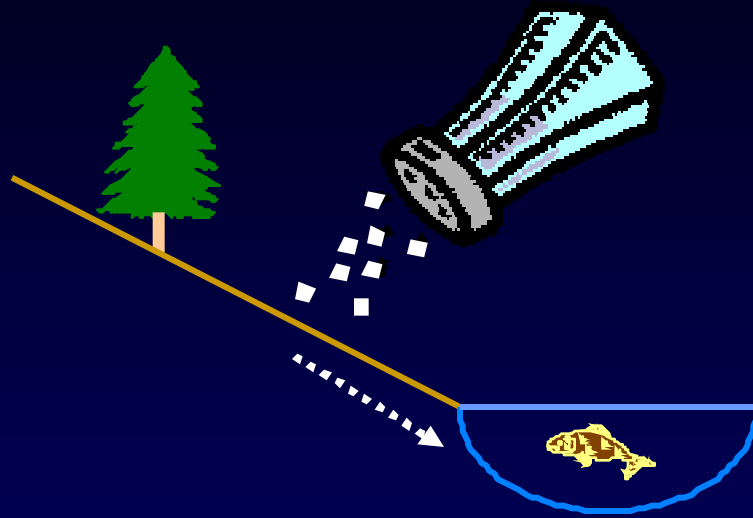


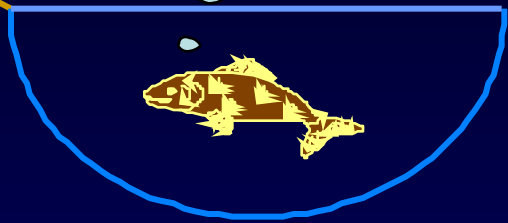
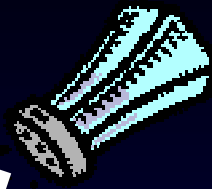
# ***Increasing Cl in northeastern surface waters: an indicator of increasing development pressure***



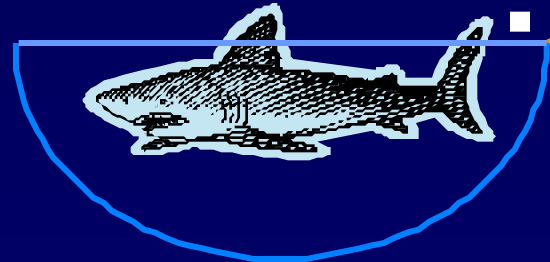
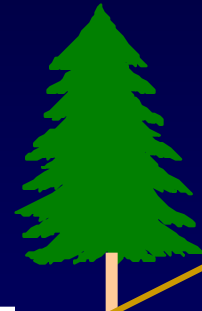
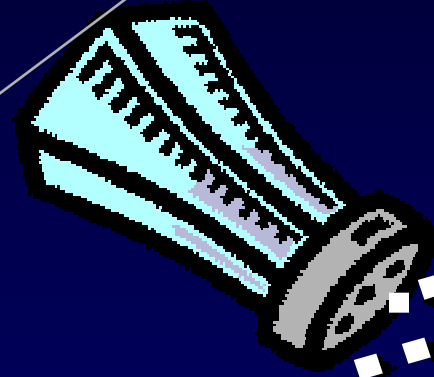
Steve Kahl  
Katherine Webster  
Dari Sassan  
Catherine Rosfjord  
Sarah Nelson  
Melissa Greenawalt-Yelle

*Plymouth State University  
University of Maine  
Plymouth State University  
WV Dept. of Environ. Protection  
University of Maine  
Plymouth State University*

*Why do we care?*



...this?

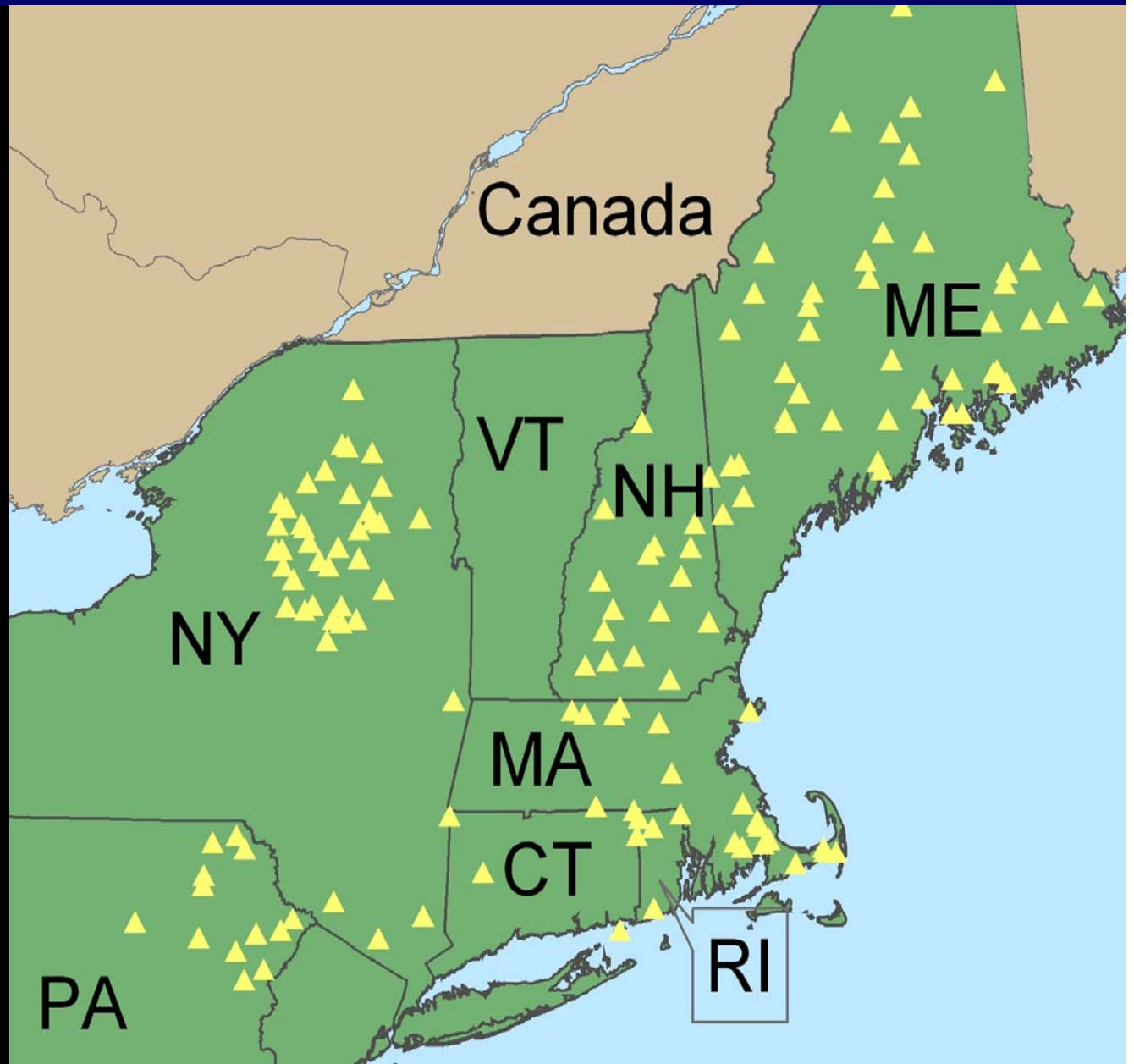


...or this?

