May 13th 2025

Sustainable Groundwater for Rural Communities: Upper Hammonds Plains

Sustainable Communities Challenge Fund

COASTAL HYDROLOGY LAB · DALHOUSIE UNIVERSITY ·

Sustainable Groundwater for Rural Communities

About

- Dr. Barret Kurylyk, Dalhousie Coastal Hydrology Lab: Sian Borden-Outreach Coordinator

- Centre for Water Resources Studies in the Department of Civil & Resource Engineering at Dalhousie University

- This project is supported by the Sustainable Communities Challenge Fund (SCCF), delivered by the Nova Scotia Federation of Municipalities on behalf of the Province of Nova Scotia.

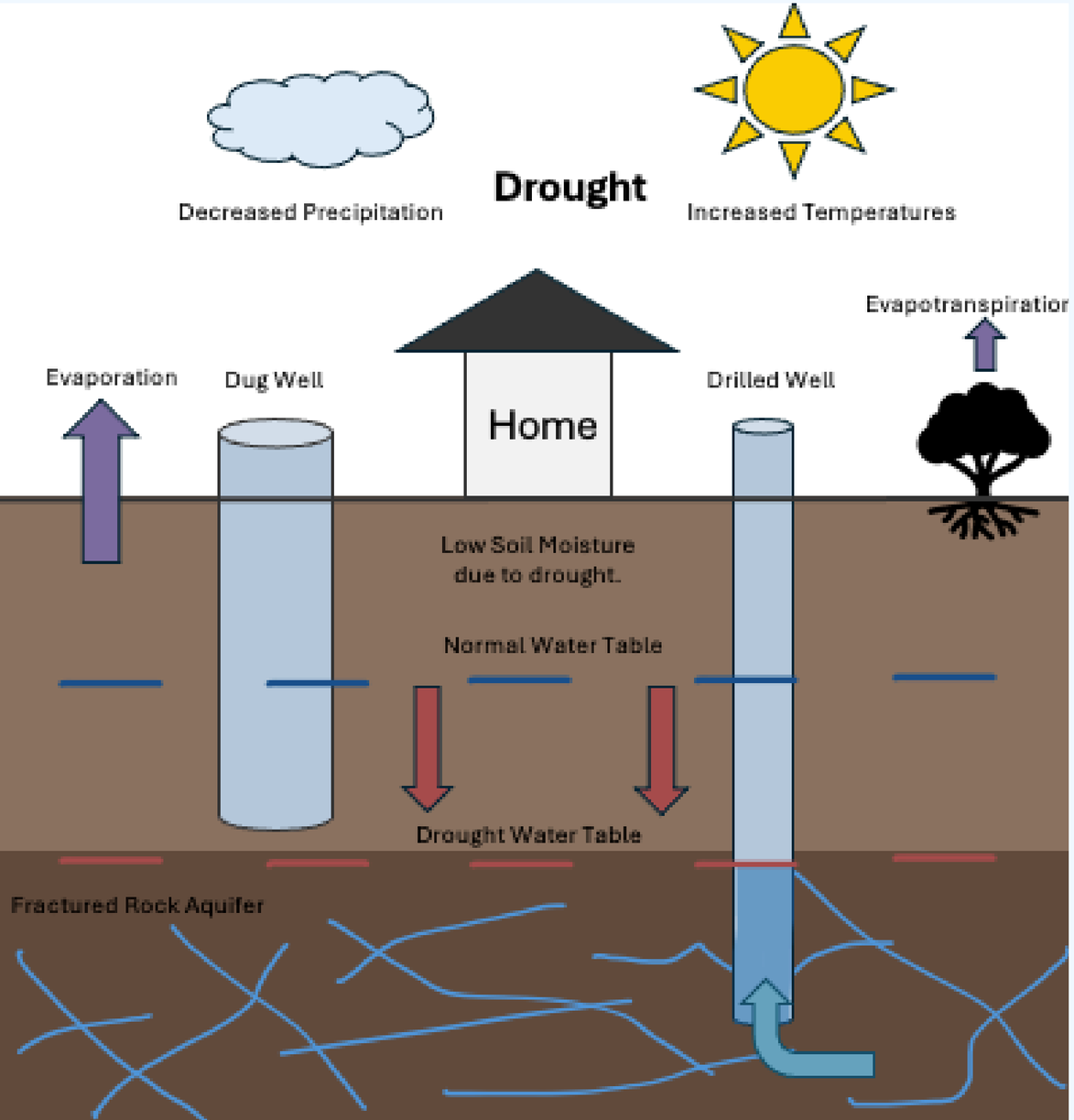
SCCF Project

- Climate Change Impacts on Community Groundwater Resources in Nova Scotia
- Partnered with Rural Water Watch and communities across the province.
- Project goal: to **model** the impact of **future climate change** on **groundwater recharge** and to develop **coastal risk maps** and **adaptation plans** for groundwater salinisation and onsite wastewater treatment system inundation.

