

MIDTERM EXAM
Friday, March 16, 2018

Exam in Two Parts:

Part 1: Take-home essay (45%) focusing on the comparative regional geography of your three assigned counties using topics covered in class as a guide. This is due no later than March 16. *Includes appropriate maps and a bibliography.*

Part 2: In-class portion taken on March 16 consisting of map-based multiple choice questions (25%) and 3 essays (30%) from a choice of topics (*see study guide*).

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9: Nature of New York's Water Resources

Underground Water

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Spring 2018

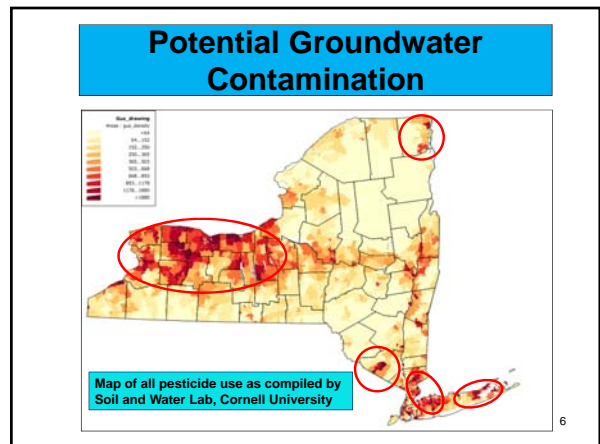
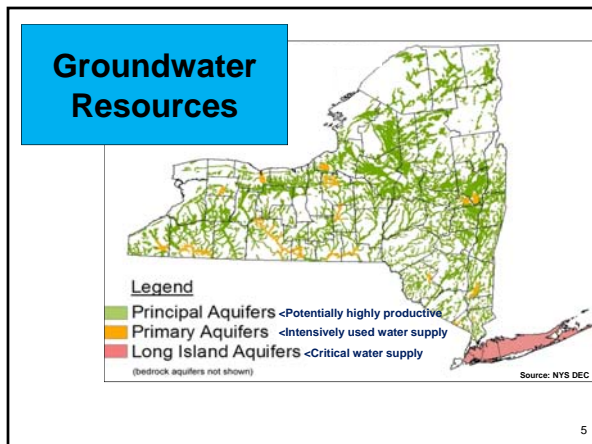
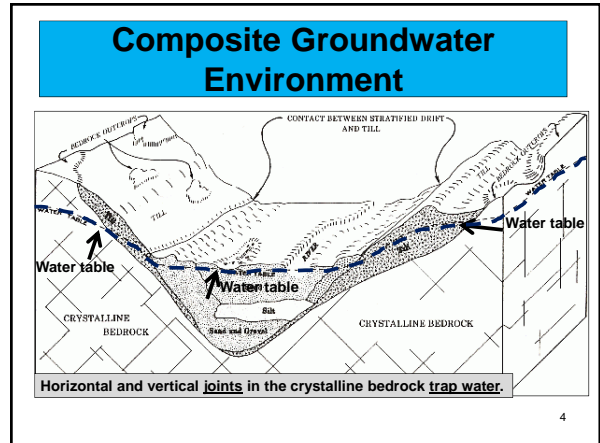
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GROUNDWATER

- **Groundwater** - water occupying the pore spaces and cracks in rocks and unconsolidated material. The best groundwater is found in sand and gravel formations.
- **Water table** - the **top** of the groundwater; varies in depth from the surface with water supply and geology.
- **Dependency** on groundwater (well water) is greatest in rural areas.
- ❖ **Largest area** of NYS that depends on groundwater is **Long Island**.
- ❖ **Greatest number of people in the US** who are rely on it are in **Nassau and Suffolk counties**.

3



Shale Formations

Southern Tier, Finger Lakes and Catskills

Extent of Marcellus and Utica shales

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“Fracking” the Shale

Hydraulic fracturing of shale layers to release natural gas is done by inserting water and chemicals under high pressure.

Contamination of groundwater and air is a possible side effect.