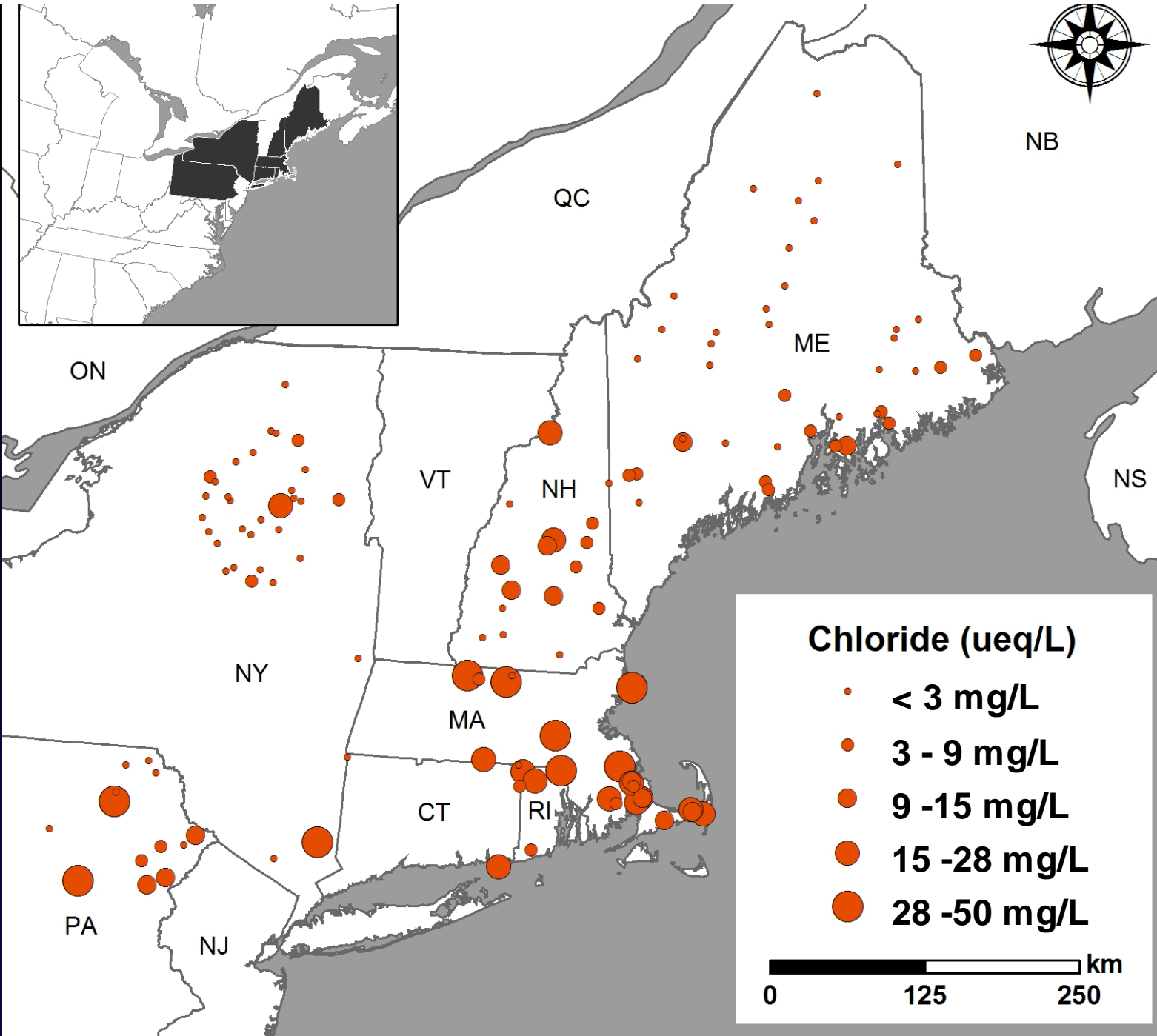
# EPA Eastern Lake Survey (ELS) 1984, 2004