Groundwater in Nova Scotia

Fieldwork in Basin Head, PEI, Nov ‘23

Groundwater in Nova Scotia



SOURCE OF DRINKING WATER

Nearly half of Nova Scotians rely on groundwater for their primary water supply.

CLIMATE CHANGE

In coastal areas, **seawater intrusion** from the ocean can threaten access to clean and safe drinking water. **Droughts** can cause wells to run dry.

CONTAMINANTS

Contaminants from natural and human sources threaten the availability and quality of groundwater.

Public VS Private Water Supply

PUBLIC WATER SUPPLY

- Managed by the municipal government
- Mandatory and regular testing of water quality

PRIVATE WATER SUPPLY

- Managed by an individual well owner
- No required testing of water quality
- Testing is highly recommend
  - For bacteria: every 6 months
  - For chemicals: every 1-2 years

What is groundwater?

- Water that is found underground in the cracks and spaces in soils and rocks.
- Groundwater is naturally replenished by rain and snow melt.
- Groundwater is stored in aquifers.

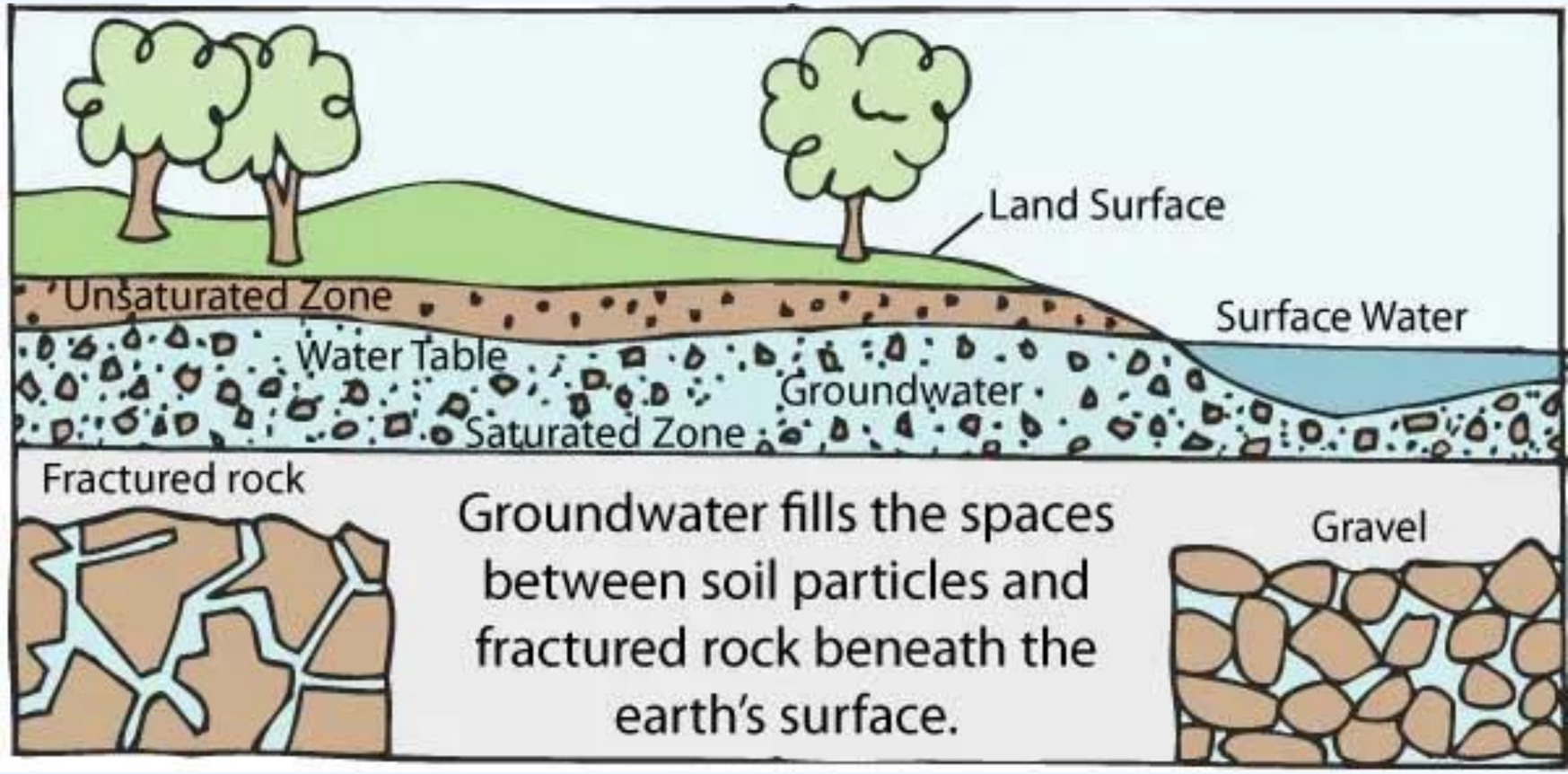
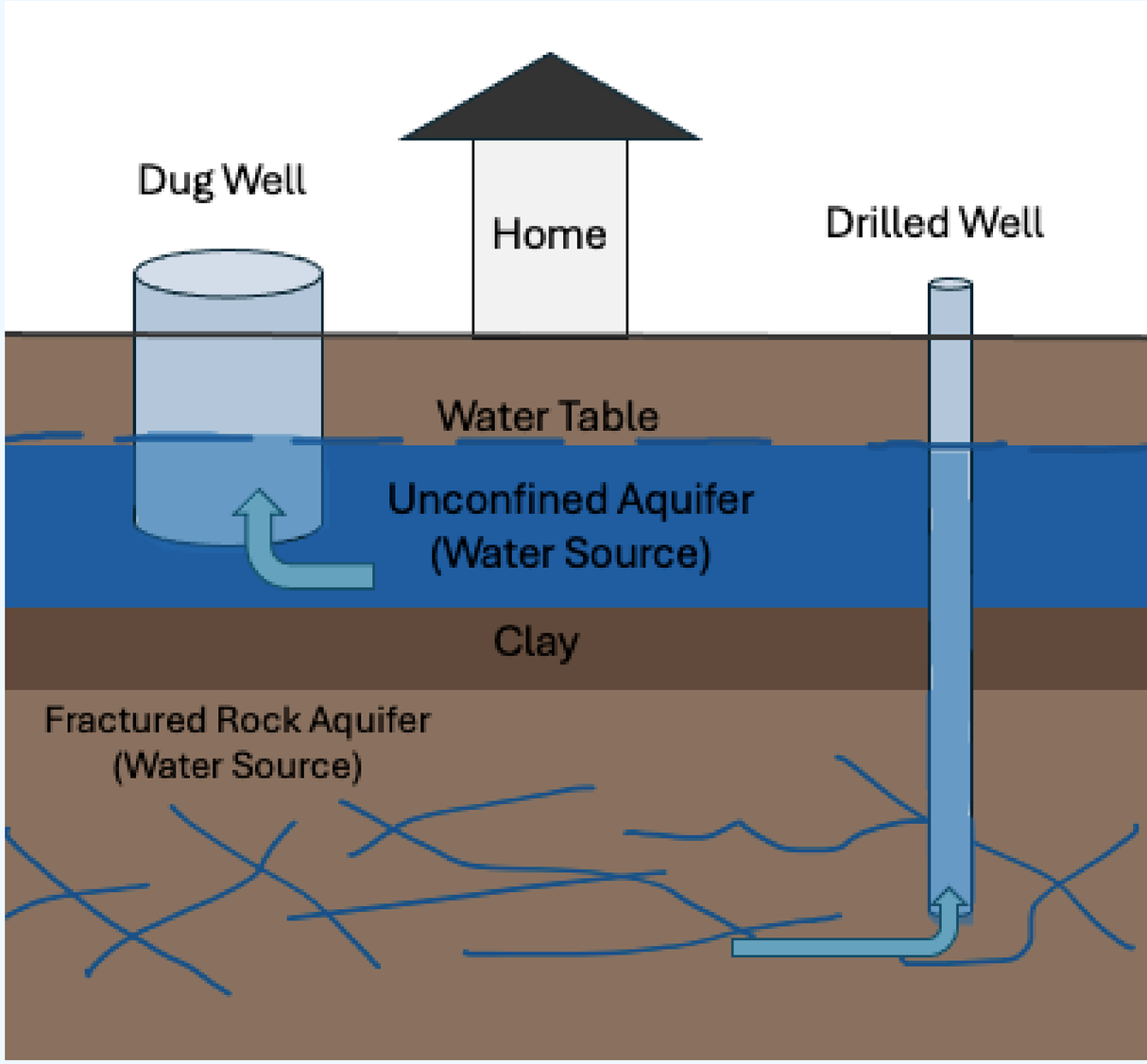


Image source: https://groundwater.org/what-is-

How to access groundwater?

- We extract groundwater through pumping wells.
- Dug wells: shallow, less expensive to install, more vulnerable to drought & biological contaminants.
- Drilled wells: deep, expensive to install, more vulnerable to chemical contaminants.



Climate Change

Fieldwork in Truro, NS, May ‘23

Climate Change in Nova Scotia

RISING TEMPERATURES

By 2100, the average temperature is expected to **rise by 4.5°C**. There will be more wildfires, droughts, and water shortages.

