

Novel shallow wells

A new design for water access in Maine

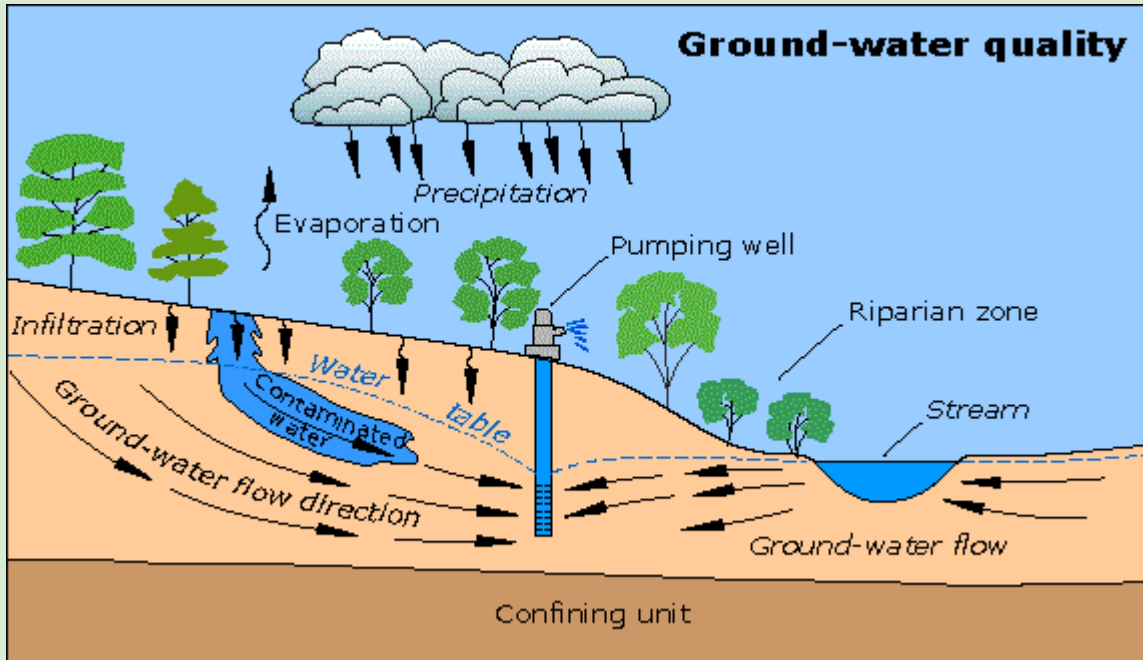
Dr. Rachel Schattman, University of Maine School of Food and Agriculture



The Agroecology Lab

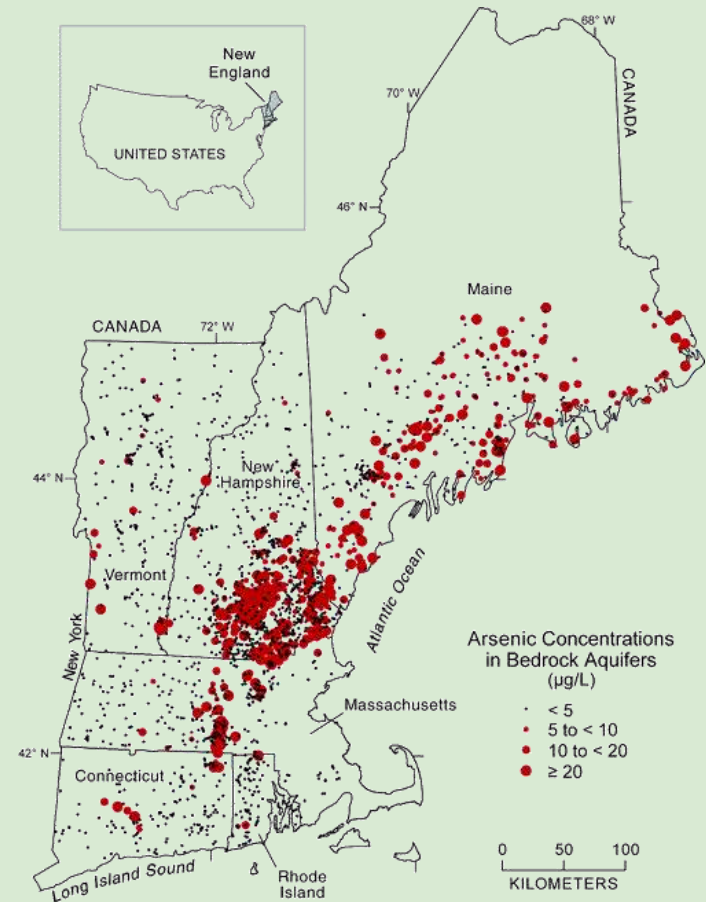
Drilled bedrock wells make up almost 100% of new wells

But... they are expensive. And they lack storage!