$n=145$

$N=3993$

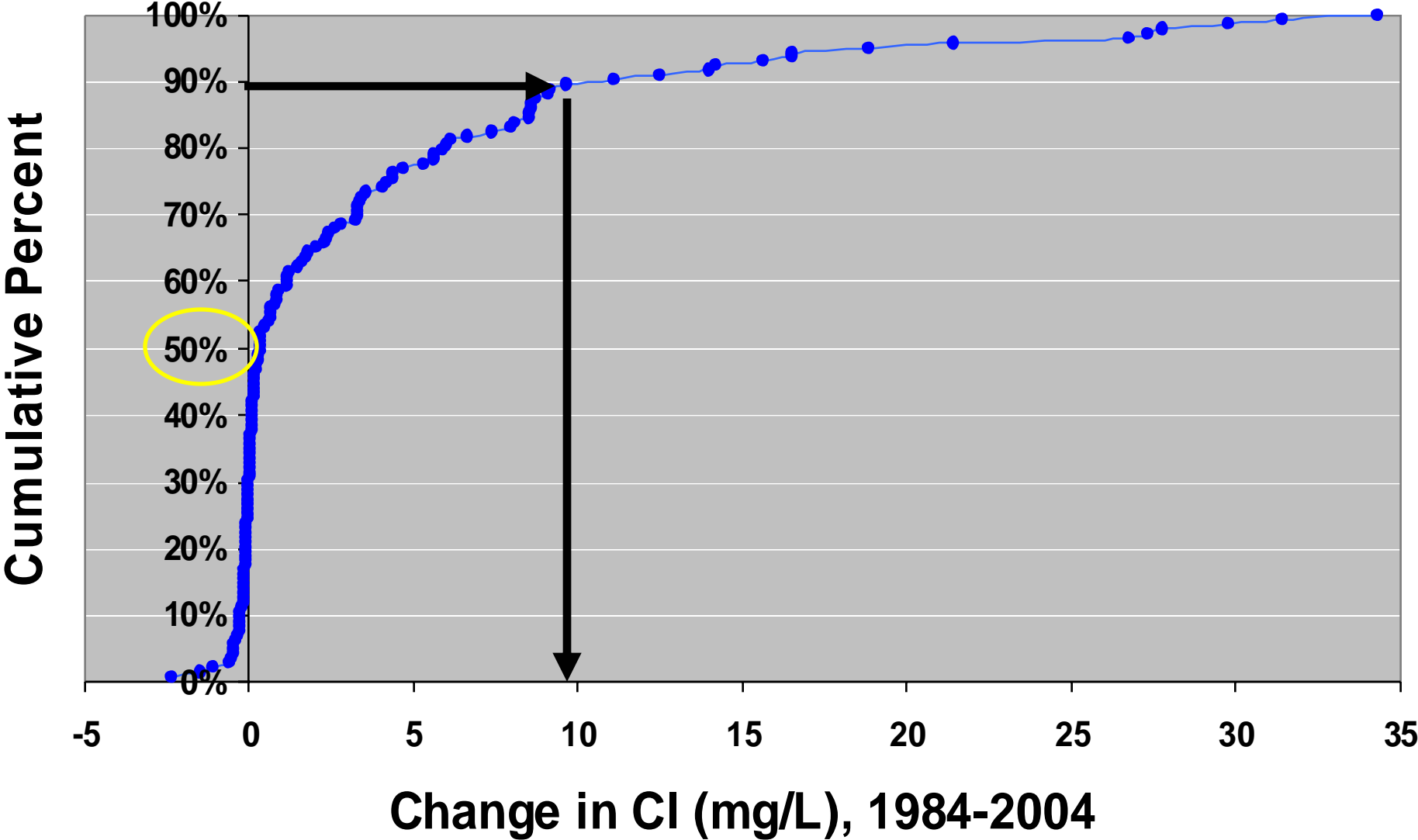


Rosfjord *et al*, in press  
ES&T

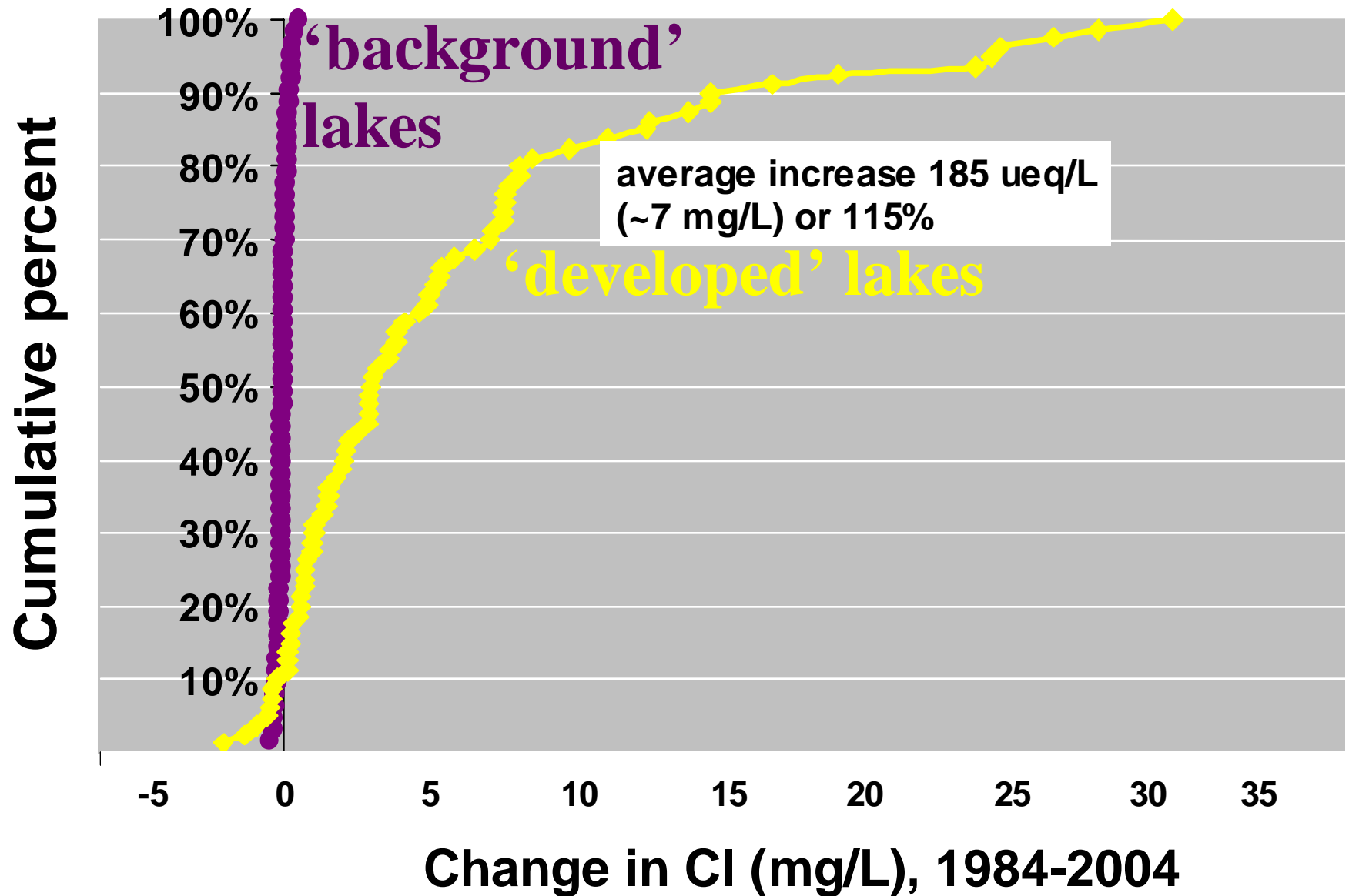


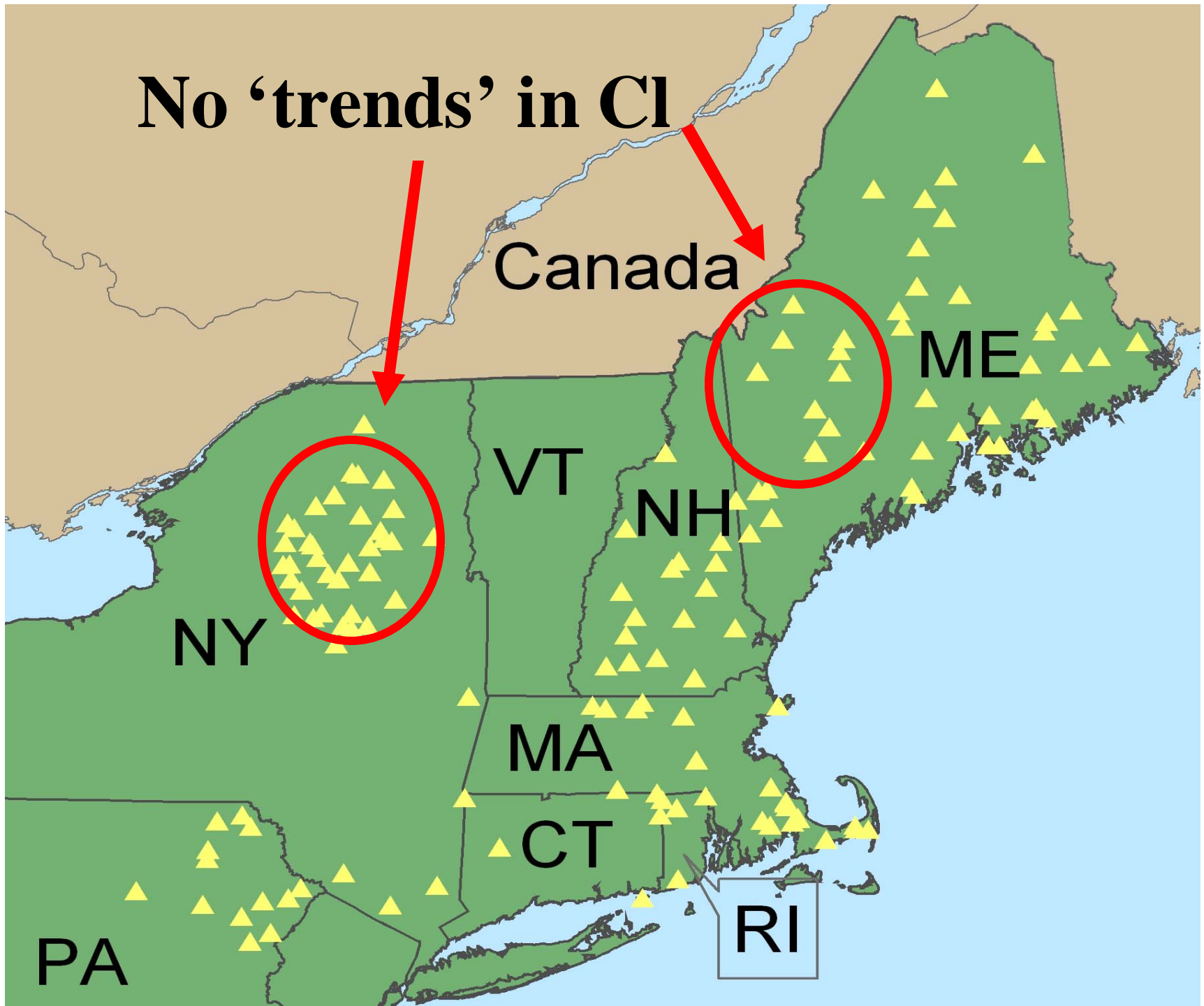
Map points developed by C. Rosford, A. Diamond, S. Nelson, University of Maine Mitchell Center.

