Groundwater Quality: McHenry County

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Groundwater Quality Issues: Some Definitions and Concepts

- Mainly concerned with drinking water quality
  - Groundwater discharges to streams and wetlands (base flow), so there are ecological issues as well
- Natural vs. Human contamination
- For human activities: Point source vs. non-point sources
Important Contaminants in McHenry County Groundwater (Regional Scale)

- Natural
  - Arsenic (sand & gravel)
  - Radium (deep bedrock)
  - Barium (deep bedrock)
- Human (non-point source)
  - Nitrate (agriculture, sewage)
  - Total dissolved solids (road salt runoff)
McHenry County is Sandy
Groundwater Quality Data Sources

- McHenry Co. Monitoring Well Network
  - USGS sampling
  - SpC sensors
- ISWS groundwater quality database
- Previous ISWS/ISGS studies
Arsenic in Sand & Gravel Aquifers
Arsenic: Wonder Lake

Large Local Variability

Geochemical Conditions are Controlling Arsenic Concentrations

Low TOC
Low As

High TOC
Low SO$_4^{2-}$
High As
Chloride and Total Dissolved Solids (TDS)

- Shallow sands and gravels mean that water quality in these aquifers are vulnerable to surface activities.
- One of the major land use activities in northeastern Illinois is road salt application.
Road Salt Application (U.S.)

USGS Data

5 Year Running Average

Metric Tons (1000s)

Chloride in Sand & Gravel Aquifers
Continuous Measurements

Specific Conductance is a good proxy for TDS and chloride

USGS Data
Chloride in Individual Public Supply Wells

McHenry Co.

Chloride (mg/L)

Changes in Chloride in Kane County: 2003 - 2015

- 5 wells increased more than 100 mg/L
- Average chloride increase in East wells was 46.3 mg/L
  - (about 4 mg/L per year)
Nitrate in Groundwater

- Nitrate concentrations have been increasing in many shallow aquifers in the last 40-50 years, primarily in agricultural areas
- Synthetic fertilizer is main source in much of the world
  - Also sewage and septic systems, oxidation of soil organic matter, atmospheric deposition
Nitrate-N: Historical Data

Nitrate-N in Sand & Gravel Aquifers: Recent Data

2008 - present

ISWS Database

Explanation

- County Boundary
- Major Road
- Sand at Land
- Surface

Nitrate (mg/L)

- < 2.0
- 2.0 to 5.0
- 5.0 to 10
- > 10
Deep Bedrock Aquifer System: Radium

MCL = 5.0 picocuries per liter

Explanation
- Unconfined
- Confined
- Precambrian Sandstones
- Precambrian Crystalline

RADIUM, in pCi/L
- • ≤ 5.00
- ○ 5.01 to 10.0
- ○ > 10.0

n = 506

USGS Data

MCL = 5.0 picocuries per liter
Deep Bedrock Aquifer System: Barium

The USEPA drinking water standard for Ba is 1 mg/L.
Barium concentrations controlled by Barite (BaSO$_4$) solubility
USGS Sampling 2010

- Pesticides: 3 detected, but at very low concentrations in shallow wells (< 50 ft)
  - Atrazine, Prometon, CIAT
- VOCs: 2 detected, very low concentrations in shallow wells (< 50 ft)
  - Trichloroethylene (TCE), Trichloromethane

Point Sources

*Irrigation wells pump 30,000 cfd total*
Groundwater Quality: Future Activities

- Use Monitoring Well Network
- Encourage private well owners to get their water quality tested
  - ISWS has a public service lab that provides a full mineral content for minimal cost ($35)
  - Includes nitrate, arsenic, chloride, etc., but no bacteria or organics
- Continue to look for ways to protect sensitive areas, such as wetlands and recharge zones
Private Well On-line Class

- **Free** on-line class
- Designed to educate homeowners about their private wells
- Self-paced