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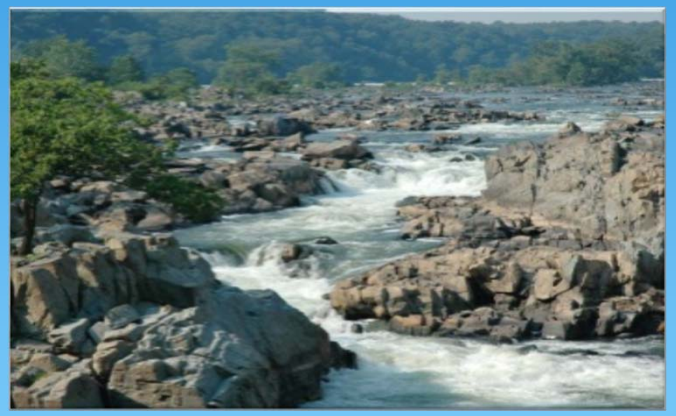
Road Salts and their Impact to our Source of Drinking Water: The Potomac River



Salt Management in the Washington Region Environmental and Transportation Perspectives

June 27, 2016

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- Single-purpose not-for profit agency
- Serves almost 2 Million Virginians
- Nearly $2 Billion in Infrastructure Assets
- Total Max Day Capacity = 375 MGD
- 10-Year CIP of $720 M

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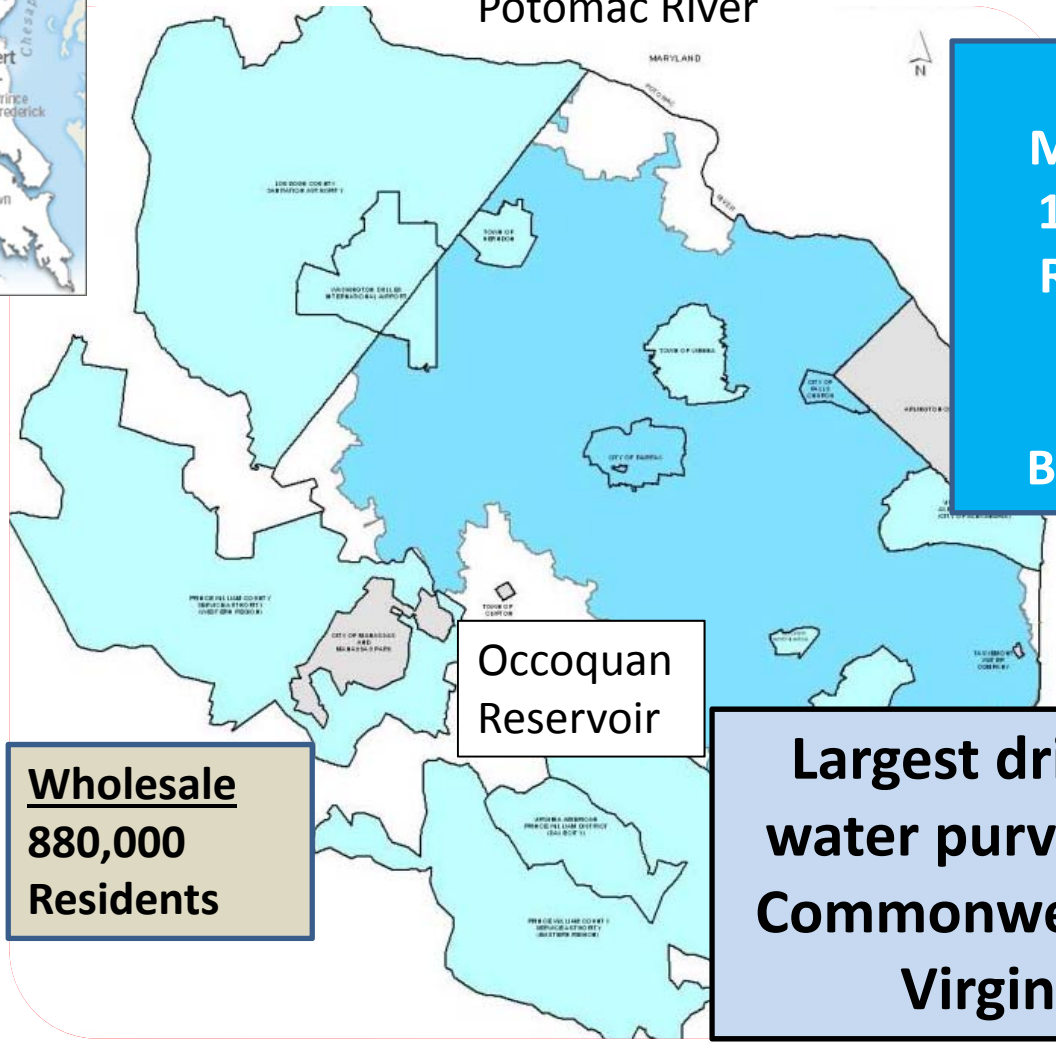
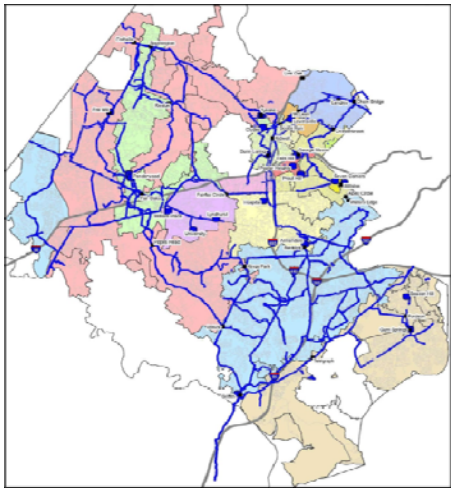
Potomac River