# Change in Cl in EPA 1984 ELS lake pop.

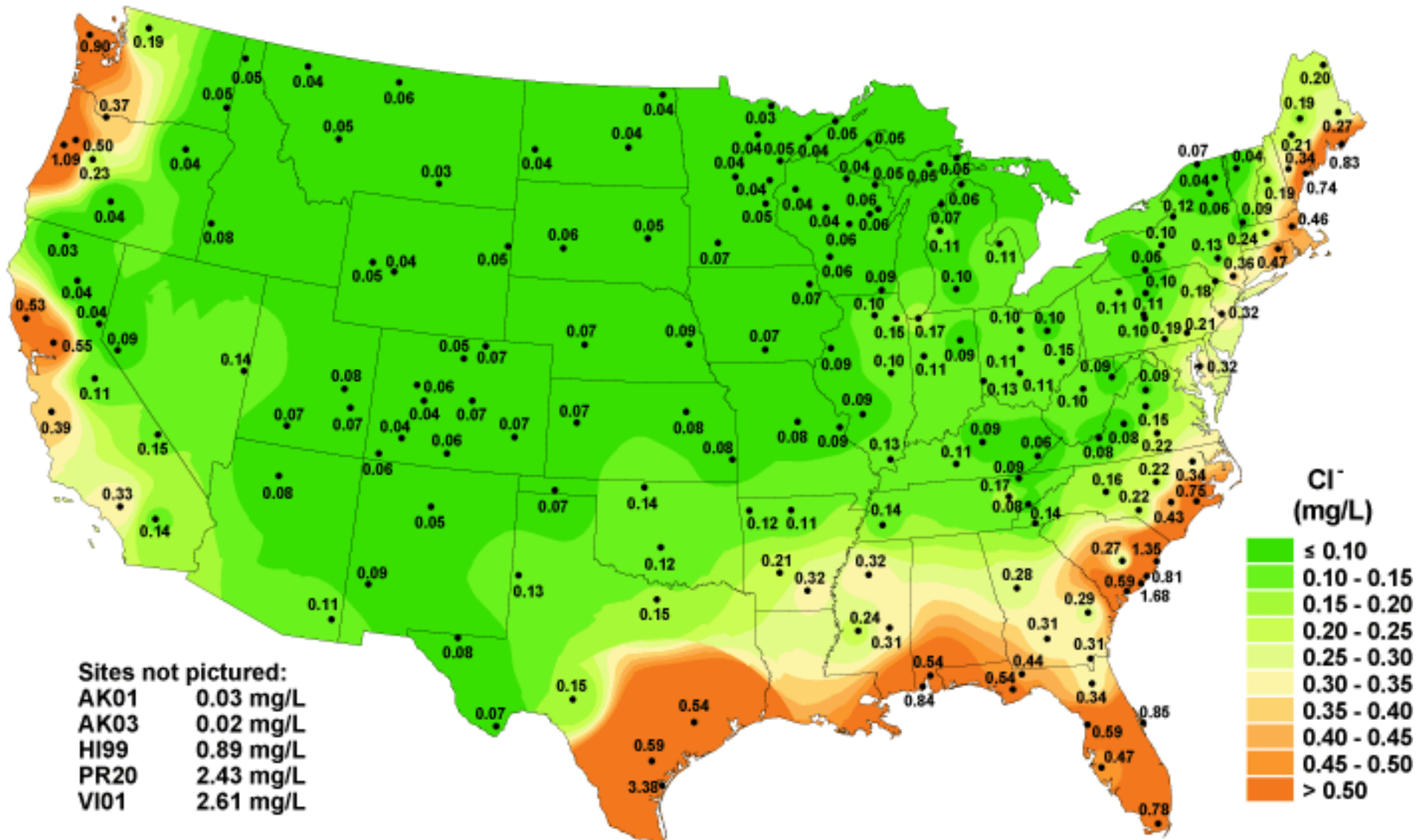


# 20 year changes in chloride, ELS-II lakes



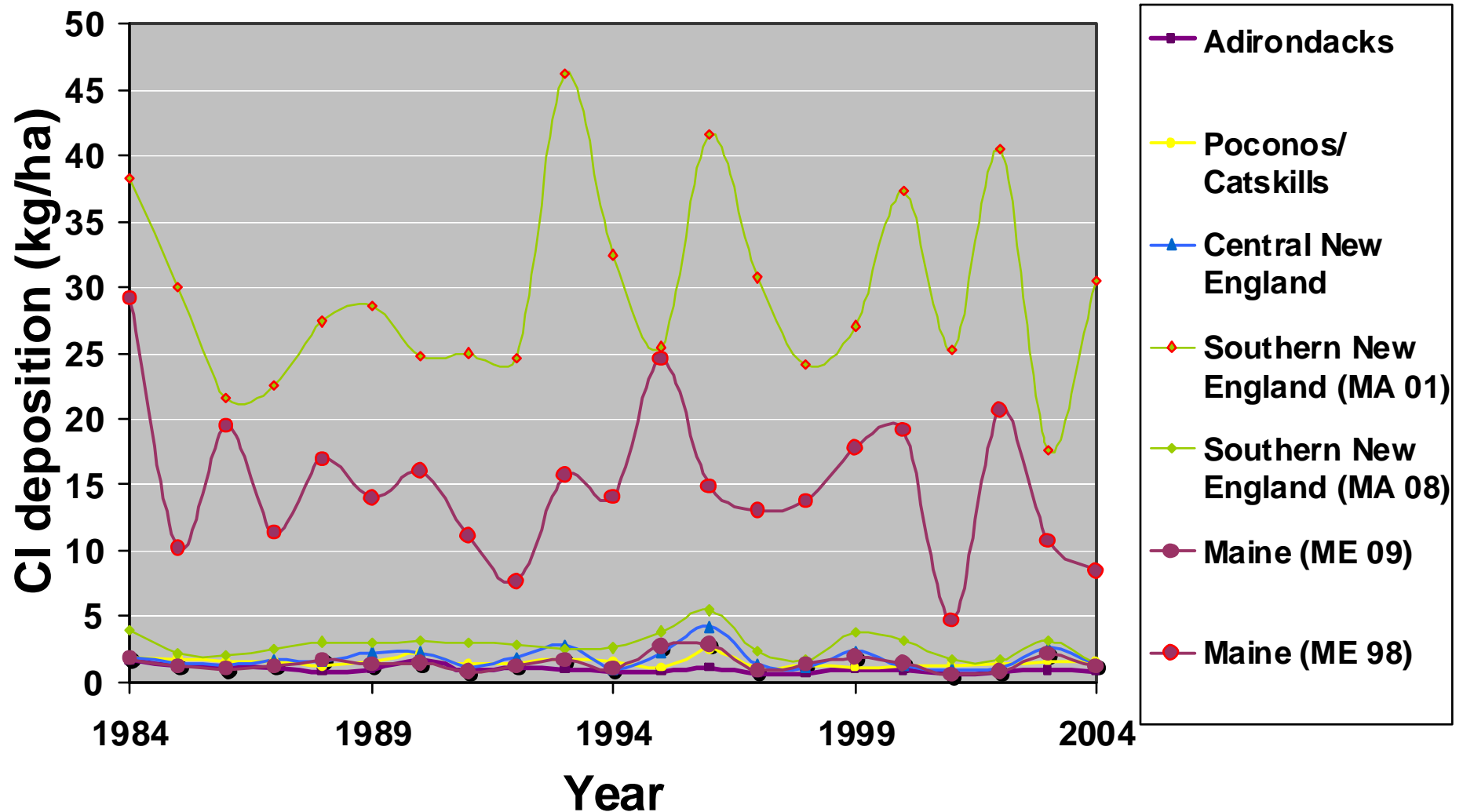


# NADP CI concentration in wet precipitation



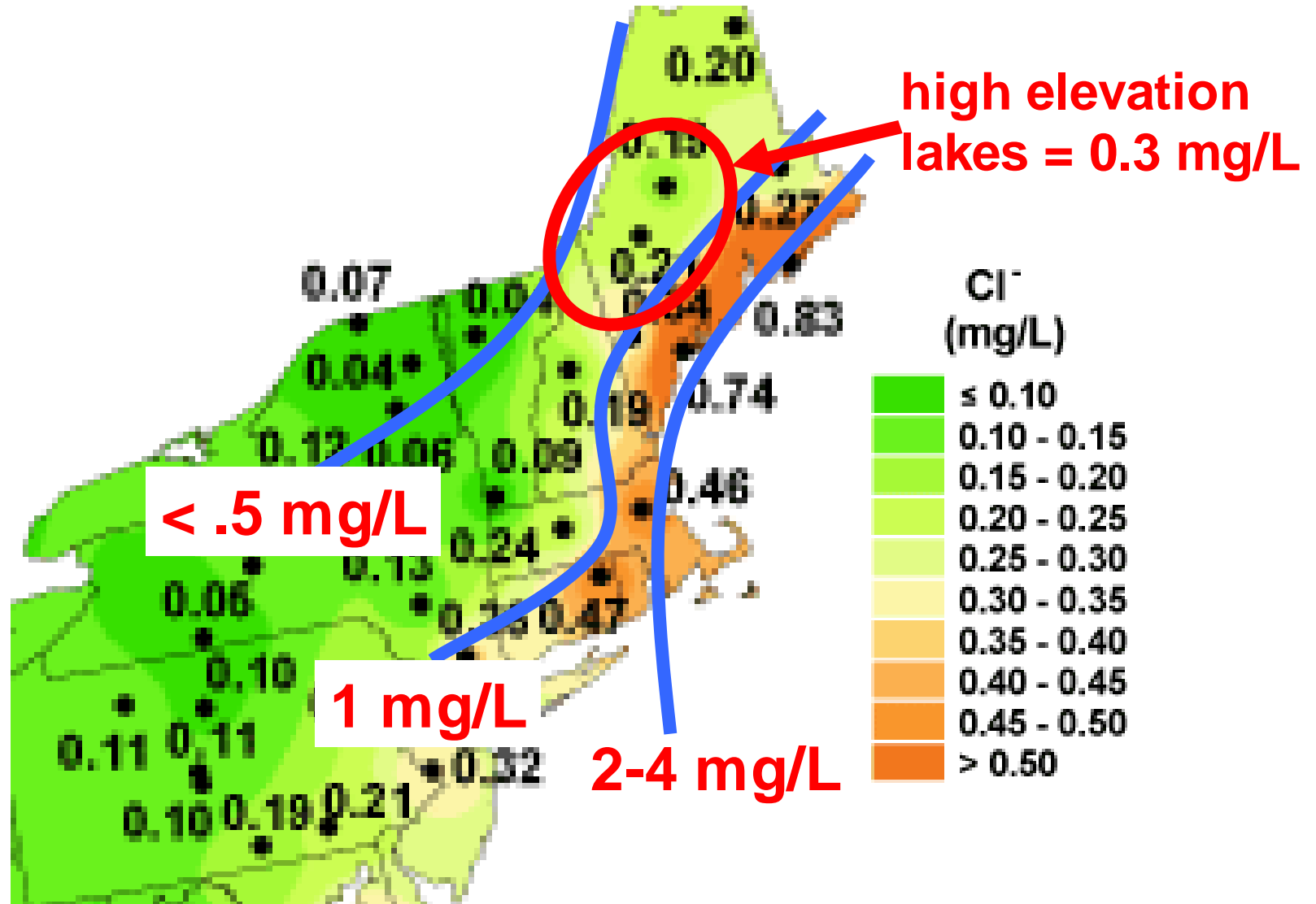
National Atmospheric Deposition Program/National Trends Network  
<http://nadp.sws.uiuc.edu>

