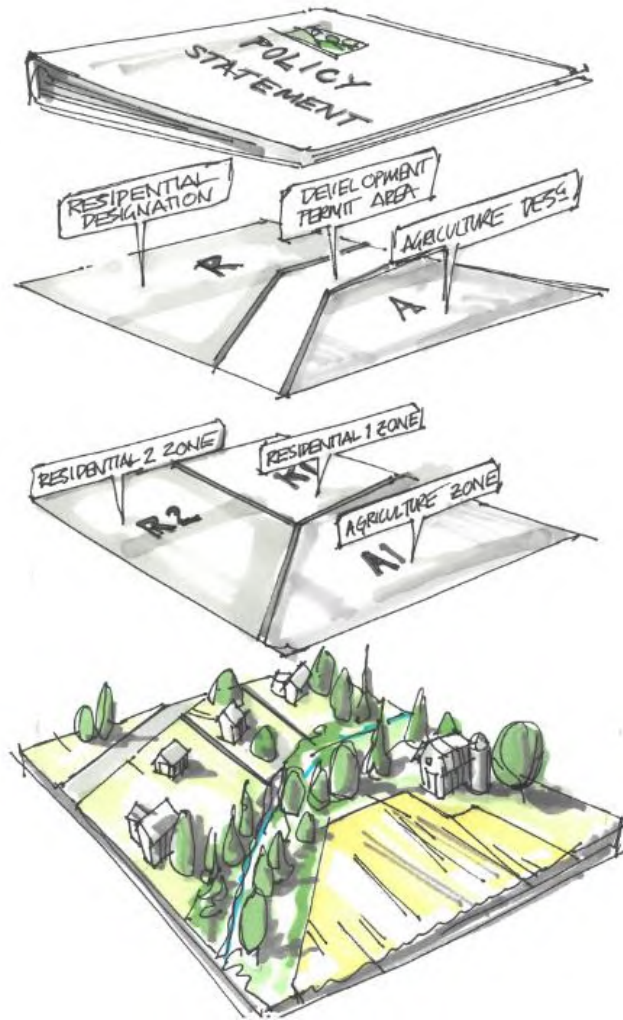


As of February 29, 2016  
Non-domestic groundwater use  
requires licensed authorization  
from the Province.

Existing groundwater users have  
until March 2022 to secure their  
First in Time, First in Right (FITFIR)  
water rights.