Retail
More than 1,075,000 Residents and 11,000 Businesses

Occoquan Reservoir



Wholesale
880,000 Residents

Largest drinking water purveyor in Commonwealth of Virginia

Water Quality Trends

- Increasing Source Water Sodium and Chloride Concentrations
  - Seasonal Spikes
  - Secondary Drinking Water Standards and Advisory Levels
- Increasing trend for Bromide (Br-)
  - Commonly exists in the form of salts (sodium, potassium) from natural sources (rocks, soil)
- Potomac and Occoquan trends consistent with other regional and national studies

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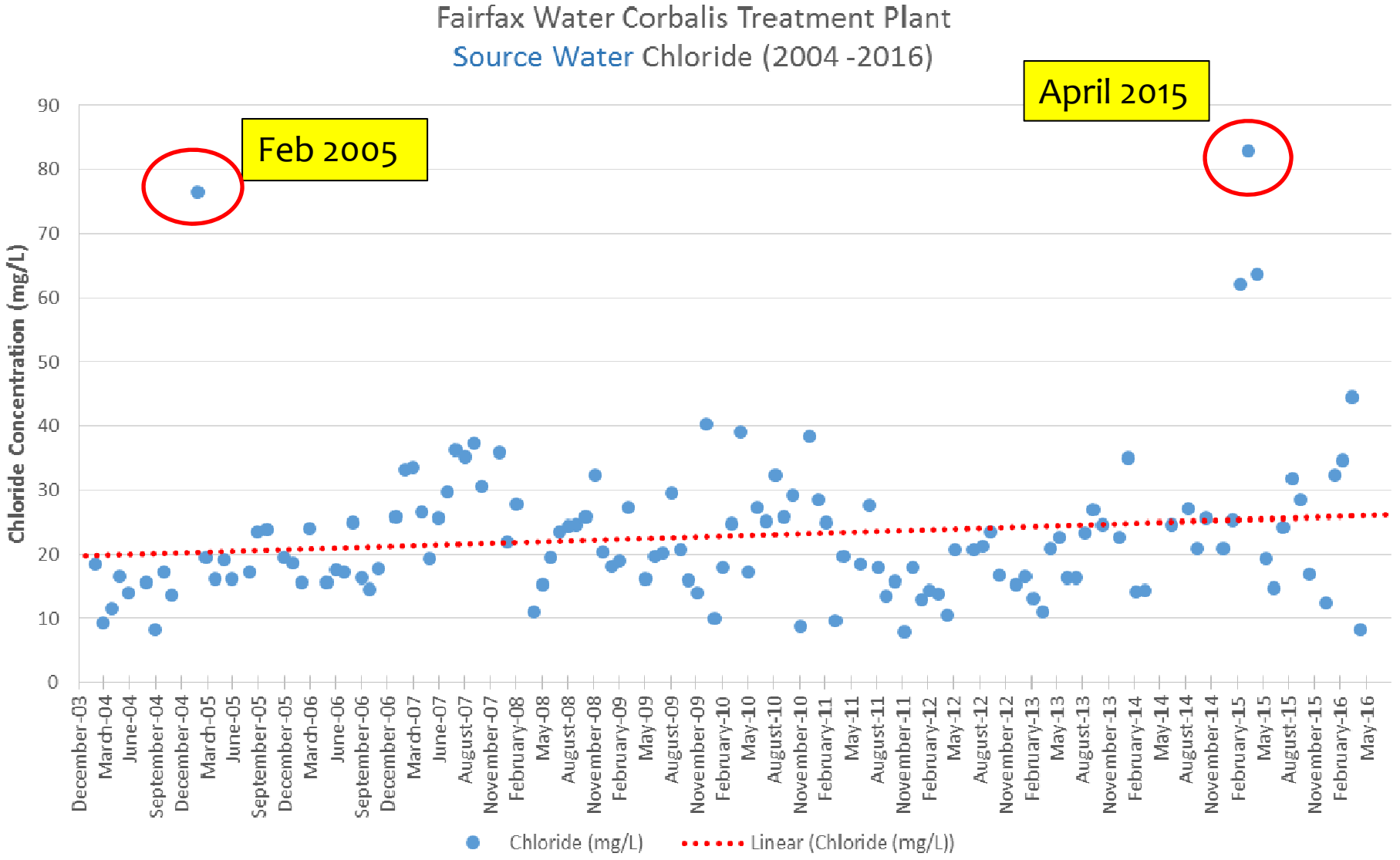