# Temporal and spatial patterns in NADP CI deposition

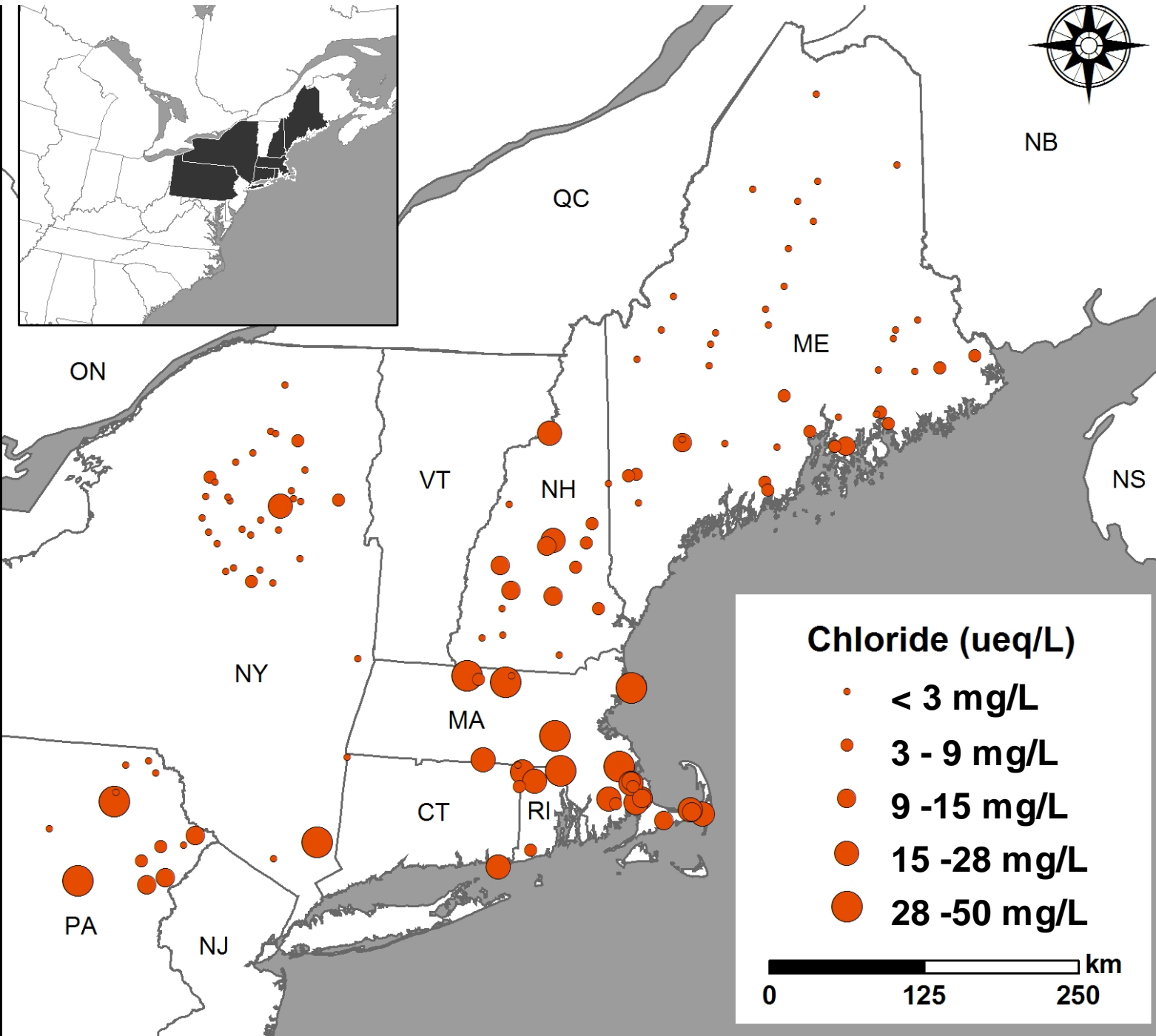


Source: NADP

# Background chloride from atmospheric deposition



National Atmospheric Deposition Program/National Trends Network  
<http://nadp.sws.uiuc.edu>



Map points developed by C. Rosford, A. Diamond, S. Nelson, University of Maine Mitchell Center.