Arsenic contamination is found in many NE drilled bedrock wells

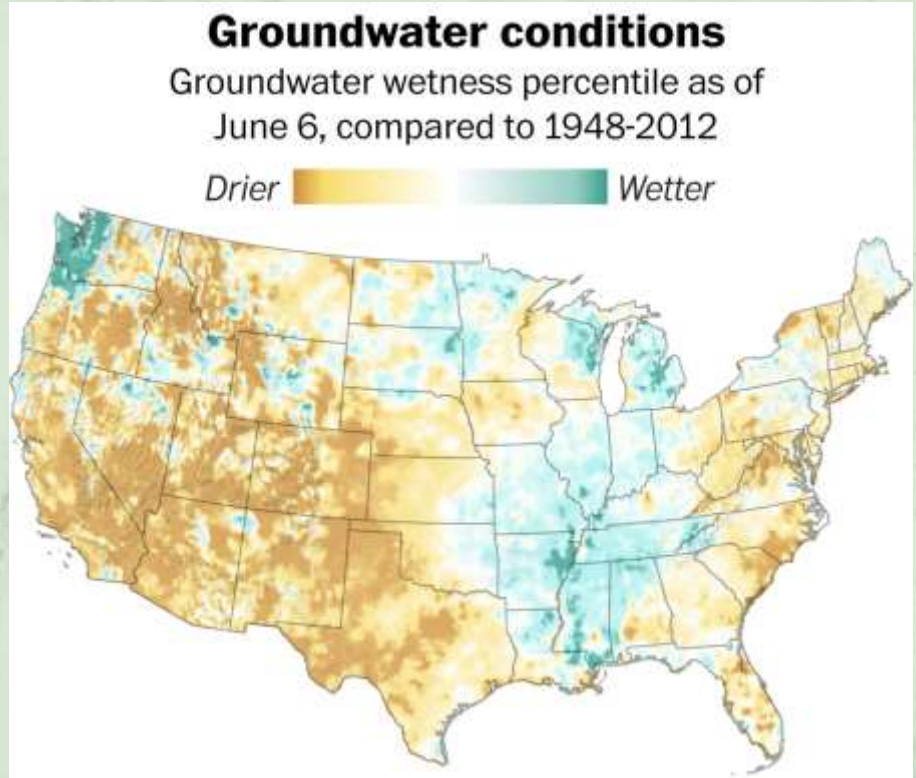
- High rates of arsenic contamination in bedrock wells (20-50% of wells)
- Arsenic contamination can lead to:
 - Impaired cognitive development
 - Lung cancer and pulmonary disease
 - Diabetes
 - Liver cancer
 - Cervical and prostate cancer
 - Skin cancer
 - Heart disease and hypertension
 - Kidney cancer
 - Bladder cancer and upper urinary tract carcinoma



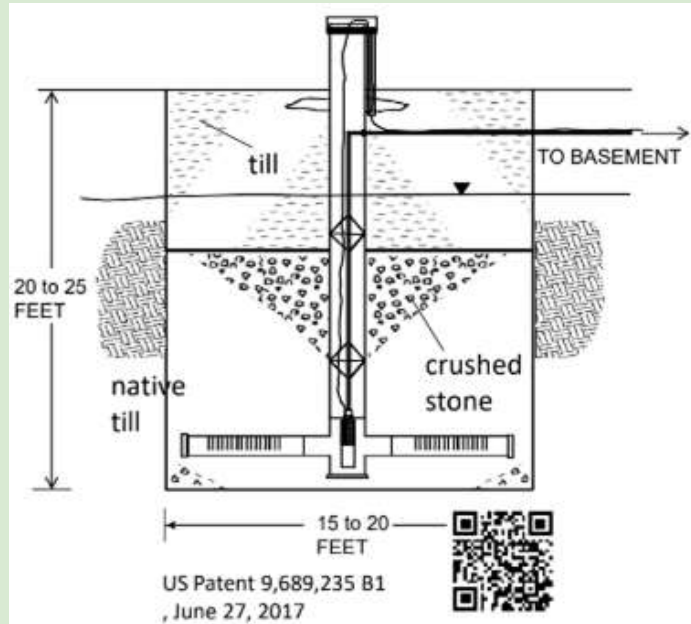
Water storage is of great importance

Droughts and dry periods increase the need for us to store water on (or in) the landscape for use throughout the growing season.

Background image credit: NASA, Atmospheric River delivering massive amounts of much needed water to the western United States
Figure: Washington Post, June 16, 2022



Introducing (drumroll) the NOVEL SHALLOW WELL



Novel shallow wells are installed in GLACIAL TILL (not bedrock)

