

Road Salt Application and Its Impact on Water Quality in the Delaware River Watershed



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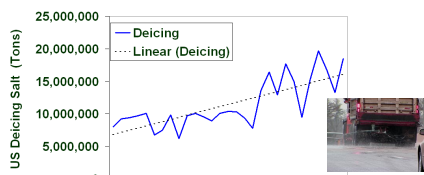
Abstract

Road salt applications have contributed significantly to the increase of sodium and chloride concentrations in the Delaware River Basin that crosses the PA, NY and NJ states.

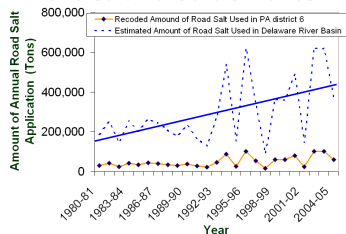


Figure 1. Map of the Delaware River Basin showing the 3 states located in each of the 12 states.

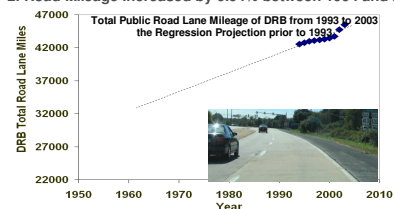
1. Increase of the deicing salt in US and Delaware River Basin



Amount of annual road salt application in District 6 and the Delaware River Basin

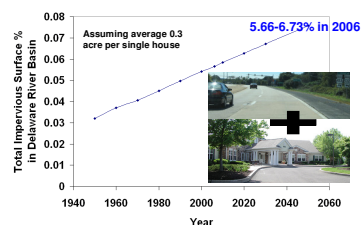


2. Road Mileage Increased by 6.94% between 1994 and 2003

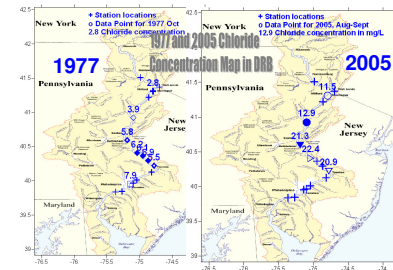


Total Impervious in DRB increased by ~ 75% from 1950 to 2000

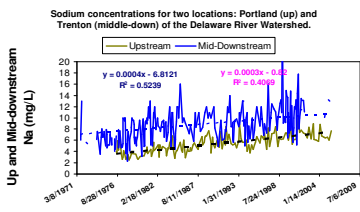
Total Impervious = Housing Impervious + Road Impervious



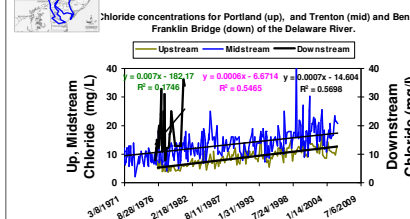
3. Comparison of summer chloride concentrations in Delaware River in 1977 and 2005



4. Time series trends of Na and Cl concentrations of three non-tidal stations in the Delaware River



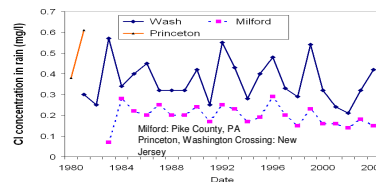
Chloride concentration in the Delaware River at Trenton Station changed by about 4.6 times from 3.5 mg/liter in 1944 to 16 mg/liter in 2004



5. Where do the sodium and chloride come from?

A. Chloride is part of a cyclic salt. Does it come from the rain?

Chloride concentrations in the rain water from three precipitation stations in NJ have not changed in the last 30 years

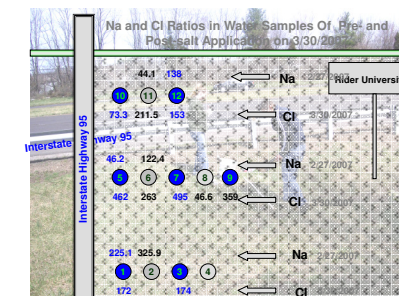


Field Water Sampling Crews

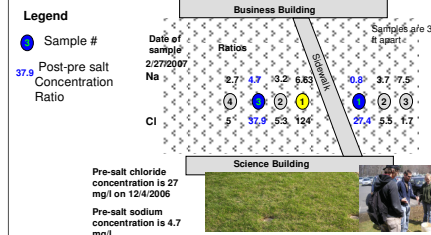


B. Does it come from road salt?

Very likely. On average, the concentrations of Na and Cl in the runoff water along the sides of highway increased more than 100 times in the following sampling cycles. Pre-salt runoff water was collected on 12/4/2006.



Na & Cl Ratios in Runoff Water Samples of Pre- and Post-salt Application along I-95 (upper) and a Sidewalk at Rider University (lower)



Conclusions

1. There is a significant increase in the road salt applications in the Delaware River Watershed.
2. There is also a significant increase in the concentrations of sodium and chloride in the Delaware River over the past 40 years.
3. Increase of sodium and chloride concentrations in the runoff water collected before and after the winter salt application along the roadsides is very large.