**Register your water right.**

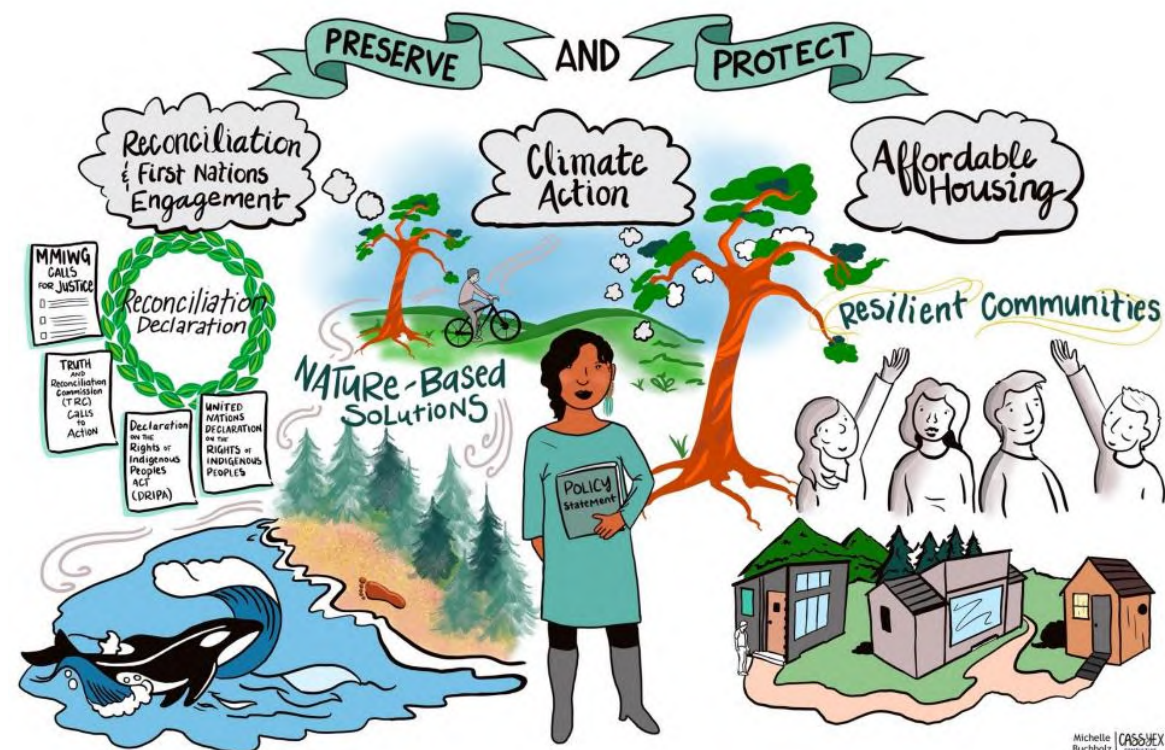
# ISLANDS TRUST TOOLS AND PROCESSES



- Islands Trust Object
- Policy Statement
- Galiano Official Community Plan
- Galiano Land Use Bylaw
- Community Education
- Coordination
- Science, Research, and Monitoring

# TRUST POLICY STATEMENT

- The Islands 2050 community engagement process identified that many island residents are concerned about freshwater resources.
- Freshwater sustainability will be supported by the Trust Policy Statement.





# NORTH PENDER OFFICIAL COMMUNITY PLAN

## Existing Policies:

- Address watershed health and the protection of groundwater supply
- Encourage the water collection and water storage, water conservation
- Acknowledge the need to consider quality and quantity of water and impacts to streams with rezoning and subdivision
- Encourage new builds to incorporate water conservation measures, including rainwater catchment systems