PRECIPITATION CHANGE

The annual precipitation is projected to **increase by 10%** with more frequent and heavy rainfall and less snowfall.

CHANGING OCEANS

Sea temperature is projected to **increase by at least 5°C**. Changing currents, decreasing oxygen levels, and acidification have detrimental impacts.

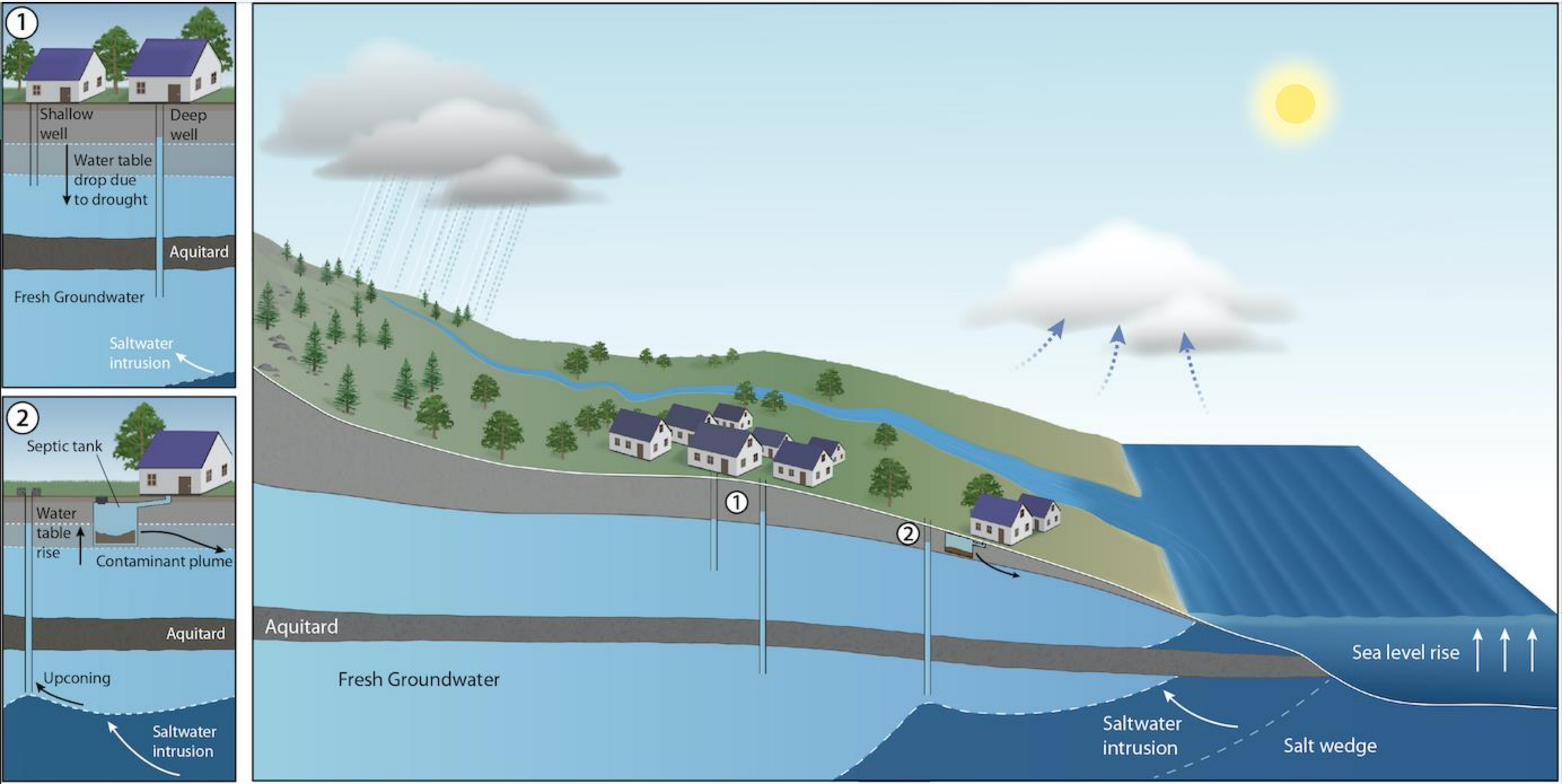
INCREASED STORMS

High intensity storms will make **landfall more frequently** causing serious damage.

SEA LEVEL RISE

Sea levels could **rise by up to 1m** by 2100. Storm surges and high tides threaten access to freshwater.

