

Chloride in Urban Streams in Maine

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Prepared for Salt Management Group
Meeting 09/13/2011

Chloride in the Baltimore Long-Term Ecological Research (LTER) site

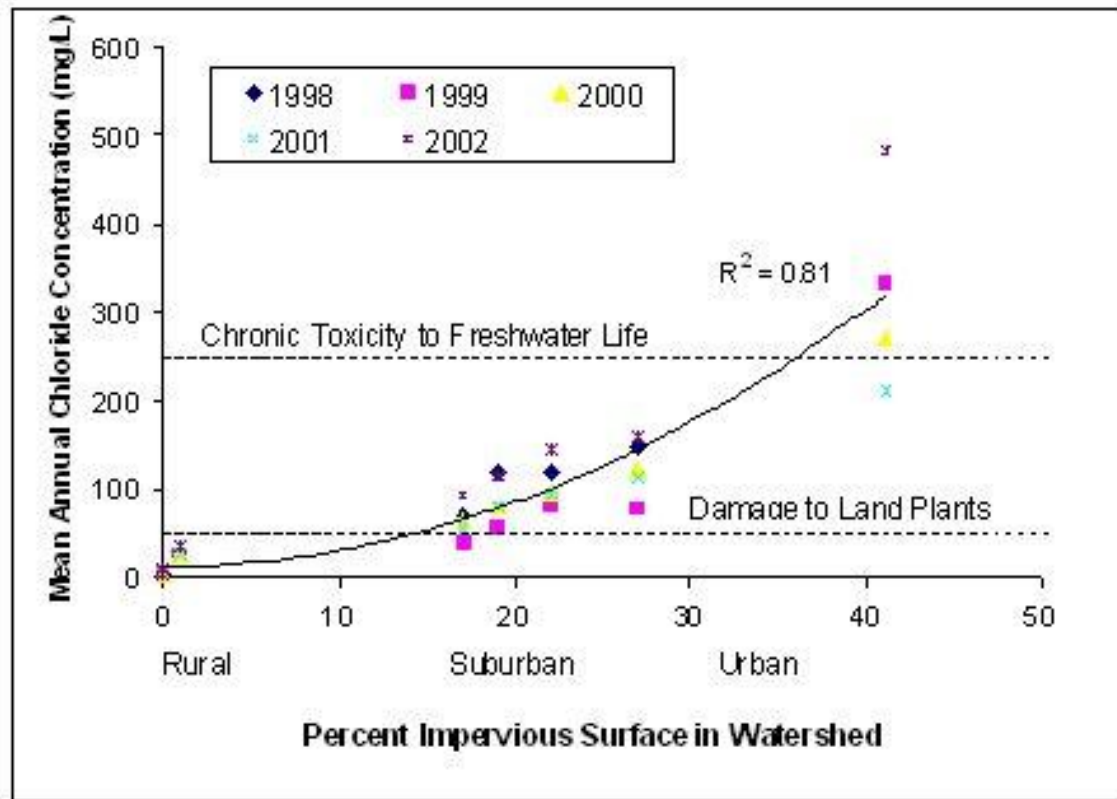
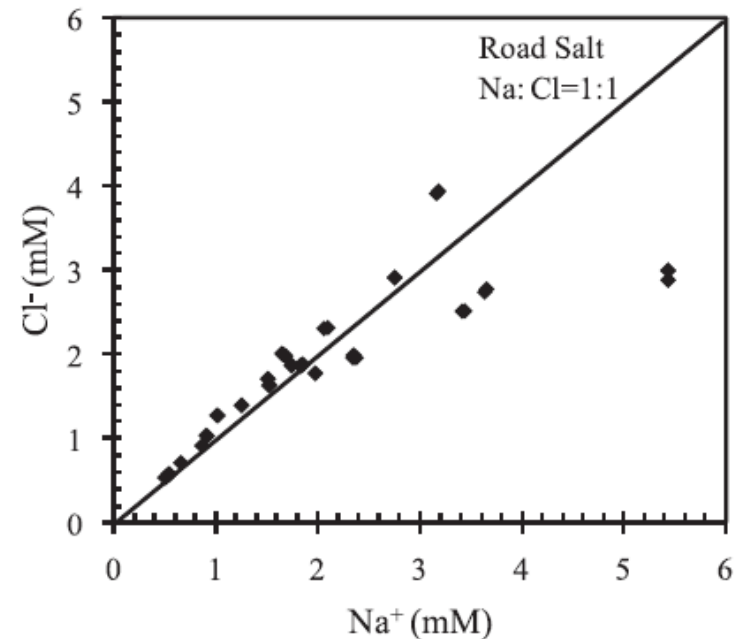