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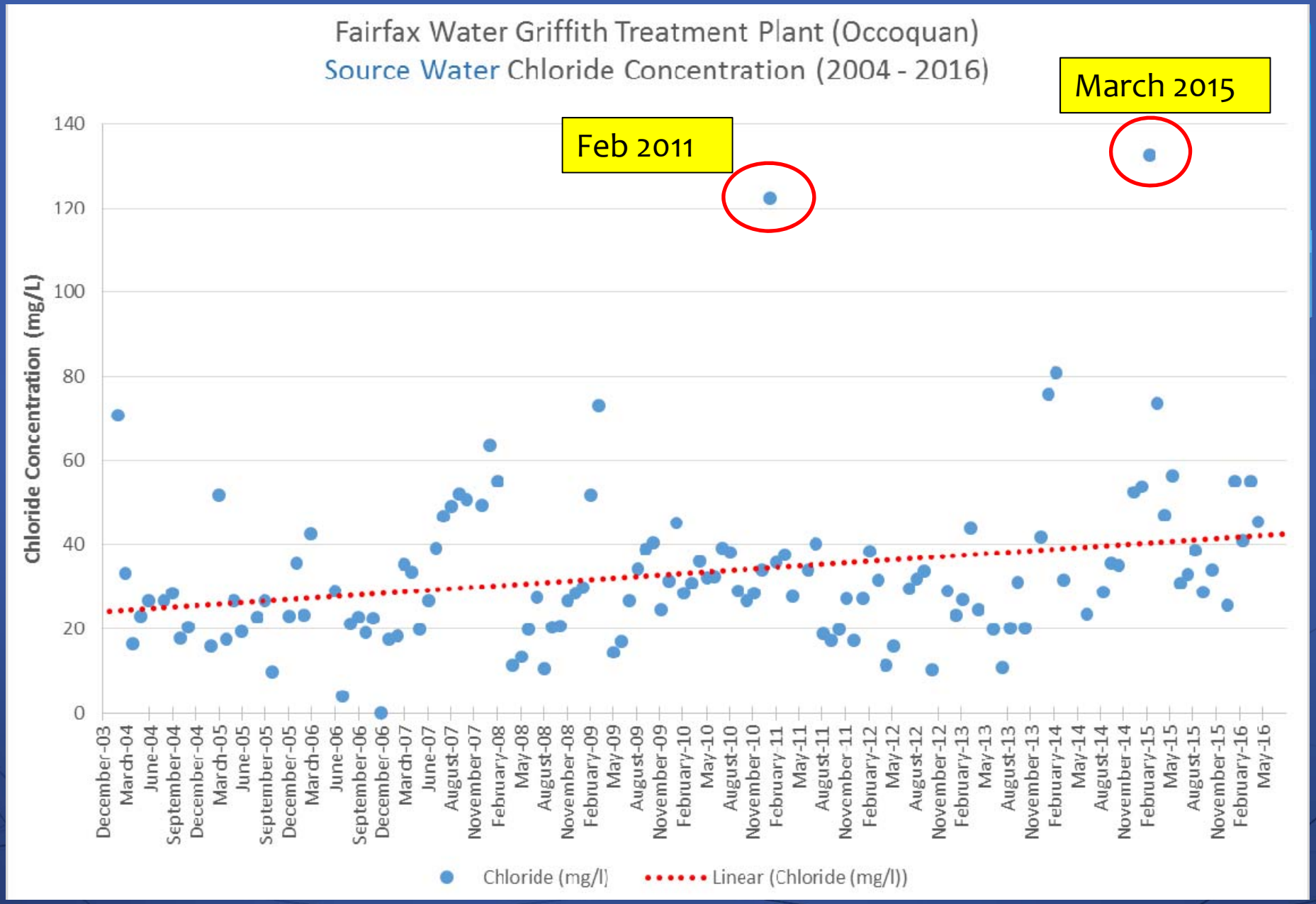

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Bromide and Bromate

- Where present in the water, reactions between ozone or chlorine and naturally occurring organic matter form disinfection by products (DBPs) such as bromate

$$Br^{-}\ (\text{bromide}) + O^{3}\ (\text{ozone}) \rightarrow BrO^{-}{}^{3}\ (\text{bromate})$$

- Bromate Regulatory Compliance and Goals
  - Maximum Contaminant Limit (MCL)= 0.010 mg/L
  - Maximum Contaminant Limit Goal (MCLG) = zero

