Good Morning!
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Lake Ontario dunes and wetlands

Northern New York alvars
Outline
What is a watershed?
How might the watershed landscape influence stream quality?
Why are some stream characteristics tested and others are not?
What can you do prior to your stream visit?
Just as a town, city, county or state has boundaries, so does a watershed.

Think of this as a line that connects all of the highest points in an area.

No matter where you live, you’re in a watershed.
Precipitation falling inside a watershed boundary may:

1. fall directly into streams and lakes
2. travel across the landscape
3. infiltrate the soil and flow underground
**wä-ter-shed (n.):** The geological and geographical area of land that contributes or drains water through its springs, seeps, ditches, pools, culverts, marshes, swamps, and streams to the same body of water.

Canandaigua Lake Watershed Management Plan
[www.canandaigualake.org](http://www.canandaigualake.org)
Watersheds can be large or small. Every stream, tributary, or river has an associated watershed, and small watersheds aggregate together to become larger watersheds.
New York State Department of Environmental Conservation
New York State Watersheds
www.dec.state.ny.us
United States Geological Survey Hydrological Unit Code Number (HUC)
The Watersheds of the Finger Lakes
Natural Community Classification

- New York State Natural Heritage Classification (Edinger et al. 2002)
- Six major systems present in New York
- Each system is broken into sub-systems, each sub-system is furthered broken into cover types (the name we use to describe natural communities)
Land Use/Land Cover Mapping

- Initial assessment based on air photo interpretation (Pictometry© imagery)
- Extensive field investigations reveal errors in initial assessment
- Modify polygons to create “truth image”
- Attribute polygons
Honeoye Lake Watershed

- 4 major ecological systems: riverine, lacustrine, palustrine and terrestrial
- 10 subsystems: natural and cultural categories
- 36 community cover types and numerous linear and point features

- 5 natural communities with significant state-wide ranking: winter stratified monomictic lake, floodplain forest, silver maple-ash swamp, shale talus slope woodland and maple-basswood rich mesic forest
For Tier 1 and Tier 2 we have simplified the land use assessment by providing the most common cover types in a check-off format!

The “other” category allows you to record unique land uses bordering your stream.
Problems created by land-use activities

- Increased sediment loading
- Altered stream temperature
- Nutrient enrichment
- Toxic and hazardous substances
- Pathogens
- Invasive species introductions

These problems may be caused by point and/or non-point sources of pollution.

These problems impact fish habitat, water supply, water quality, as well as recreational and economic uses of the water.
Commercial/Industrial and Residential land uses increase impervious surfaces

![Diagram showing the relationship between impervious cover and surface runoff.](image)

*Figure 3.21: Relationship between impervious cover and surface runoff. Impervious cover in a watershed results in increased surface runoff. As little as 10 percent impervious cover in a watershed can result in stream degradation.*
Residential development can also create impacts when riparian vegetation is removed.
Cropland, Pasture, Orchard, Vineyard and Nursery increase nutrients in runoff
Natural Forest, Old Fields and Wetlands are desirable land uses but non-sustainable practices can create problems in streams.

UNLESS someone like you cares a whole awful lot, nothing is going to get better. It's not.
Total Watershed

Sub-watershed

Direct Drainage Basin
T-34 Lincoln Hill Direct Drainage
Direct drainage work

• Sampling dates: April 3, 2002 (0.93” rain)
  April 15, 2002 (0.63” rain)
  May 2, 2002  (0.14” rain)
  November 23, 2002 (0.64” rain)
  March 17, 2003  (0.00” rain, a snowmelt event)

• Several intermittent streams sampled within the direct drainage sub-basin
From East Lake Road looking west
Mean Phosphorus Concentrations
2002-2003 Direct Drainages

Sampling locations

 ug/L
Why we are not sampling Total Phosphorus concentrations in our stream monitoring

• Most field test kits do not have the sensitivity to accurately measure extremely small quantities of total phosphorus

• Standard Methods for phosphorus analysis requires sample preservation with strong $\text{H}_2\text{SO}_4$, a potential safety issue with your students

