Tracking Road Salt Impacts in the Neshaminy Watershed

A Community Science Initiative (2023–2025)

Neshaminy Watershed Association

In collaboration with Stroud Water Research Center and community volunteers

Executive Summary

Road salt is an essential tool for winter safety, but increasing evidence shows it is also a growing threat to freshwater ecosystems, drinking water sources, and infrastructure. Since 2023, the Neshaminy Watershed Association (NWA), in collaboration with the Stroud Water Research Center and community volunteers, has been monitoring chloride (salt) levels throughout the Neshaminy Creek watershed.

This community science initiative has evolved from baseline sampling during summer low-flow conditions to expanded watershed-wide surveys and winter storm "snapshot" monitoring. Together, these efforts provide a longitudinal view of how chloride concentrations vary seasonally, spatially, and from year to year.

Key findings show:

- Rising baseline chloride concentrations over time
- Extreme chloride spikes during winter conditions
- Particular vulnerability in small tributaries near roads and developed areas
- Evidence that salt is becoming a year-round water quality concern, not just a winter problem

Why Chloride Matters

Chloride enters streams primarily through road salt used on roads, sidewalks, and parking lots. While it helps keep communities safe during winter storms, chloride does not break down in the environment. Instead, it accumulates in streams, groundwater, and drinking water supplies.

Elevated chloride levels can:

- Harm fish and aquatic insects

- Alter freshwater ecosystems
- Corrode pipes and infrastructure
- Increase sodium levels in drinking water, posing health risks

Key reference thresholds:

- **50–100 ppm**: Elevated; exceeds some state and international freshwater guidelines
- **250 ppm**: U.S. chronic exposure threshold for aquatic life
- **500 ppm**: Acute toxicity threshold and drinking water exceedance

Program Evolution and Monitoring Approach

Baseline Monitoring – 2023

In September 2023, NWA collected 37 water samples across the Neshaminy Creek watershed under summer baseflow conditions. Samples were analyzed for chloride, nitrate, and conductivity to establish a baseline understanding of watershed conditions.

Expanded Baseline Monitoring – 2025

In October 2025, baseline sampling expanded to 68 sites, including smaller tributaries and adjacent watersheds. This effort occurred during lower-than-normal stream flows, providing insight into how drought conditions influence salt concentrations. Continuous monitoring equipment was also installed to better track changes throughout the year.

Winter Salt Watch – 2024–2025

During winter conditions, NWA and Stroud partnered with community volunteers to collect 66 samples across Bucks County, with a strong focus on the Neshaminy watershed. This "snapshot" approach captured chloride spikes immediately following winter weather events and integrated the data into regional and statewide databases.

Key Findings

Increasing Baseline Chloride

- Average chloride concentrations increased by approximately **45% between 2023 and 2025**
- Lower stream flows appear to concentrate chloride, especially during dry periods
- Wastewater effluent can make up a significant portion of stream flow during low-flow months, amplifying salt signals

Winter Chloride Spikes

- Winter samples ranged from **below 50 ppm to nearly 600 ppm**
- **13 sites exceeded the U.S. chronic exposure threshold**
- **4 sites exceeded drinking water standards**
- 97% of sites with both summer and winter data showed higher chloride levels in winter

Spatial Patterns

- Small streams adjacent to roads, parking lots, and developed areas were most vulnerable
- Streams with limited riparian buffers showed the highest chloride concentrations

Nitrate Observations

While chloride was the primary focus, nitrate and nitrite were also measured. Several sites—particularly in the Little Neshaminy Creek and West Branch Neshaminy—exceeded the drinking water standard of 10 ppm. Winter timing suggests these nutrients likely originate from wastewater sources rather than agricultural runoff.

The Role of Community Science

Community participation was central to this initiative. Volunteers collected samples, analyzed water quality, and contributed to a dataset that now informs both local and statewide assessments. Their involvement increased geographic coverage, strengthened data quality, and helped raise awareness of winter salt impacts throughout the region.

What This Means for the Neshaminy Watershed

The data clearly show that chloride pollution is:

- Widespread
- Increasing over time
- Highly variable depending on season and location

Salt is no longer only a winter concern. Persistent background levels suggest long-term accumulation that may continue to affect streams even during dry, warm months.

Looking Ahead

NWA will continue:

- Seasonal baseline and winter monitoring
- Continuous chloride tracking
- Identification of high-risk tributaries
- Community outreach and education
- Collaboration with municipalities on smarter salt use strategies

Get Involved

Community science plays a critical role in protecting our waterways. Residents can help by:

- Participating in seasonal sampling
- Hosting monitoring sites
- Learning about salt reduction practices
- Staying informed about watershed conditions