## **Conclusions, Part A**

**CI is much too high in most surface waters...**

**...and it is measurably increasing  
in a timeframe of years**

**Increasing CI may be useful as an indicator of  
over-development**

## **Part B: a CI TMDL in southern NH**

**Limiting development to meet the CI standard?**

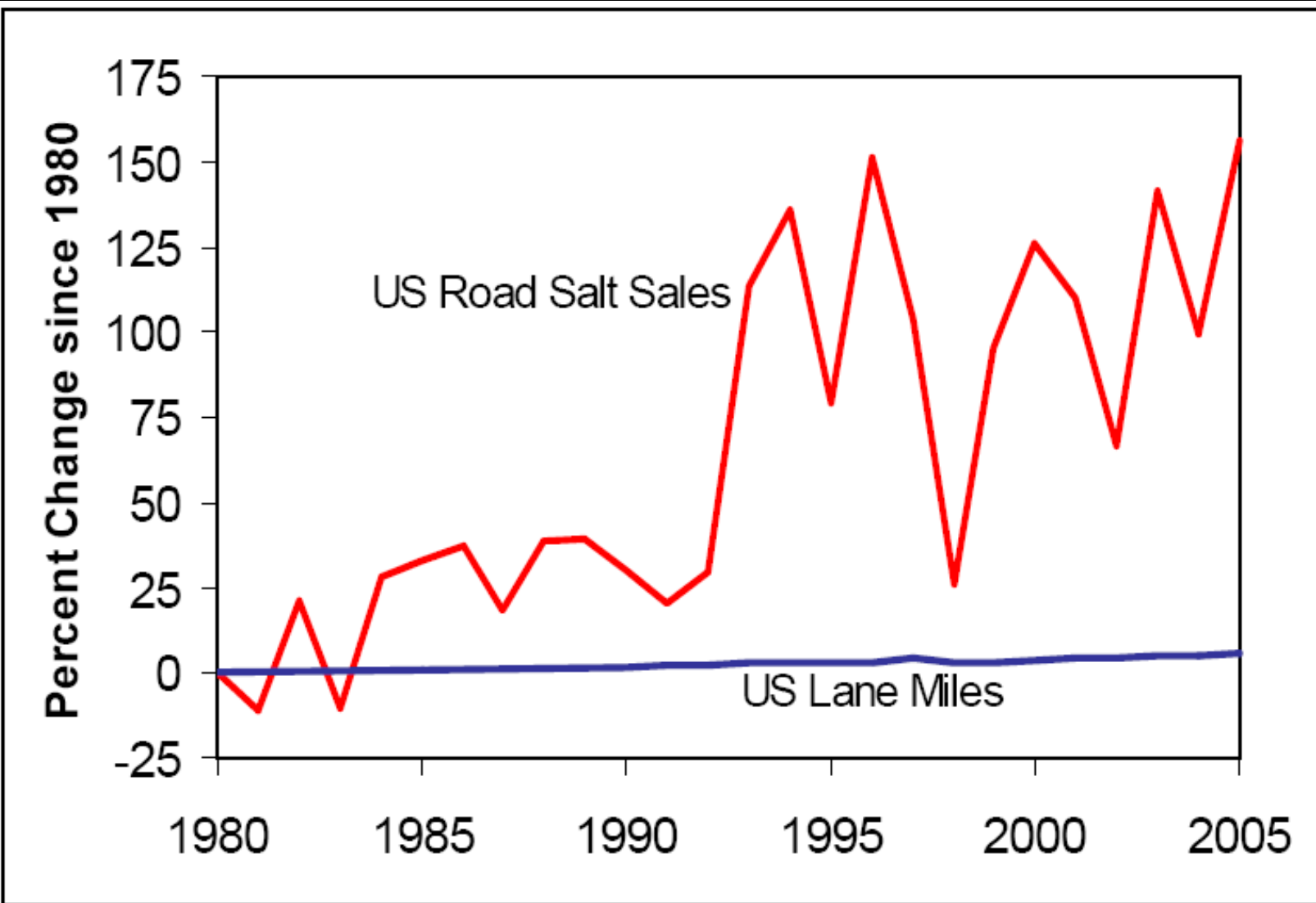
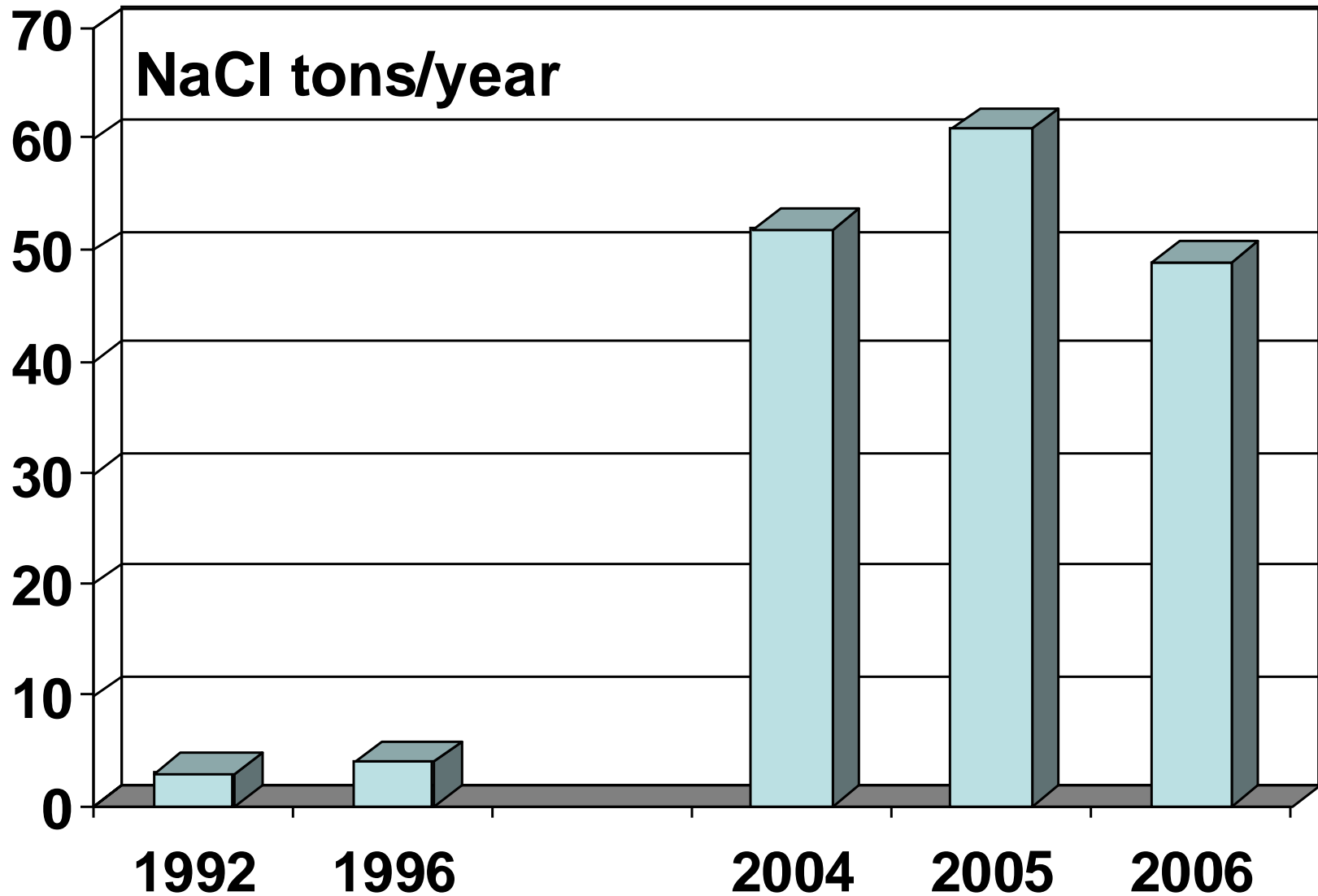