Figure 2. Relationship between impervious surface and mean annual concentration of chloride in BES streams during a five-year period ($R^2 = 0.81$). Sites are located along a gradient of urbanization (Kaushal et al. 2005). Dashed lines indicate thresholds for damage to some land plants and for chronic toxicity to sensitive freshwater life (EPA 1988)

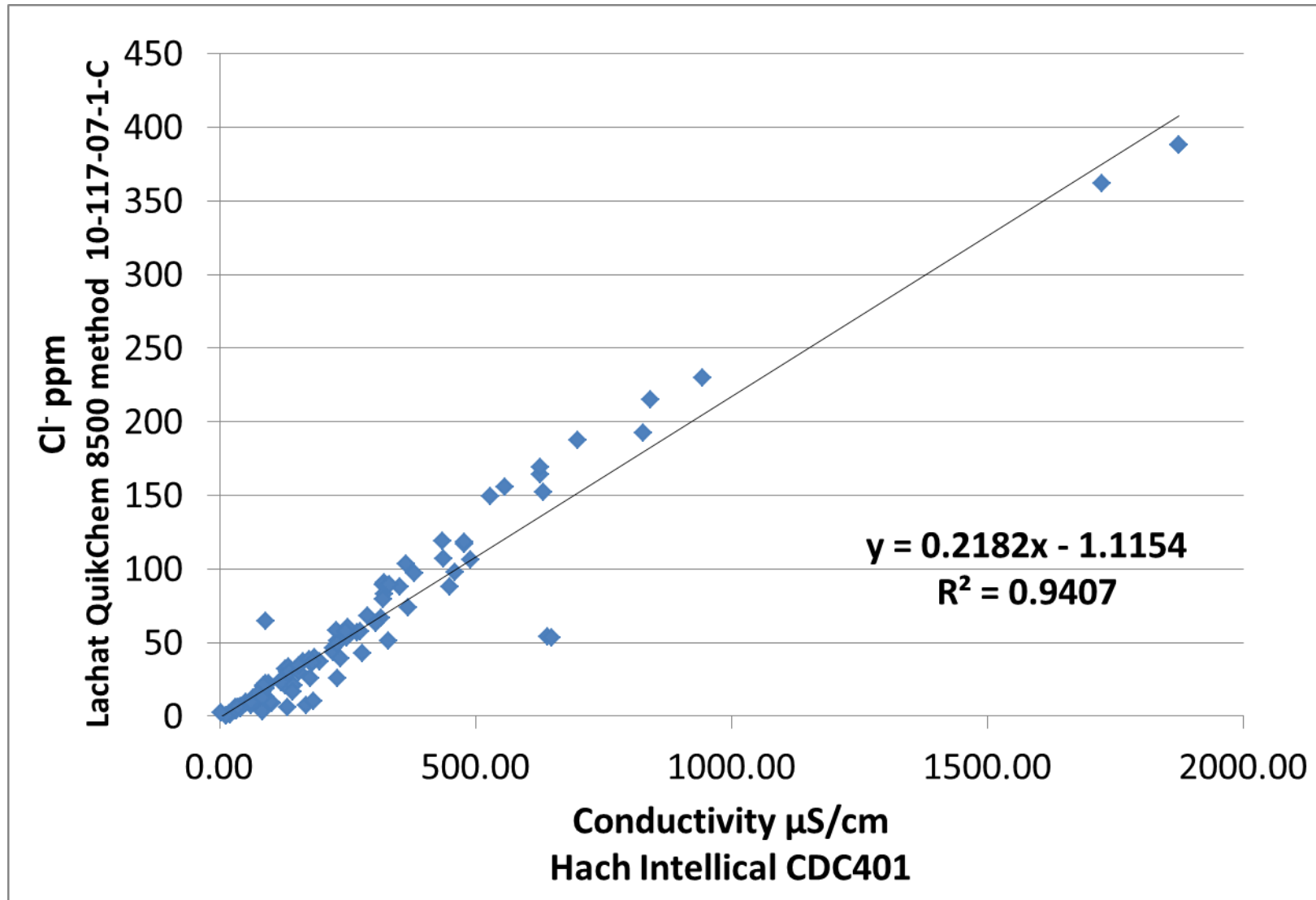
Tracking Chloride Sources

- Cl^- source was tracked in Fishkill Creek, NY using elemental ratios (Jin et al. 2011)
 - $\text{Cl}:\text{Br} < 2000$ indicates marine influences (Mullaney et al. 2009)
 - $\text{Na}:\text{Cl} = 1:1$ indicates road salt influences and direct flowpaths.
 - Other deicers will be different
 - Cl^- from road salt 85%
 - Cl^- from home water softeners 12%