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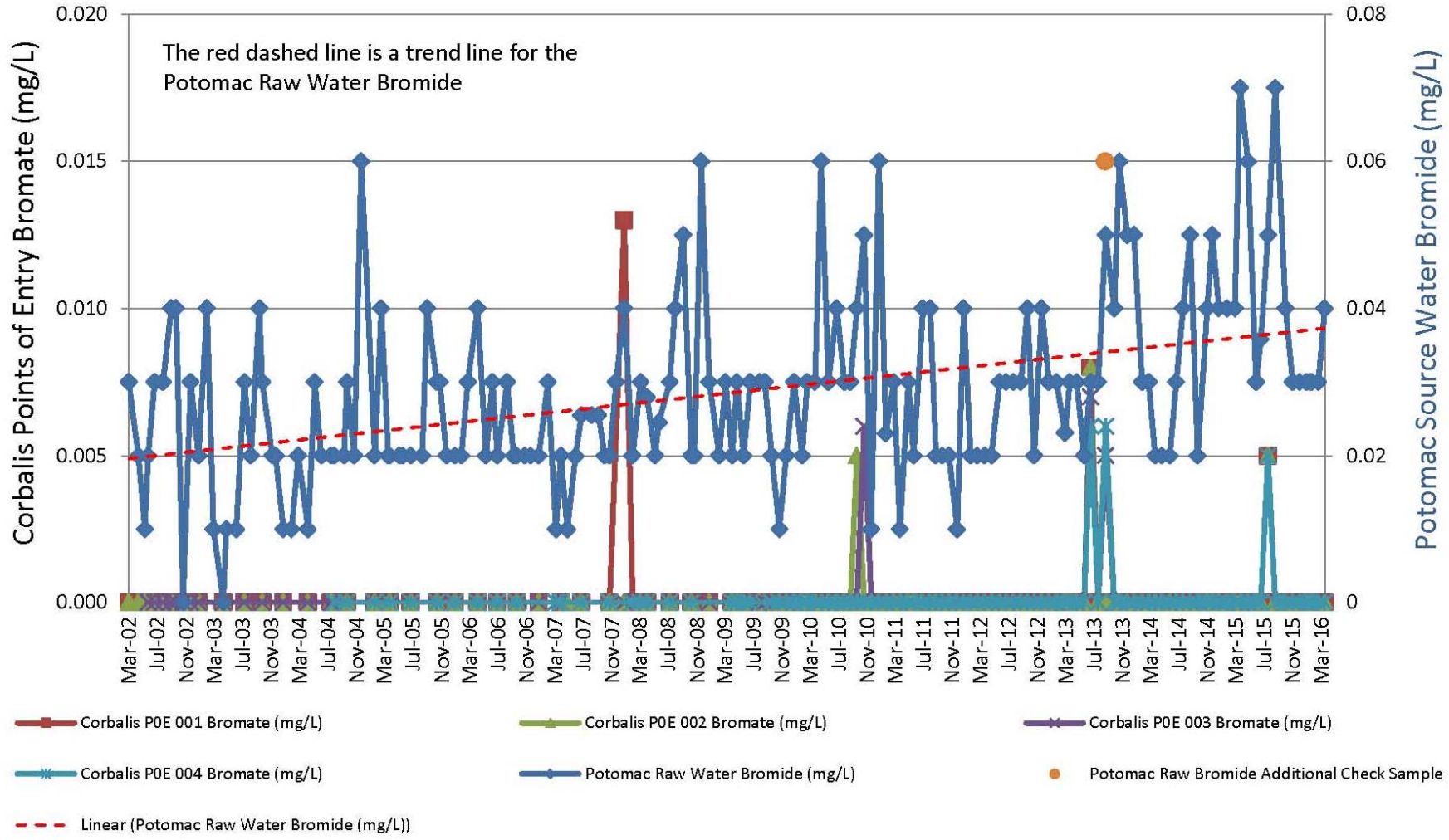
Fairfax Water Corbalis Treatment Plant

Source Water Bromide and Points of Entry Bromate



A plotted result of 0 indicates the result was below the laboratory's reporting level for the test. The reporting level for bromide is 0.01 mg/L. The reporting level for bromate is 0.005 mg/L (prior to July, 2007 the bromate reporting level was 0.01 mg/L).