Fracking Site

In 2011 DEC Proposed to Prohibit Fracking in Sensitive Areas

Areas where High-Volume Hydraulic Fracturing Surface Drilling Would Be Prohibited

- State Parks and Lands within the Extent of the Marcellus Shale Formation
- Primary Aquifers within the Extent of the Marcellus Shale Formation
- Surface Water Drinking Supply Watersheds with Filtration Avoidance Determinations (FADs)
- Extent of Marcellus Shale Formation
- Marcellus Shale Deeper than 2000 feet South of this Line
- County Boundary

https://www.dec.ny.gov/docs/materials_minerals_pdf/fsgeis2015ch2a.pdf

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NYS Banned Fracking

Press Release: Monday, June 29, 2015

New York State Officially Prohibits High-Volume Hydraulic Fracturing: DEC Issues Findings Statement Concluding Extensive Seven-Year Review

“The state Department of Environmental Conservation (DEC) today officially prohibited high-volume hydraulic fracturing (HVHF) in New York State by issuing its formal Findings Statement, completing the state’s seven-year review of this activity.”

LPG Fracking:
<https://marcellusdrilling.com/wp-content/uploads/2017/05/Hanson.pdf>

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L I Groundwater Situation

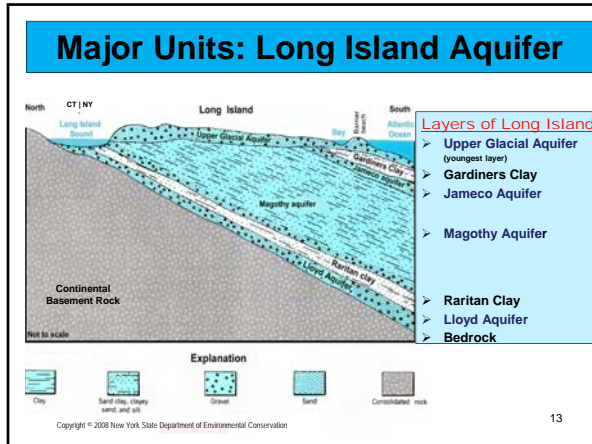
- ❖ LI is the **largest populated area** of the country that **depends exclusively** on groundwater.
- It is rapidly urbanizing.
- There are **no dependable surface water sites** to supply fresh water to the residential, industrial and agricultural sites.
- Long Island is **surrounded by salt water**.
- The **NYC Water Supply system does not have enough water to share with LI** without drastically enlarging the Catskill collection system.

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Physical Make-up of Long Island

- ✓ Created by glaciers.
- ✓ Porous unconsolidated material (sand, silt, clay and gravel) form layers that hold water.
- ✓ Bedrock deeply buried.
- ✓ Receives about 44 in. of precipitation annually.
- ✓ Surrounded by salt water.

- **There are 4 aquifers:**
 - Upper Glacial
 - Jameco
 - Magothy
 - Lloyd
- **There are 2 aquicludes:**
 - Gardiners Clay
 - Raritan Clay
- ❖ **The depth of the water table varies locally with the rates of withdrawal and recharge.**



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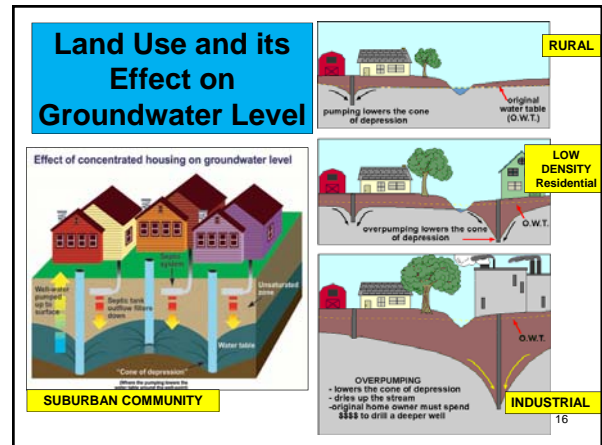