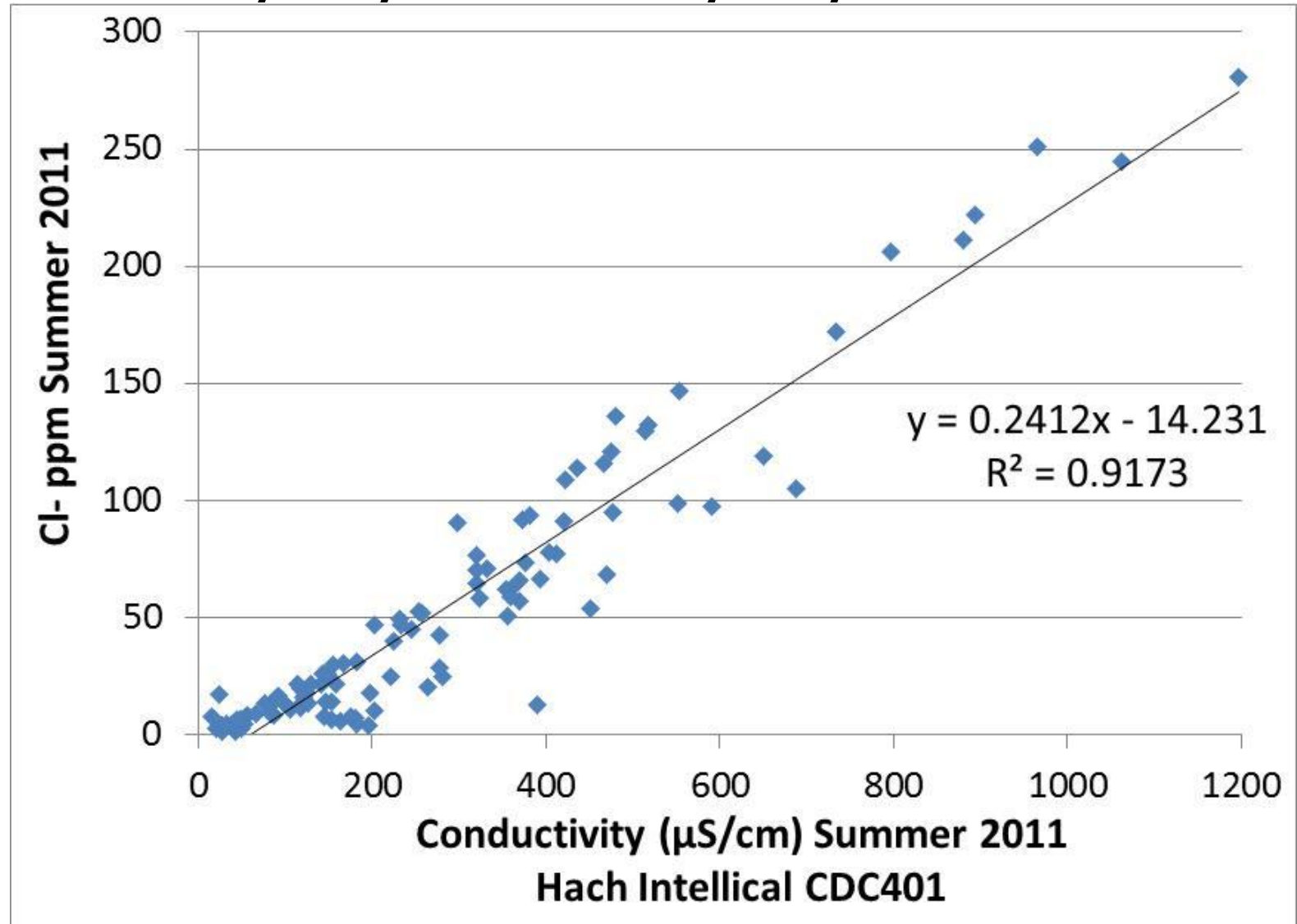
Maine Chloride – Conductivity

04/28/2011-5/14/2011

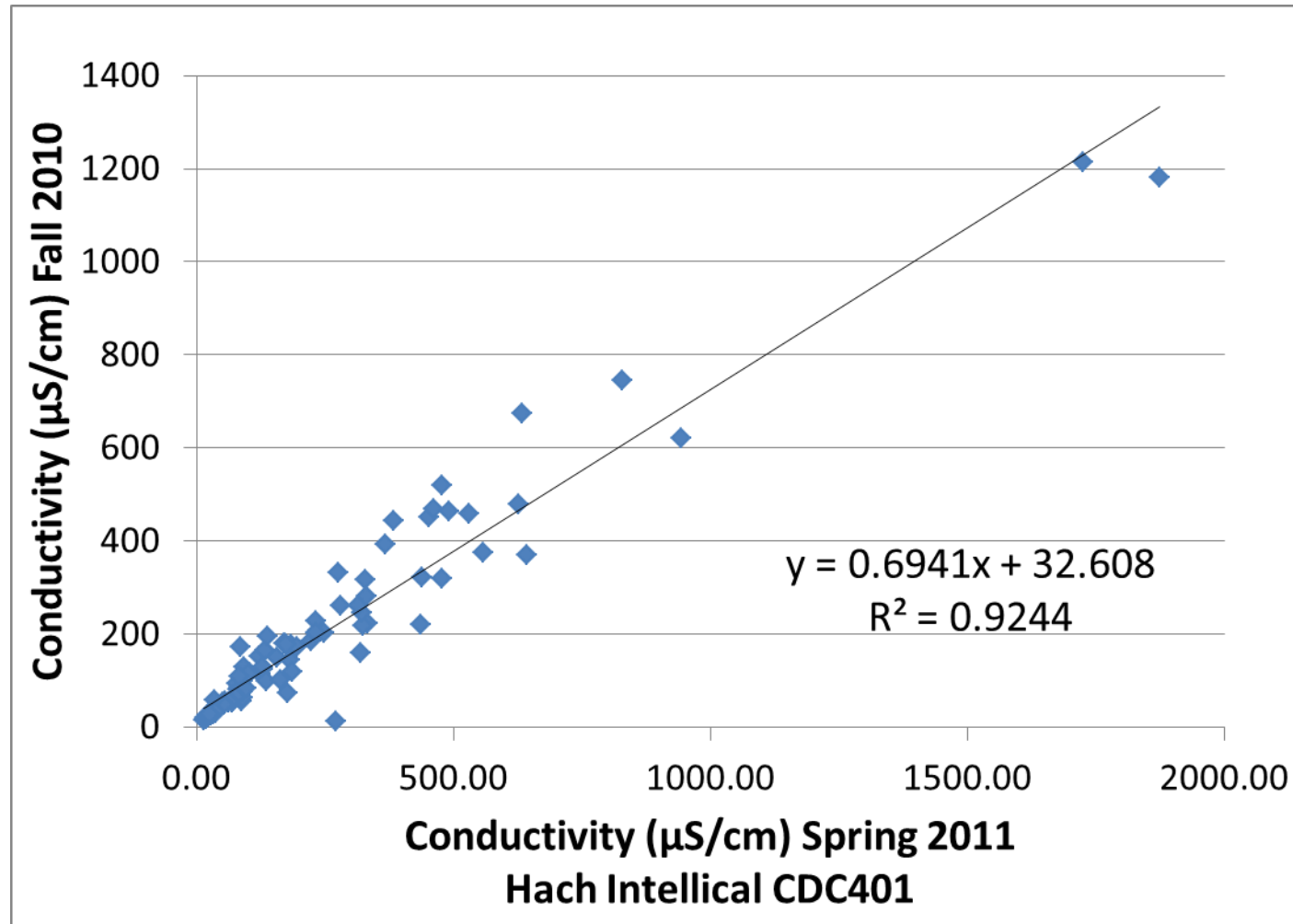