# NORTH PENDER OFFICIAL COMMUNITY PLAN

## Options and Opportunities:

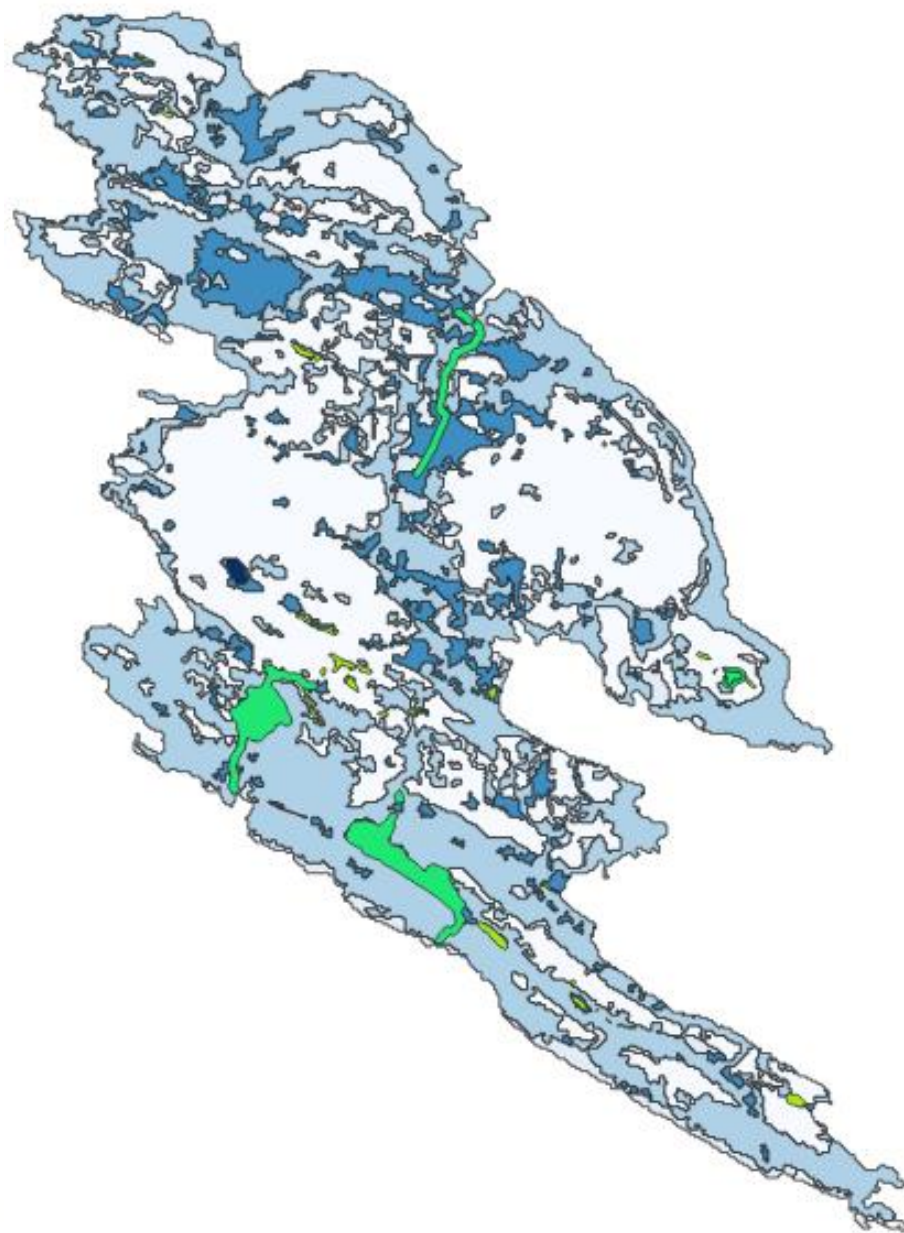
- Include a map of groundwater regions
- Update relevant sections of the OCP to include reference to groundwater regions, recharge potential, water balance, and related data
- Update policies related to subdivision regulations
- Add policies related to groundwater sustainability for each land use designation
- Add policies supporting required rainwater catchment for non-potable outdoor uses in critical areas
- Consider indigenous knowledge and cultural and spiritual value of water.
- Consider development permit areas to address groundwater management and Coastal Douglas-fir preservation in areas where the likelihood of vulnerability is critical to groundwater resources
- Update advocacy policies based on recommendations from the Islands Trust Freshwater Sustainability
- Develop groundwater sustainability analysis criteria for rezoning

# NORTH PENDER LAND USE BYLAW

## Options and Opportunities:

- Create groundwater protection zones for critical areas (Class 1, some areas in Class 2 and 3)
- Change zoning in some critical areas to reduce or transfer current density or development potential (focus on Class 1).
- Create zoning regulations that limit existing uses, place restrictions on size and siting (e.g. setbacks for wells, setbacks from community water system wells)
- Create potable water requirements as a condition of certain uses and/or increases in density
- Limit impermeable surfaces
- Develop rainwater capture and cistern regulations
- Update subdivision servicing regulations related to potable water requirements, cistern requirements, stormwater management, and wastewater requirements. Address potential multi-unit residential development
- Require non-potable rainwater capture for building permits for new construction in critical areas
- Require non-potable rainwater capture and storage system as a condition of building permit if the building is to contain a secondary suite