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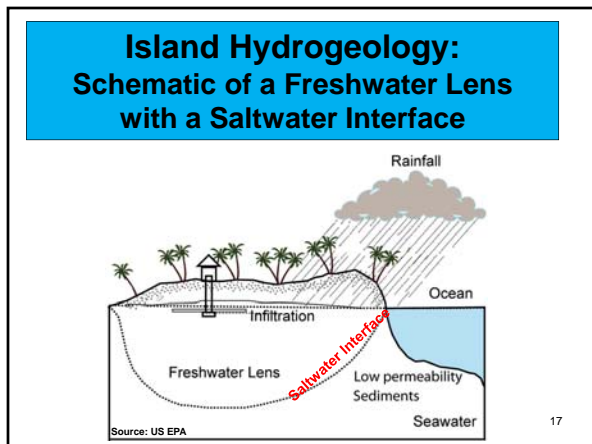
Problems Facing LI Groundwater

- Freshwater area (lens) under LI is shrinking.
- Surface area for freshwater recharge has gotten smaller.
- The water table is being lowered (more pumping and less recharge).
- Reduction in outward pressure is allowing salt water to move inland.
- Surface pollution has contaminated groundwater closest to the surface.
- Rising sea level will submerge more coastal areas, reducing recharge and contaminating freshwater.

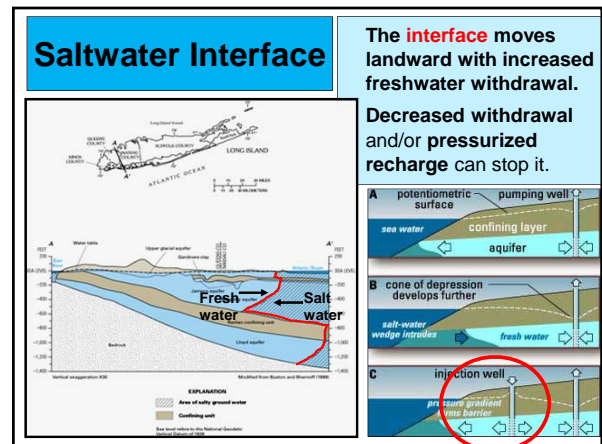
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Groundwater Recharge Basin

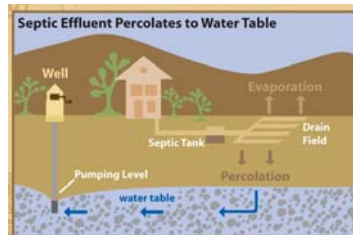
Rainwater needs to be collected to replenish with-drawals since groundwater is the sole source of freshwater for the people who live on Long Island outside of NYC.

Open space, storm water collection and the return of treated waste water are ways to help replace removed groundwater.

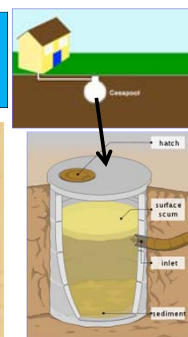


This is an example of non-pressurized or natural recharge by seepage.

Waste Water Disposal Septic System vs. Cesspool



- Septic System separates solid waste from waste water.
- Waste water is directed to an underground drainage field for dispersal.
- Holding tank needs to be cleaned out.



- Cesspool tank fills with waste water and solids.
- Water is slowly released to surrounding soil.
- Solids have to be pumped out.

Ensuring a Safe Yield on LI

Problem	Remedy
• Increased use	>>Conservation; regulate consumption
• Suburbanization	>>Preserve open space; restore wetlands
• Over pumping	>>State regulation
• Contamination	>> Regulation of land fills, cesspools, septic tanks, industry and agriculture
• Replenishment	>>Required recharge basins; open space
• Loss of run off	>>Move to sanitary sewers, collection/seepage ponds
• Irrigated farmland	>>Water conservation methods; hybrid plants
• Salt water intrusion	>>Reduced pumping; pressurized recharge

NEXT

The Coastal Zone