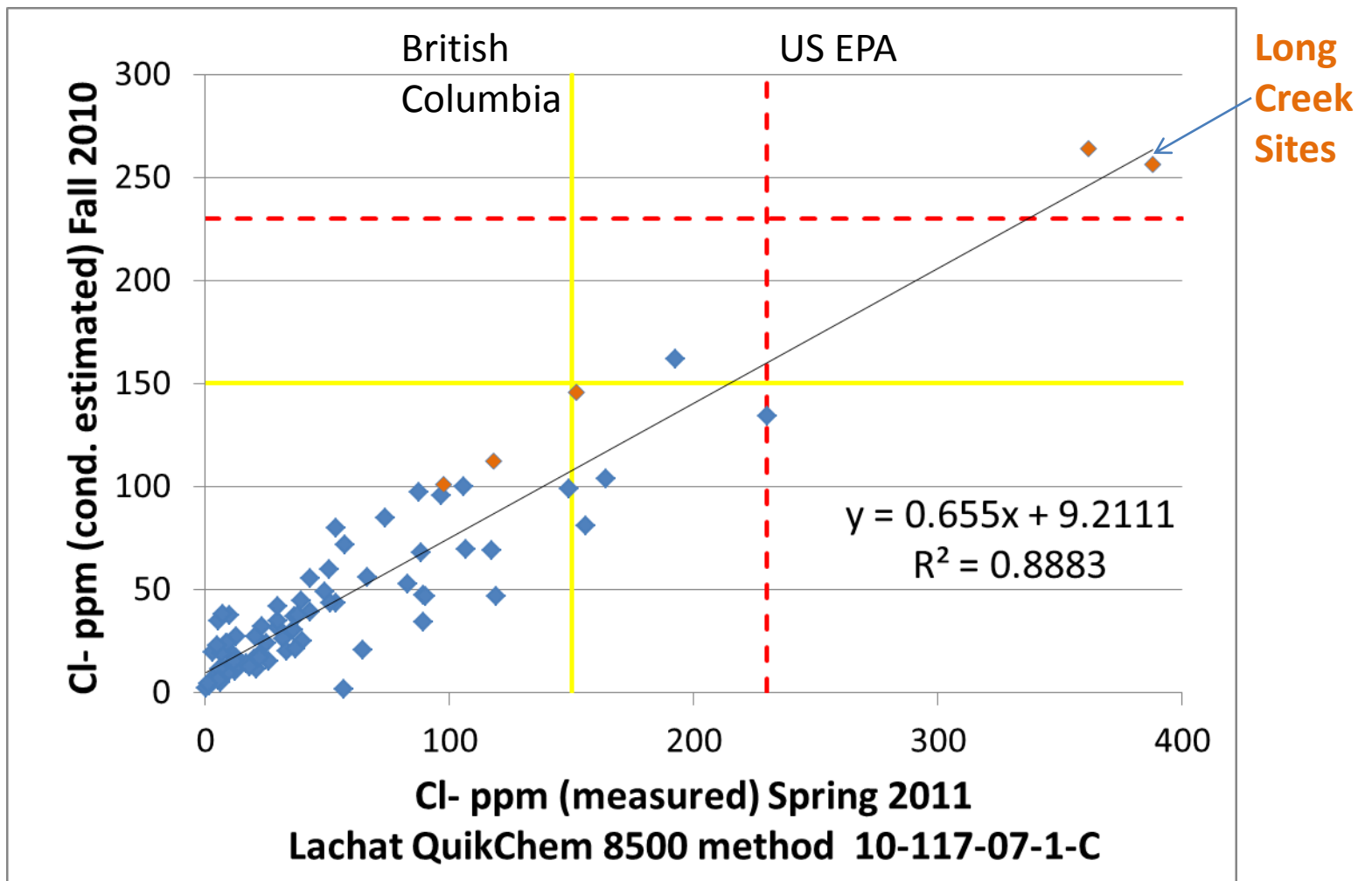
Maine Chloride Conductivity

8/17/2011-09/03/2011



2 Season Conductivity Relationship