DPA10 - Riparian\_and\_Aquatic

DPA4 - Wetland

DPA3 - Riparian

Discharge Potential

0 - 0.1

0.1 - 0.2

0.2 - 0.3

0.3 - 0.4

0.4 - 0.5

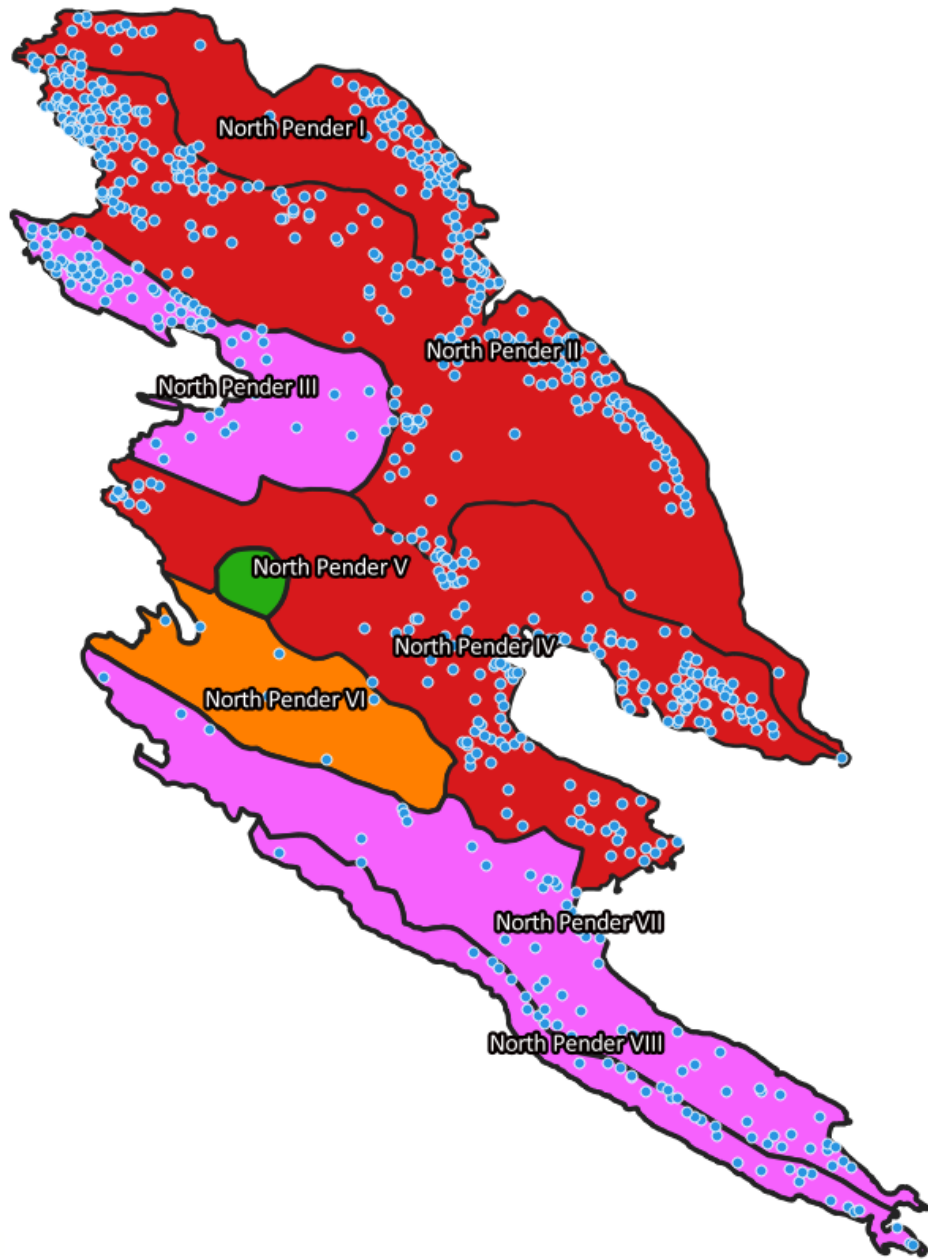
0.5 - 0.6

0.6 - 0.7

0.7 - 0.8

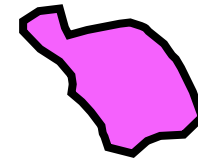
0.8 - 0.9

0.9 - 1



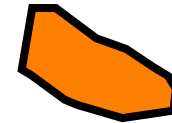
**CLASS I: HIGH VULNERABILITY**

Areas that are in critical need of attention where there is high confidence in existing data



**CLASS II: CRITICAL ASSESSMENT**

Areas where there is a potential for critical attention but some data uncertainty



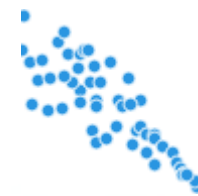
**CLASS III: SUSTAINING**

The level of attention needed is moderate based on existing use but could become critical if buildout or licensed potential is maximized.