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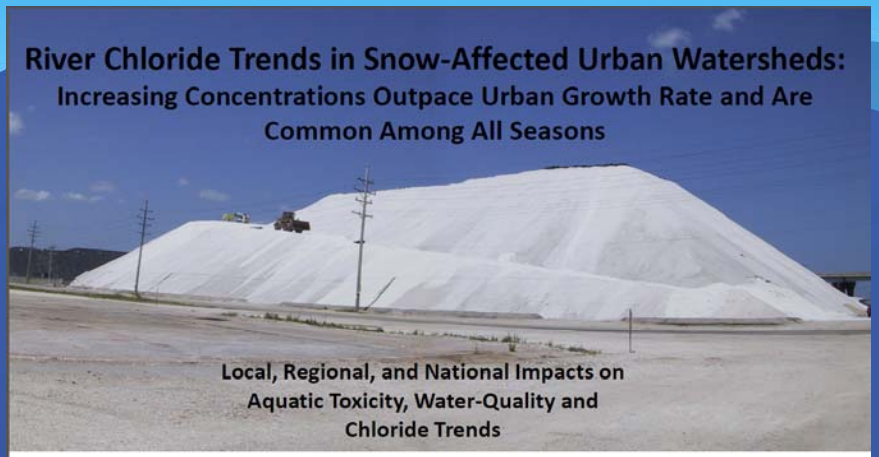
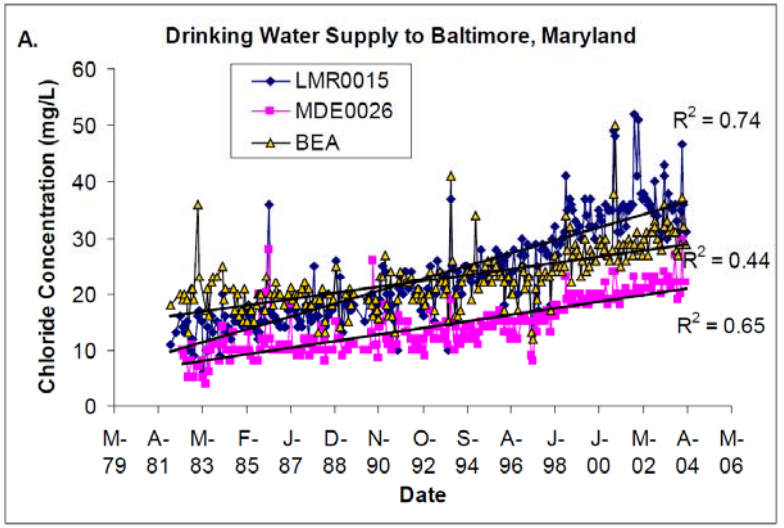
Consistent with other studies





Kaushal et al. (2005) *PNAS*

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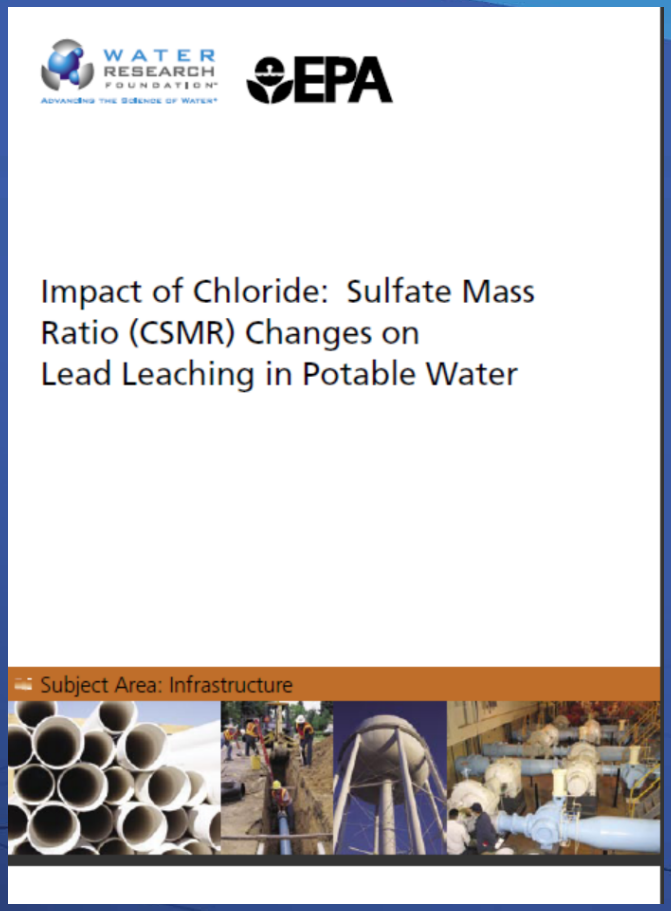
Other Water Quality Issues



Title: Effect of long-term changes in soil chemistry induced by road salt applications on N-transformations in roadside soils.