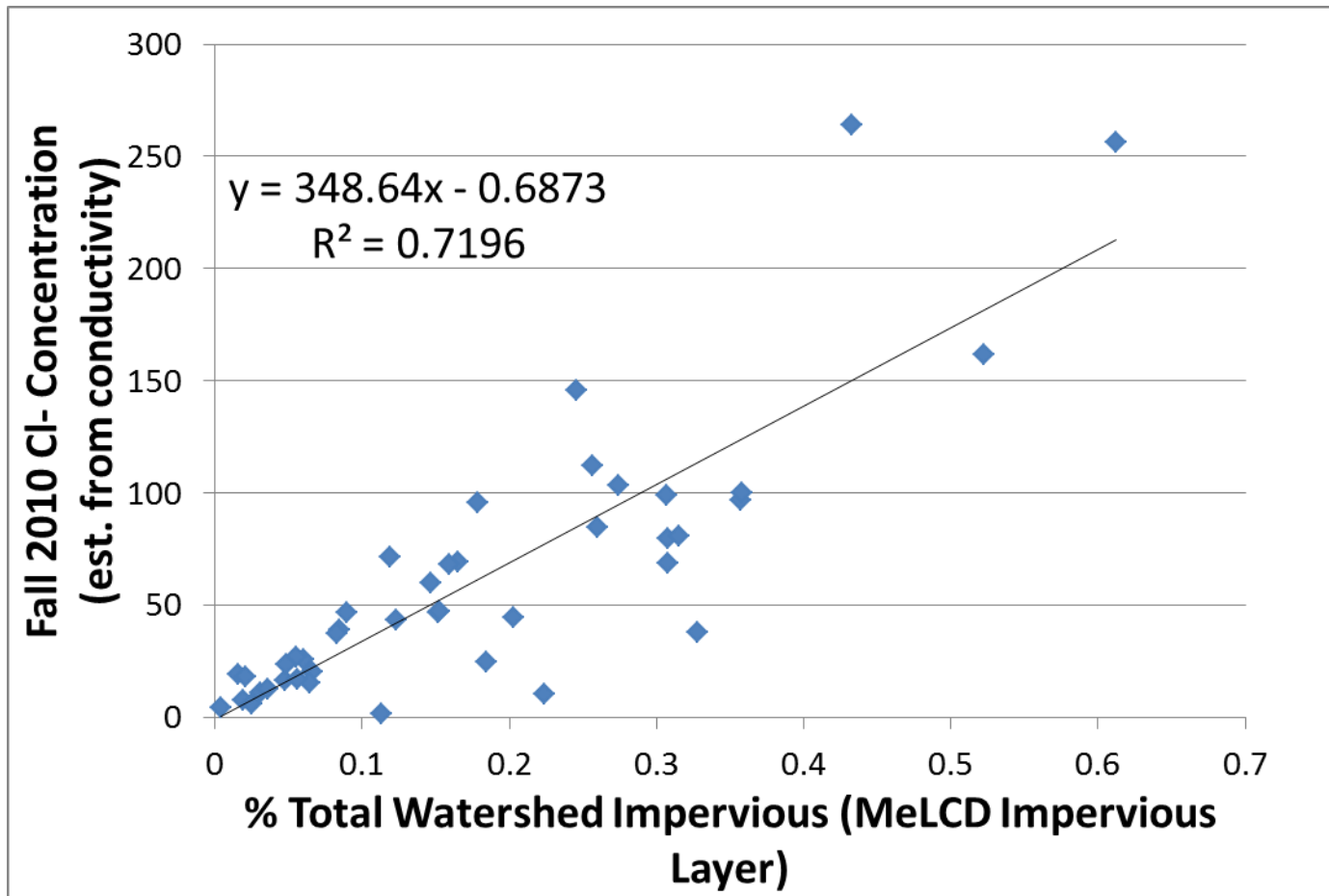




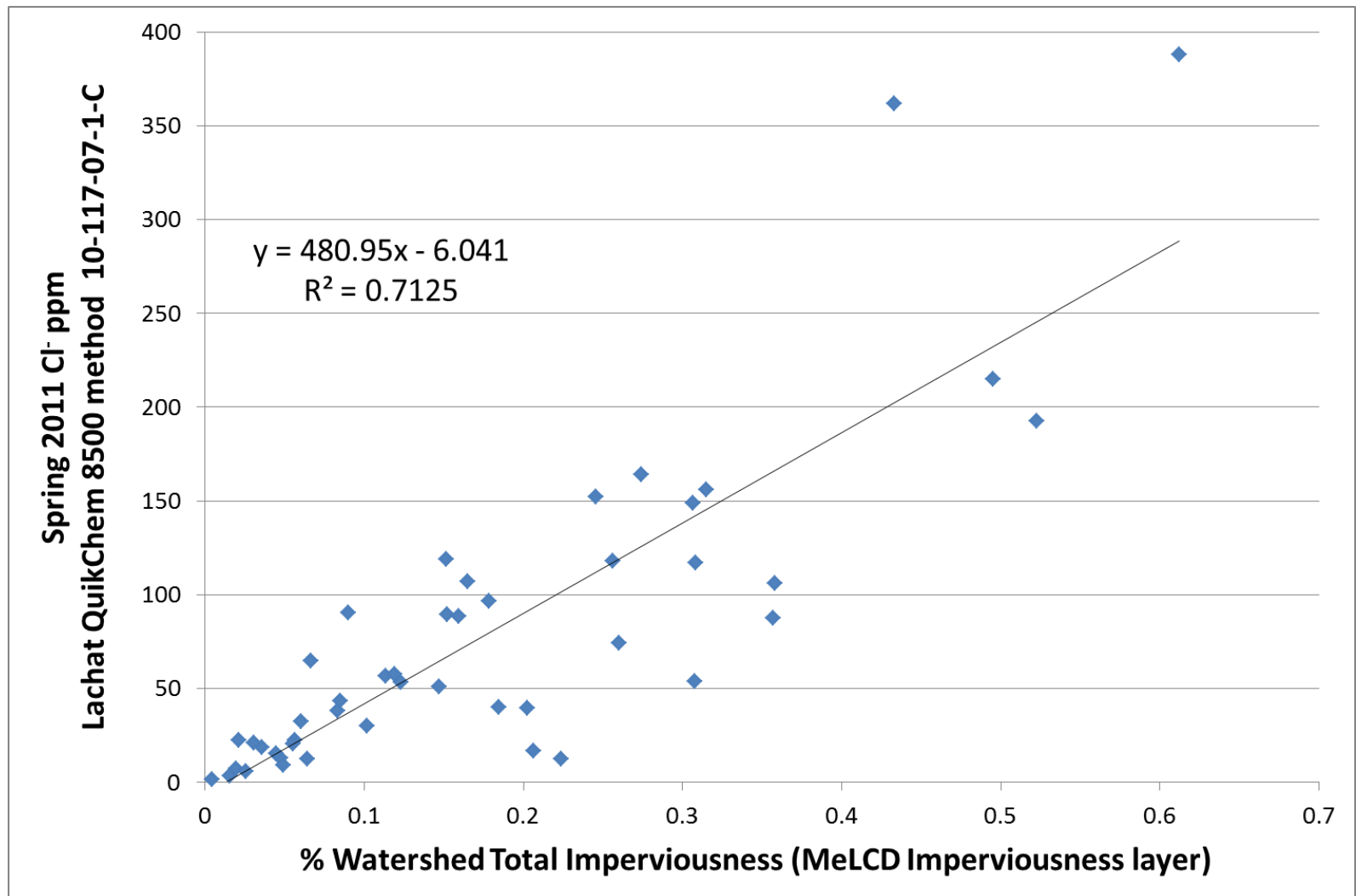
- Spring 2011 Cl⁻ is 1.52 times greater than fall 2010 Cl⁻
- Only two sites consistently exceed the 230 ppm chronic toxicity threshold, and one reaches that threshold seasonally.
- Conductivity Cl⁻ is likely higher during spring snowmelt.
- Cl⁻ was estimated for fall 2010.