Glacial till in North America

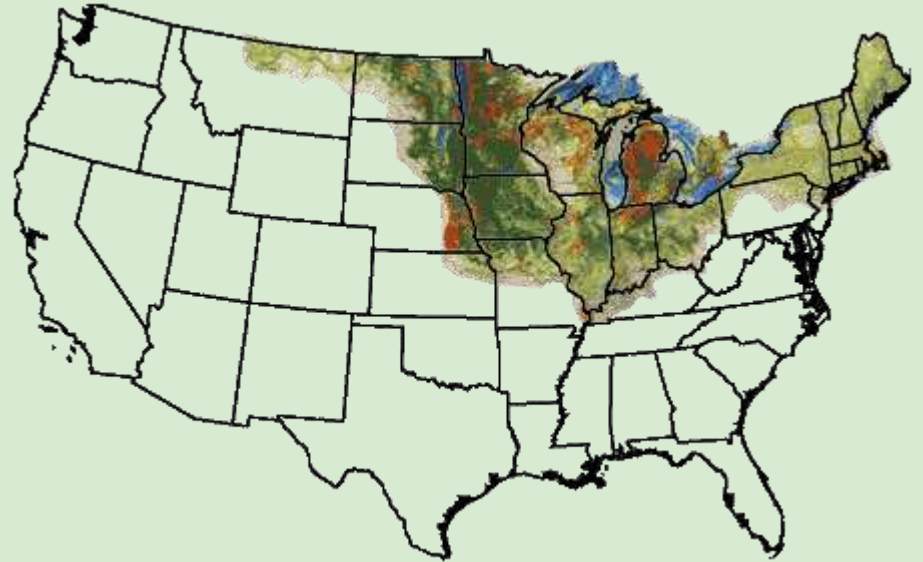


Image left: A good example of glacial till. Credit: Burlington Geographic. Image Right: Thickness and Character of Quaternary Sediments in the Glaciated United States East of the Rocky Mountains. Credit: USGS <https://pubs.usgs.gov/ds/656/>

The well functions like an artificial aquifer



Left: washed stone used as fill at the well in Old Town, ME. Right: Yours truly assesses depth of the well prior to completion. Photo credit for both: Linden Schneider, 2022

Moving lots of material



Old Town, Maine. Photo credit: Linden Schneider 2022

On-farm in Holden, Maine



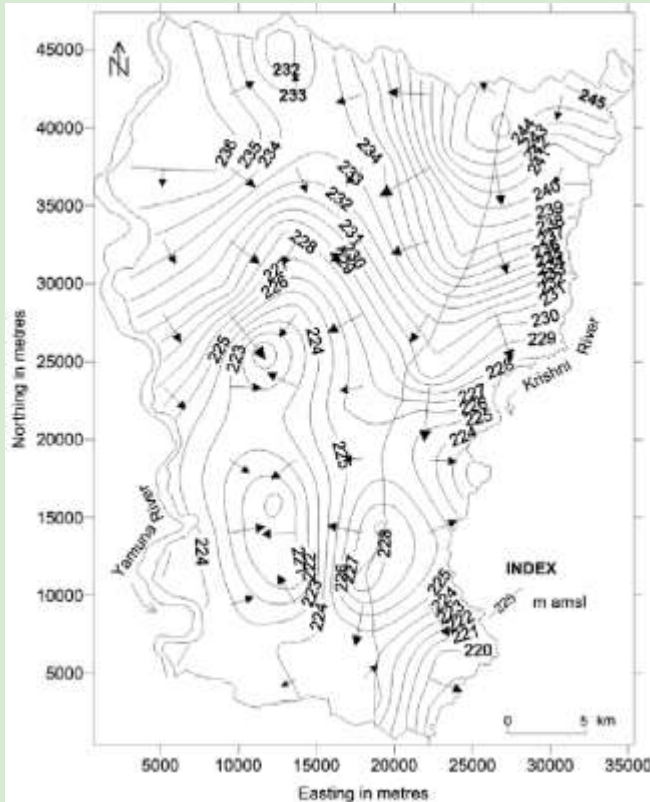
Well installation and test wells at Hart Farm. Middle photo: Joe Ayotte (USGS hydrologist, original well designer extraordinaire) and Haley Jean (MS student in the UMaine Agroecology Lab) test the water level of a test well. Photo credits: Rachel Schattman 2021.

A (nearly) completed well



Photo credit: Linden Schneider, 2022

Assessments in progress



- Assessment of drawdown, well yield, recovery rates, and safe yield for the novel well, which is equal to the average replenishment rate of the aquifer from recharge.
- Test for N, E. coli, Arsenic, PFAS
- Goals:
 - a. develop optimal pumping strategies to meet farm needs;
 - b. understand the effects that novel shallow wells have on conditions of the surrounding water table.

Left: Example of a water table contour map, originally published in Ahmed & Umar, 2009; 10.1007/s12040-009-0050-5

In summary

- Novel shallow wells decrease exposure to arsenic by staying above bedrock.
- Recharge rates are high because of the surface area of external walls.
- Volume of well storage and recharge rates are currently being assessed.
- Novel shallow wells can help us store more water on the landscape, and by extension better manage drought.
- High potential for these wells to serve as primary or secondary sources, but evaluation is ongoing!

Thank you to collaborators and funders

Joseph Ayotte and Marcel Belaval, USGS New England
Water Science Center

Will Sommers and Michelle Coombs, EPA Region 1

Erin Lane and David Hollinger, USDA Northeast Climate Hub



Questions?

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