Sophie M. Green*, Robert Machin and Malcolm S. Cresser
Environment Department, University of York, Heslington, York, Y010 5DD, UK

Abstract:
Of several impacts of road salting on roadside soils, the potential disruption of the nitrogen cycle has been largely ignored. Therefore the fates of low-level ammonium-N and nitrate-N inputs to roadside soils impacted by salting over an extended period (decades) in the field have been studied. The use of road salts disrupts the proportional contributions of nitrate-N and ammonium-N to the mineral inorganic fraction of roadside soils. It is highly probable that that the degree of salt exposure of the soil, in the longer term, controls the rates of key microbial N transformation processes, primarily by increasing soil pH. Additional influxes of ammonium-N to salt impacted soils are rapidly nitrified therefore and, thereafter, increased leaching of nitrate-N to the local waterways occurs, which has particular relevance to the Water Framework Directive. The results reported are important when assessing the fate of inputs of ammonia to soils from atmospheric pollution.

"Capsule": Road salting effects ammonification and nitrification in roadside soils.

Keywords: Road salt, ammonification, nitrification, roadside soils.

1. Introduction:

The application of deicing agents to roads has been widely practised in Europe and North America during winter months since the 1960s to minimise the risk of accidents due to ice and snow and to maintain traffic flow. Several different de-icing agents are available, but most agencies in the UK use sodium chloride, which can be applied to roads as a liquid or solid, depending upon the conditions (Blomqvist and Johansson, 1999). The salt may be relatively pure NaCl, or mixed with grits and sands, and possibly an anti-caking agent such as sodium hexacyanoferrate (II) (Ohno, 1990).

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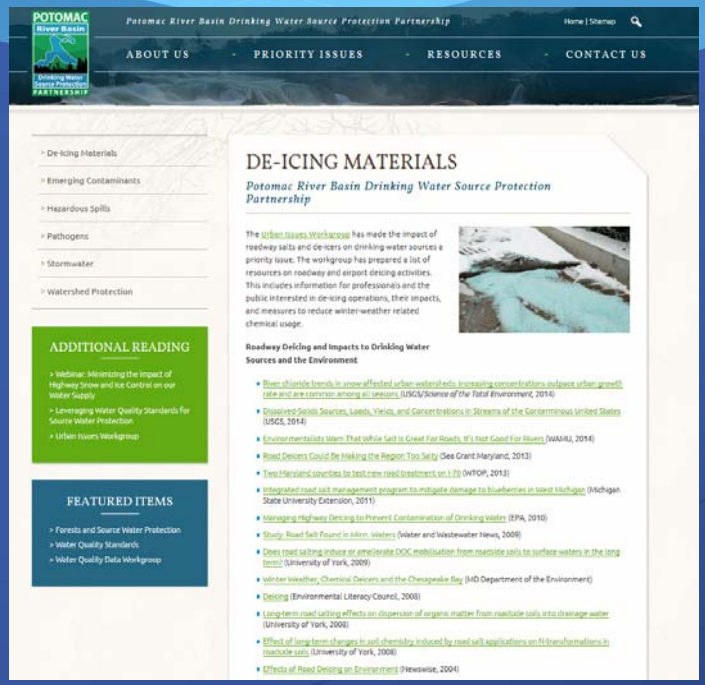
About the Potomac Drinking Water Source Protection (DWSP) Partnership

- Voluntary regional organization
  - Water Utilities
  - State and Federal Agencies
- 20 Signatory Members
- Administrative support by ICPRB
- Focus on Drinking Water
- Impact of De-Icing is a Priority Issue



For Life, For Health
POTOMAC River Basin
Drinking Water Source Protection PARTNERSHIP
Clean Water

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Questions?

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