Saltwater Intrusion



Flooding

- More common with climate change.
- Already an issue in Nova Scotia.
- Affects water quality
- Coastal flooding linked to saltwater intrusion

Parts of Nova Scotia ravaged by heavy rains and flash flooding – again

Emergency alerts were issued Thursday evening as the remnants of post-tropical storm Beryl swept through

Nova Scotia flooding causes over $170 million in insured damage

Drought

- More common with climate change.
- Already an issue in Nova Scotia.
- Affects water quantity & quality

CANADA

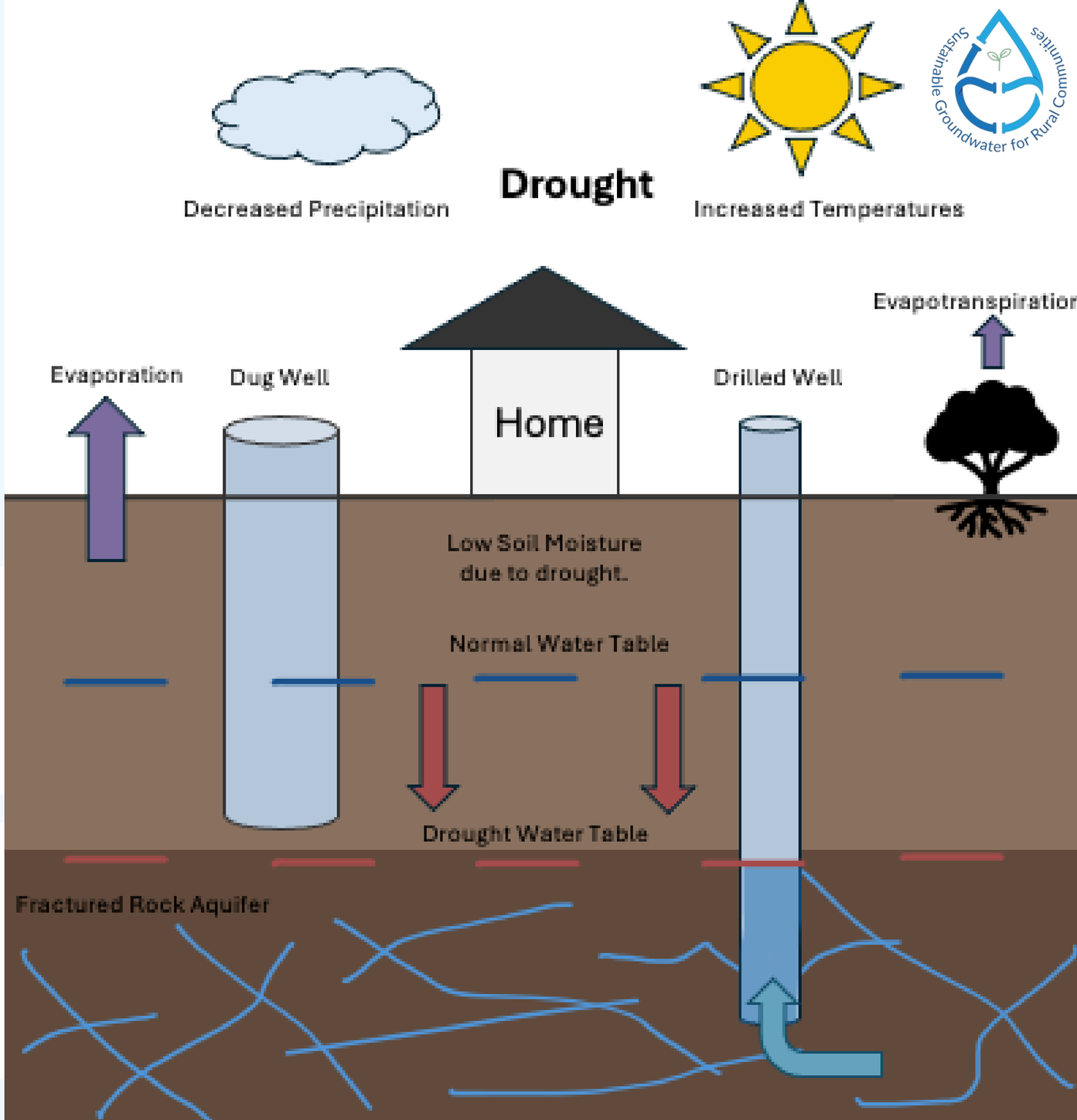
Parts of Nova Scotia seeing one of worst dry spells on record

By Staff • The Canadian Press
Posted September 15, 2016 1:23 pm · Updated September 16, 2016 2:55 pm

CANADA

Dried up wells and lack of rainfall spark calls for wider drinking water relief distribution

By Elizabeth McSheffrey • Global News
Posted August 18, 2020 6:54 pm · Updated October 7, 2022 2:52 pm



Wildfires

- More common with climate change.
- Already an issue in Nova Scotia.
- Affects water quantity & quality

Post-Wildfire Drinking Water Safety

- Do not use your well.
- Flush and disinfect your well and wait for 5 days before sampling.
- Disinfect your well by chlorination
- Drop off your sample on the same day you took it.
- Test your water for bacteria and chemicals.