Chloride Impervious cover relationship

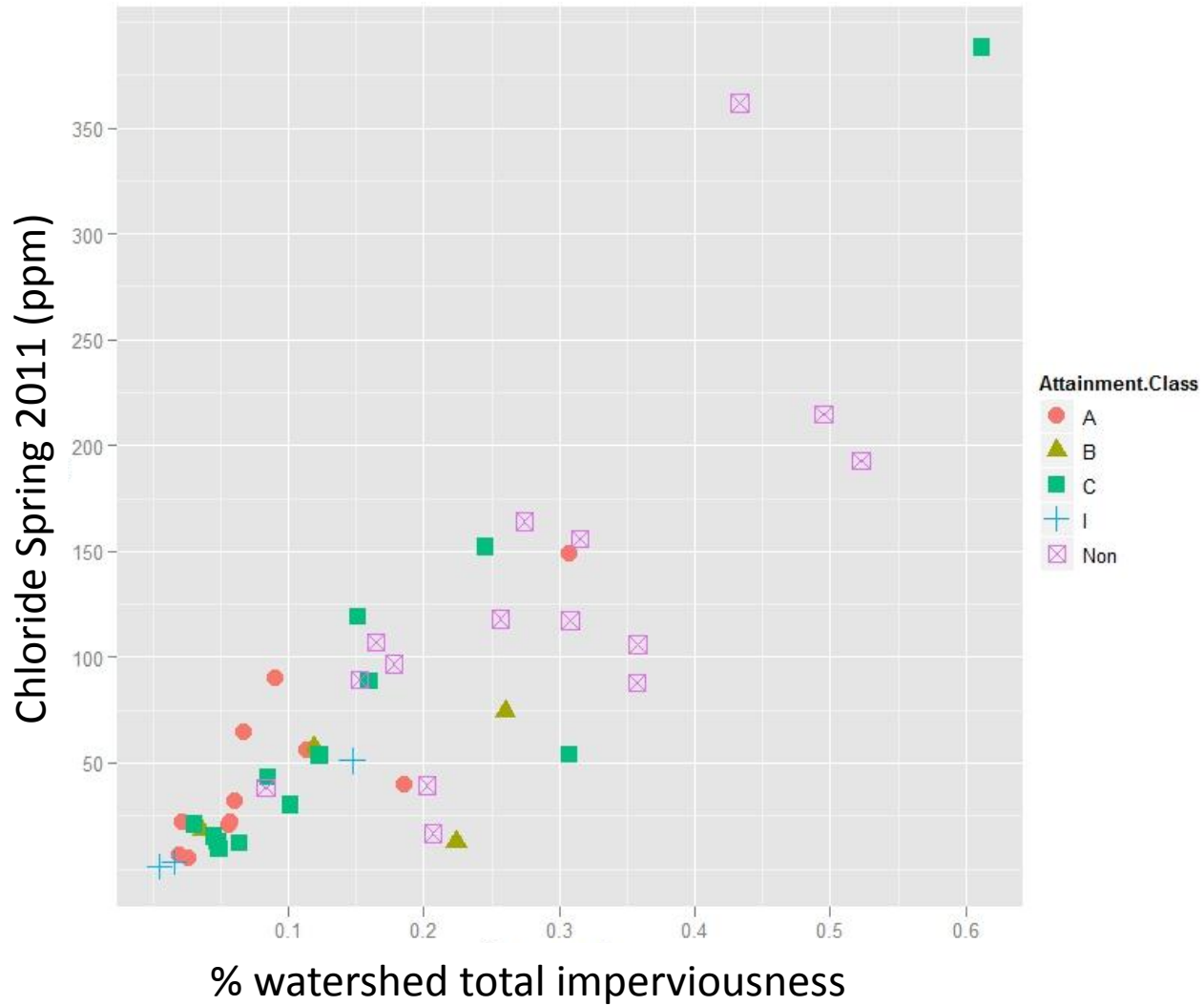
Fall 2010



Chloride impervious cover relationship – Spring 2011



Attainment class



Conclusions

- Chloride increases in the spring likely due to winter deicers.
- Sources of Cl^- can be tracked using ion ratios specific to deicer composition.
- A minority of low order streams seem to be exceeding or approaching chronic toxicity thresholds.
- Little is known about acute chloride concentrations in Maine.
- Chloride increases with increase in extent of impervious cover (IC). This relationship is stronger at lower levels of IC and weaker at higher levels.
 - The specific pattern and purpose of high IC is likely a key predictor of Cl in the waterways
 - 10% IC seems to be the threshold where the relationship becomes more scattered
- More information on effective imperviousness is needed