**CLASS IV: NOT CRITICAL // UNDERDEVELOPED**

The level of attention needed is not critical. This includes protected areas and forest lots, or areas with limited development potential.



**GROUNDWATER WELLS**

From the BC GWELLS registry

## WHERE DOES ALL THAT WATER GO?

5%



10%

14%



20%



22%



27%

Source: Regional District of Nanaimo

## Be a water saver!

## In the home – reduce, repair, retrofit

Our daily activities affect our groundwater.

**Toilets**

Use low-flush toilets.

**Showers and baths**

Use low-flow showerheads and take short showers.

**Laundry**

Use high efficiency machines – you could use up to 50% less water. Do full loads.

**Check for leaks**

Fix leaky faucets, showerheads, toilets and irrigation systems – you could save thousands of litres of water a month.

**Kitchen**

Use a basin to wash and rinse dishes and vegetables/fruit and dispose of the water on plants. Don't run the water constantly while washing dishes. Use high efficiency dishwashers.

**Cleaning**

Use a pail rather than running water.

## Consider alternative technologies for efficient water use at home.



**Well monitors** tell you if you're using more water than you have by measuring the amount and rate of flow of water into your well, and how much you are pumping out. Well monitors help you see the trend of how much water is in your well and how the static level changes over time. It is an early warning signal of critical low water levels.



**Well pump timers**, when used with a cistern, let you set pump intervals to slowly draw water out of your well at pre-set times and store it in a cistern. This water stored in a cistern can be used on-demand. These devices help people with low-producing wells by maximizing the amount of water from a well, without overdrawing it.



**Rainwater harvesting** is a way to collect and use water for your plants, outdoor cleaning, and even for household use and drinking. Learn more about rainwater harvesting at [rdn.bc.ca/events/attachments/evID6235evattID1344.pdf](http://rdn.bc.ca/events/attachments/evID6235evattID1344.pdf)



**Greywater recycling systems** can relieve demand on your well, cistern and septic system. Use a two-pipe system to collect water from your sinks, laundry, showers and bathtubs for re-use at home. Contact your local building inspector, health authority and a qualified plumber for more information.



**Composting toilets** may be acceptable as an "alternative solution" in some cases if the toilet and greywater treatment comply with provincial regulations. Please contact your local health authority before considering this option.



# NEXT STEPS

- **Community engagement on groundwater science projects**
- **Analysis and reporting on options for bylaw amendments**
- **Community, First Nations, and agency consultation**
- **Recommendations on potential amendments**
- **Legislative process to amend bylaws**

# Water

it's more than a symbol or a metaphor.

WE ARE INTERCONNECTED WITH LAND, AIR & WATER.

WE HEAR IT IN THE WORDS AND STORIES OF OUR GRANDPARENTS

IT IS OUR GROCERY STORE, OUR PHARMACY, OUR SCHOOLS AND OUR TRANSPORT AND OUR SACRED PLACES.

THIS IS 10,000 YEARS OF KNOWING.

OUR CREEKS AND RIVERS ALLOW US TO HAVE SPIRITUAL BATHS...

TO HEAL OURSELVES.

WE COME FROM THE WATER...

WE NEED A BRIDGE OF UNDERSTANDING THAT INCLUDES OUR SACRED RELATIONSHIP.

WE GET TO REST, BUT THE WATER IS ALWAYS AT WORK.

IT'S NOT A RESOURCE... IT IS A RELATIONSHIP.



IT TEACHES ABOUT PATIENCE, RESPECT, DEATH AND BIRTH

RIVERS ARE THE VEINS OF MOTHER EARTH.

EDUCATING ABOUT THE PAST AND PRESENT... FOR THE FUTURE!  
IT IS ALIVE. & HAS A SPIRIT.



THERE ARE IMPACTS AT EVERY SCALE.