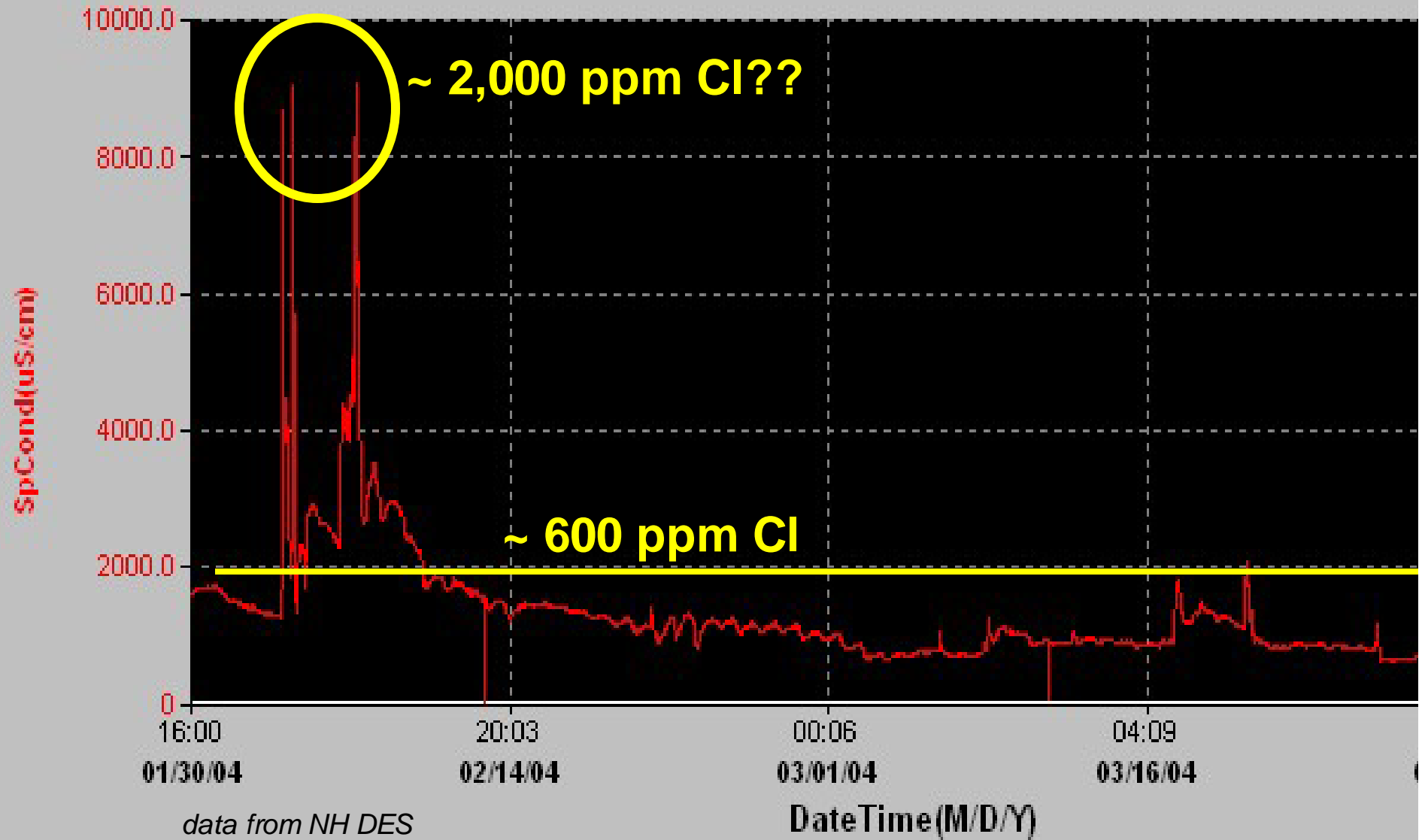
Figure 1. Comparison of percent increase in US lane miles (blue) to percent increase in salt use (red) since 1980. (US Department of Transportation, Salt Institute)

# Historical salt use at 'local' high school



# POLICY BROOK BEHIND ROCKINGHAM MALL, SALEM, NH

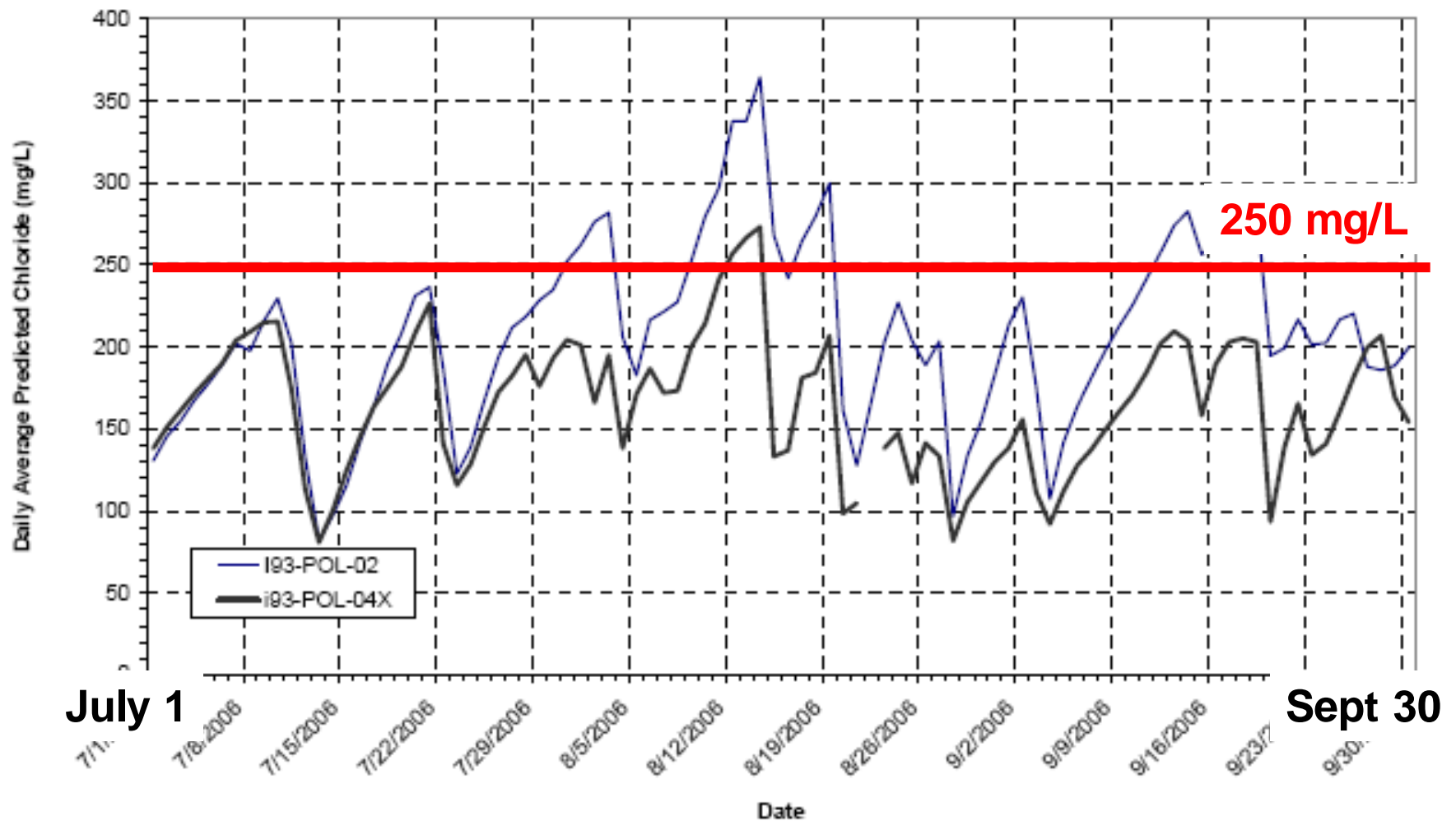
PB07A.DAT



# Average daily predicted Cl during summer 2006, Policy Brook

(data from NH DES)