Nova Scotia

Nova Scotia saw its most devastating wildfire season on record in 2023

Blazes burned through a record 25,000 hectares of land, 200 homes

Aly Thomson · CBC News · Posted: Oct 30, 2023 6:00 AM ADT | Last Updated: October 30, 2023

Resources

WATER TESTING

- Biological contaminants: Test every 6 months
- Chemical contaminants: Test every 1-2 years

WHERE TO TEST?

- Nova Scotia Health: St. Margaret's Square in Tantallon or Cobequid Community Health Centre in Lower Sackville
- Water laboratories: Bureau Veritas Laboratories in Bedford
- Drinking Water Interpretation Tool

GROUNDWATER CHEMISTRY MAPS

- Drought: low risk
- Lead: high risk, all dug wells are high risk for corrosivity
- Uranium: low risk
- Manganese: high risk in the bedrock
- Arsenic: medium risk

Resources

CLEAN FOUNDATION

- Resilient Home Retrofit Pilot Project.

HALIFACT

- HRM’s climate action plan to achieve a net-zero economy by 2050.

CLIMATLANTIC

- Regional hub that enhances climate resilience in Atlantic Canada.

Climate Adaptation

Fieldwork in Sheet Harbour, NS, May ‘22

Flooding

- Flood risk map: helps with planning! Coastal and low-lying areas are most at-risk.
- Emergency planning: identify roles, plan escape routes, keep emergency supplies on hand, include vulnerable people in the planning, monitor weather and flowforecasts.
- Maintain vegetation: helps to absorb and retain floodwater, especially in a floodplain, wetland, and on a waterfront.
- “Flood-proofing”: seal doors & windows, installing sump pumps, using flood-resistant building materials, moving electrical systems or furnaces to higher floors.
- Permeable surfaces: using plants and more permeable surfaces can absorb the runoff of water.

Drought

- Xeriscape: plant drought-tolerant native species such as staghorn sumac, northern bayberry, virginia rose
- Natural systems: protect, restore, and expand wetlands and forests that keep watersheds healthy.
- Rainwater harvesting: collecting & storing rainwater; helps reduce the impact of flooding
- Greywater recycling: reusing household water for other uses such as gardening

Wildfires

- Remove fire hazards: Remove any fire hazards, such as dried branches and debris, near your home, well, septic tank, and other structures on your property.

- Back-up water supply: Keep filled drinking water jugs on hand in case of emergency.

- Emergency planning: Identify roles, plan escape routes, keep emergency supplies on hand, include vulnerable people in the planning, monitor weather and wildfire conditions, familiarize yourself with local emergency management organizations.

- Protect your home: Firesmart Canada offers many tips on how to best prepare your home in case of a fire, everything from home construction to regular yard maintenance.

Our Work

- Field methods: remote sensing, geophysical surveys, groundwater and soil monitoring
- Numerical modelling: Simultaneous Heat and Water (SHAW) model and 1D representations of groundwater recharge

