Lake Champlain long-term monitoring program

How is the lake’s water quality? Is it changing?

Multi-decadal monitoring reveals salinization impacts of road de-icing salt application in the Lake Champlain watershed

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Chloride concentration data

- Starting 1991
- 18 tributaries
- 8,000 samples
- 15 lake sites
- 7,250 epilimnion or unstratified samples
• Combine with streamflow
• Model to predict concentrations
• Estimate loads
• Trends
Time-weighted annual mean chloride concentration (mg/L) by tributary

Lake region
- Missisquoi Bay
- Northeast Arm
- Malletts Bay
- Main Lake
- South Lake
Chloride load (thousand mt / yr)
by tributary

Lake region
- Missisquoi Bay
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Graphs showing chloride load over time for different tributaries.
How does chloride loading relate to impervious land cover?
What portion of trends are driven by changes in streamflow vs. watershed management?
Primarily streamflow trend effects

Percent change due to changes in streamflow

Percent change due to changes in watershed management

Primarily watershed management effects
Percent concentration change due to changes in streamflow

Percent concentration change due to changes in watershed management

Significant change 1991-2022

- Decrease
- Increase
- No change
Percent load change due to changes in streamflow

Percent load change due to changes in watershed management

Significant change 1991-2022

- Decrease
- Increase
- No change

LaPlatte, Pike, Little Otter, Saranac, Mettawee, Great Chazy
Chloride concentration (mg/L)

- Shallow sites
- Deep sites

Years when trends reversed

Concentrations are now increasing
Annual mean chloride concentration (mg/L) by lake region

- **Main Lake**: +1.2% per year, 54% increase
- **Malletts Bay**: +0.6
- **Missisquoi Bay**: +0.5
- **Northeast Arm**: +0.4
- **South Lake**: +1.2

% change: 30, 20, 37, 52
Water quality monitoring buoys
Provisional weather data from the Malletts Bay monitoring buoy

- Air temperature (degC)
- Wind speed (mps)
- Wind direction (deg from North)
- Solar radiation (W/m²)
- Relative humidity (%)

Dates: Aug 29, 2022 → Sep 28, 2022
Overview of LCBP ongoing chloride research

- Journal article
- Mirror Lake study and monitoring (AsRA, AWI)
- Basin-wide study of chloride data - long-term trends, inform BMP implementation (AWI)
- Forecast future road salt use with downscaled climate models (AWI)
- Study on chloride sources and impacts to macroinvertebrates (Middlebury College)
Lake Champlain
STATE of the
LAKE and
Ecosystem Indicators Report

2024
Questions?

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