7/1/2006-9/30/2006, Policy Brook, Salem, NH



# Winter Parking Lot and Sidewalk Maintenance Manual

*June 2006*

*Produced by:*



Minnesota Pollution Control Agency

FORTIN  
CONSULTING, INC.  
serving the environment

CTAP Circuit Training and  
Assistance Program



UNIVERSITY OF MINNESOTA



LTAP  
UNIVERSITY OF MINNESOTA POLLUTION CONTROL AGENCY

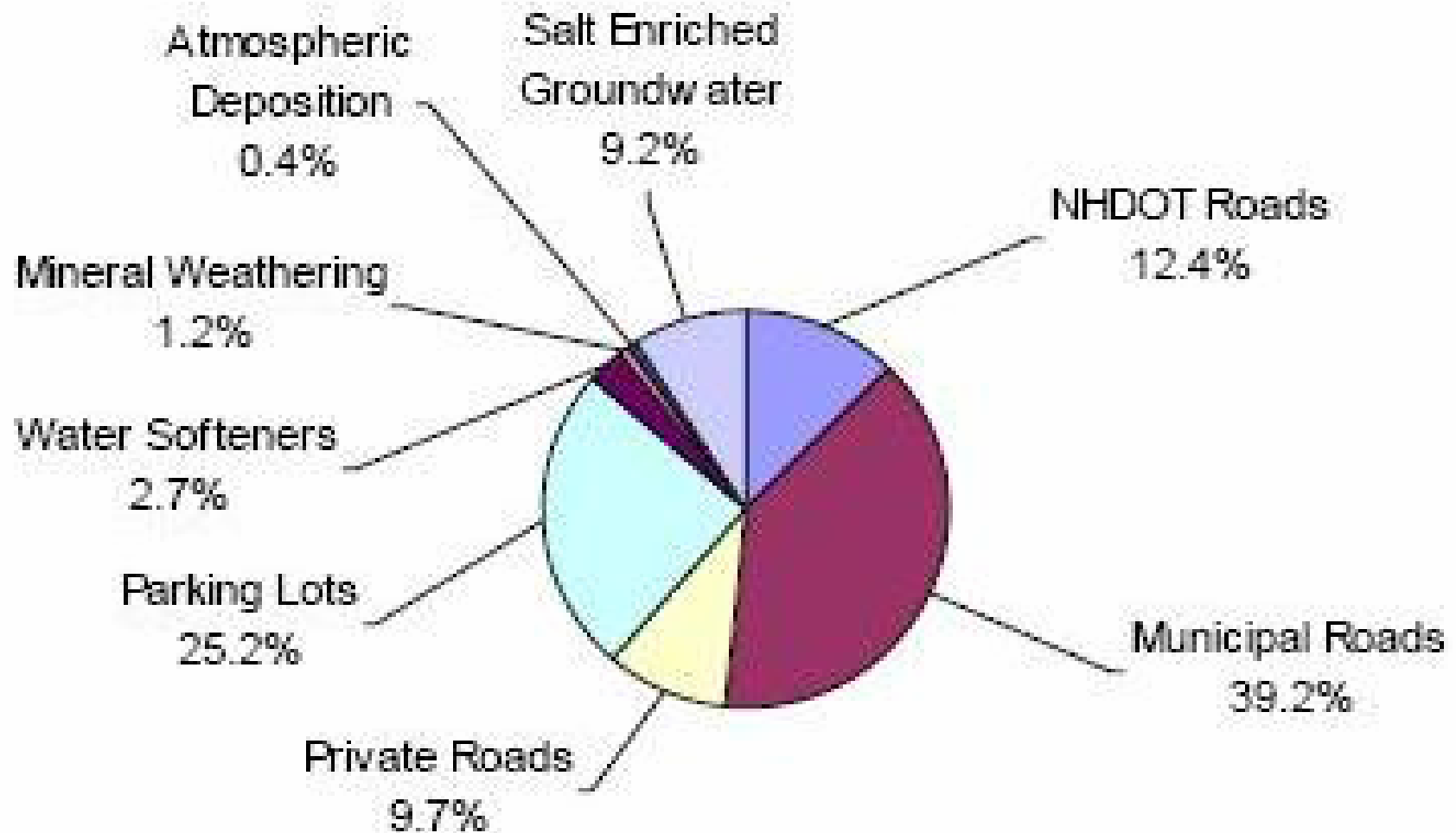
ENVIROTECH  
SCIENCE, INC.

Cardwell Lawn Care & Landscaping  
Saving Our Customers  
And The Environment

GGP General Growth Properties, Inc.

Scott  
ESTABLISHED 1915

## Controlling sources for a TMDL (estimates from NH DOT)



# Municipal Salt Piles



(yes)



(no)




Snow pile

Salt pile

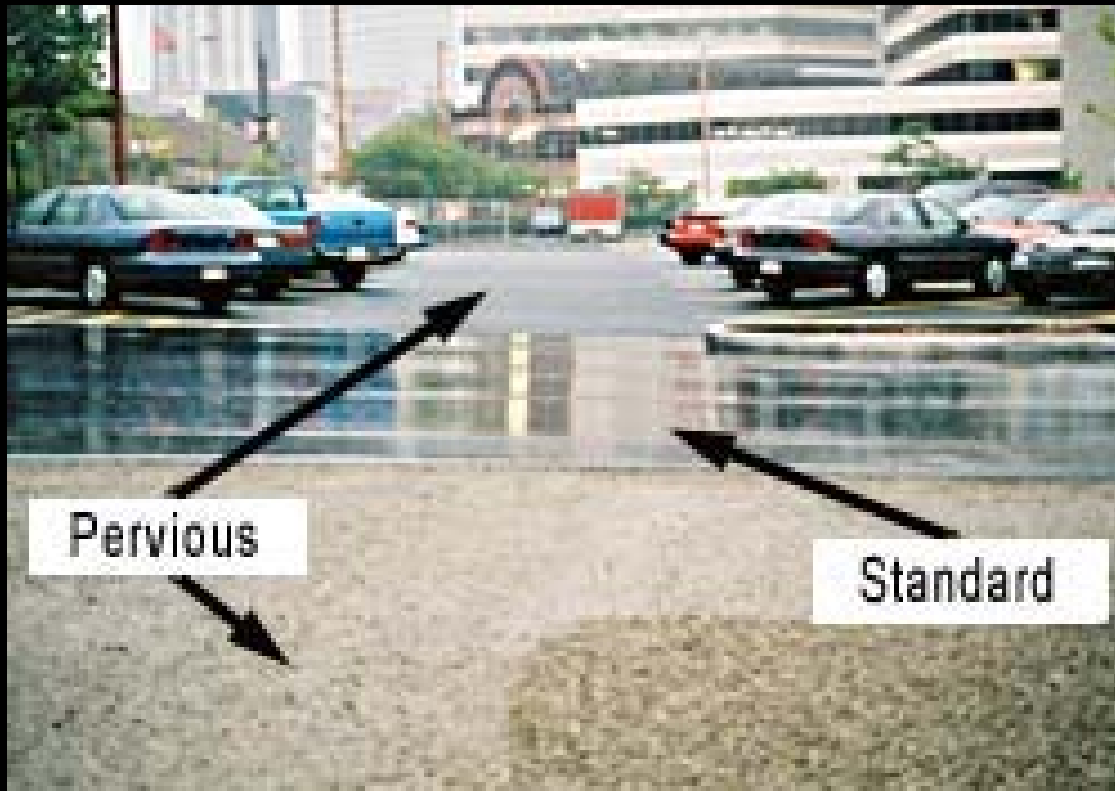
Storm drain connects to surface water

***Avoid storing snow up-gradient of the salt pile***

- 
- aggressive physical removal
  - of snow;
  - metering applications;
  - sweeping excess

*Re-crystallized excess  
salt in mall parking lot*

*new solutions*



**pervious pavement and  
concrete; less water means  
less ice**



## **Conclusions, Part B**

**CI control is going to be necessary in some locales**

**CI BMPs will require a new way of thinking**

**Is dilution still the solution to (CI) pollution?  
(DEP, 1980s)**



<http://www.boatnerd.com/news/newpictures02/salt3-23-02-al.jpg>