WalkTEM in Northern Shore, NS

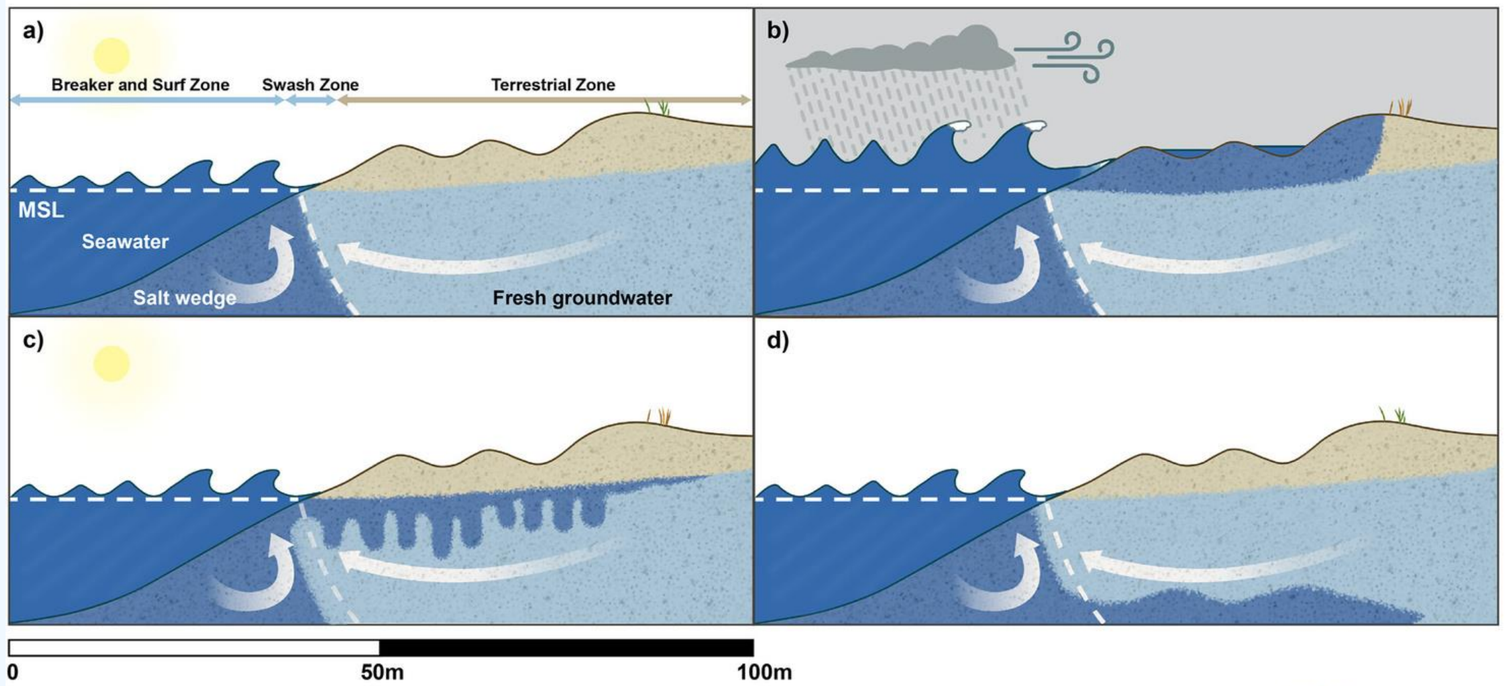
Remote Sensing in Truro, NS

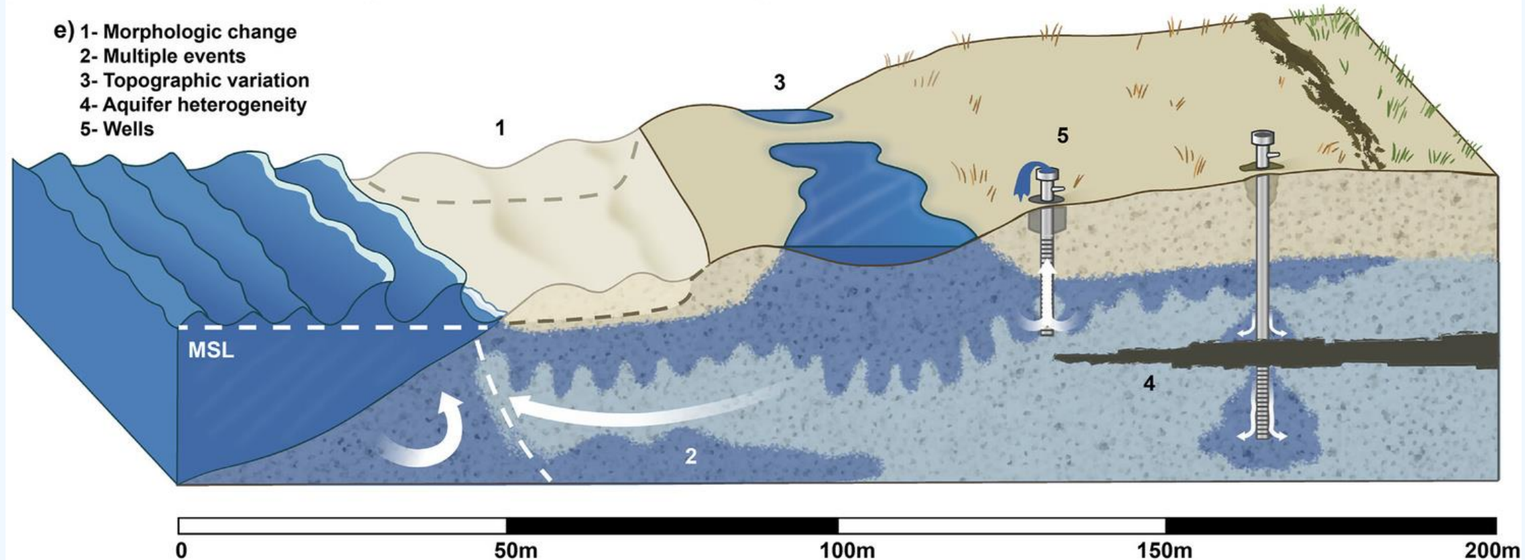
Our Work - Drought

- Agriculture & Agri-Food Canada Historic Drought Map
- ArcGIS model

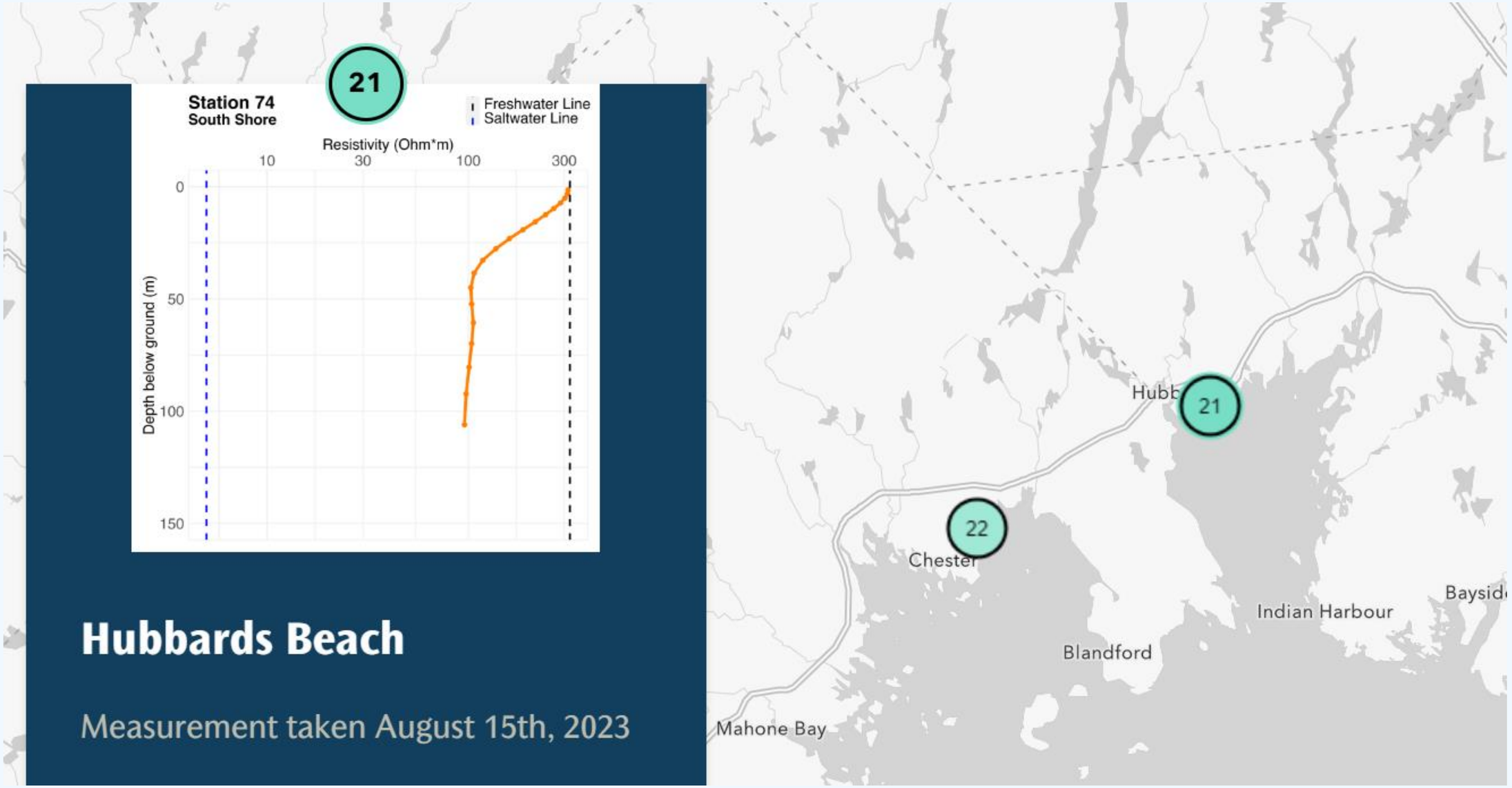
Our Work - Saltwater Intrusion

- Rural coastal communities will be greatly affected
- The evolution of saltwater intrusion after coastal flooding
- Baseline measurements at 49 locations across the province





Our Work - Saltwater Intrusion



https://forms.office.com/r/Pz7fW6UZ4P

Community Testing of Dug Well Water

Do you own a well like this???

This study aims to explore the virome in private well water in Nova Scotia, which are rarely studied compared to bacteria.By identifying pathogen genes in dug wells, we aim to establish a baseline for future research.This research is **exploratory** & does not assess health risks.

What we will do together:

- You receive a water sampling kit at home
- You collect well water & return it to us
- As a token of appreciation, you will receive FREE water testing for standard bacterial & chemical analysis

Interested in participating?

Scan here or use URL link to sign-up

https://forms.office.com/r/Pz7fW6UZ4P

Join this study & receive free water testing!

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CENTRE FOR WATER RESOURCES STUDIES | DALHOUSIE UNIVERSITY

To learn more, contact: Water@dal.ca

Questions

Thank you!

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