• Biological productivity in streams most likely is limited by conditions other than total phosphorus concentrations
Mean Nitrite and Nitrate
2002-2003 Direct Drainages

mg N/L

T-31A  T-32A  T-32B  T-33A  T-33B  T-33C
T-34A  T-34B  T-34C  T-34D  T-34E

Sample locations

Comments on Nitrite and Nitrate Concentrations

- Rainfall intensity and antecedent soil moisture conditions strongly influence overland flow to streams.
- Livestock operations increase environmental nitrogen levels.
- Concentrations exceeding 10 mg NO$_3$-N/L suggest polluted stream conditions.
EPA Water Pollution Categories

- Oxygen demanding wastes
- Heavy metals
- Radioactive substances
- Carcinogenic and teratogenic agents
- Corrosive materials
  - Chloride (Cl\(^{-}\)) is considered a corrosive material
Sources of Chloride

• Bedrocks
• Agricultural runoff
• Industrial wastewater
• Sewage treatment plant effluent
• Oil well and gas well wastes especially those produced by hydrofracking
• Road de-icing materials
Recent Trends

- Winter road safety is adding salt pollution to Great Lakes streams.
- Urban streams carried 88 tons of chloride per square mile of watershed area. Forest streams carried about 6 tons per square mile.
- Monitoring chloride effectively gauges increasing development trends and the risk of other stream pollutants.

U.S.G.S. research report, September 2009
FLCC road salt monitoring

- Streams studied during February
- Grab samples collected downstream of major highway bridges
- Period of record: 1990 to 2010
- Lab procedure: argentometric titration
- Data expressed as mg/L chloride
- Safe level: concentrations less than 250 mg/L
Mean Tributary Chloride
Canandaigua Lake and Honeoye Lake (Years of Record)

chloride (mg/L)

year

Canandaigua
Honeoye
Tributary Chloride
Honeoye Lake, 2-24-2006

The diagram shows the chloride levels (mg/L) for various tributaries associated with Honeoye Lake on 2-24-2006. The highest chloride concentration is observed at T10k, while other tributaries have much lower levels.
Tributary Chloride
Honeoye Lake, 2-2007

chloride (mg/L)

tributary code

T1  T2  T5  T6  T7  T8  T9a  T10  T10  T10  T10k  T11  T12  T16  out

Tributary Chloride

Honeoye Lake, 2-2007
Tributary Chloride
Honeoye Lake, 2-29-2008

- Chloride (mg/L) vs. Tributary Code

- Tributary codes range from T1 to T16 with 'out' indicating the final point of interest.

- Chloride values per tributary code:
  - T1: Approximately 110 mg/L
  - T2: Approximately 40 mg/L
  - T5: Approximately 4 mg/L
  - T6: Approximately 10 mg/L
  - T7: Approximately 15 mg/L
  - T8: Approximately 30 mg/L
  - T9a: Approximately 20 mg/L
  - T10: Approximately 60 mg/L
  - T11: Approximately 120 mg/L
  - T12: Approximately 180 mg/L
  - T16: Approximately 100 mg/L
  - 'Out': Approximately 150 mg/L

- Note: The highest chloride value is observed for T10k, significantly higher than the other tributaries.
Tributary Chloride
Canandaigua Lake, 2-23-2006

chloride (mg/L) vs. tributary code
Tributary Chloride
Canandaigua Lake, 2-28-2008

chloride (mg/L) vs. tributary code

Tributary codes: T21, T20, T19, T18, T17, T14, T13, T16, T11, T12, T27, T10, T9, T8, T6, T5, T4, T3, T2, T1, out
Tributary Chloride
Canandaigua Lake, 2-27-2009

chloride (mg/L)

tributary code

T21  T20  T19  T18  T17  T17  T14  T13  T16  T11  T12  T12  T27  T10  T9  T8  T6  T5  T4  T3  T2  T1  out
Doing Your Homework!
Activities prior to the stream visit.

- Check for existing water quality information
- Obtain maps and aerial photographs
- Make a site visit before you bring your class on the field trip
Examples of existing water quality information

• NYS DEC assessments, their reports are available at the regional office and often online as a pdf file.
• Local lake associations may have sampling and monitoring programs, summary data could be available from their watershed manager.
• College and University aquatic research, reports available from participating scientists.