Chloride in Urban Streams in Maine

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

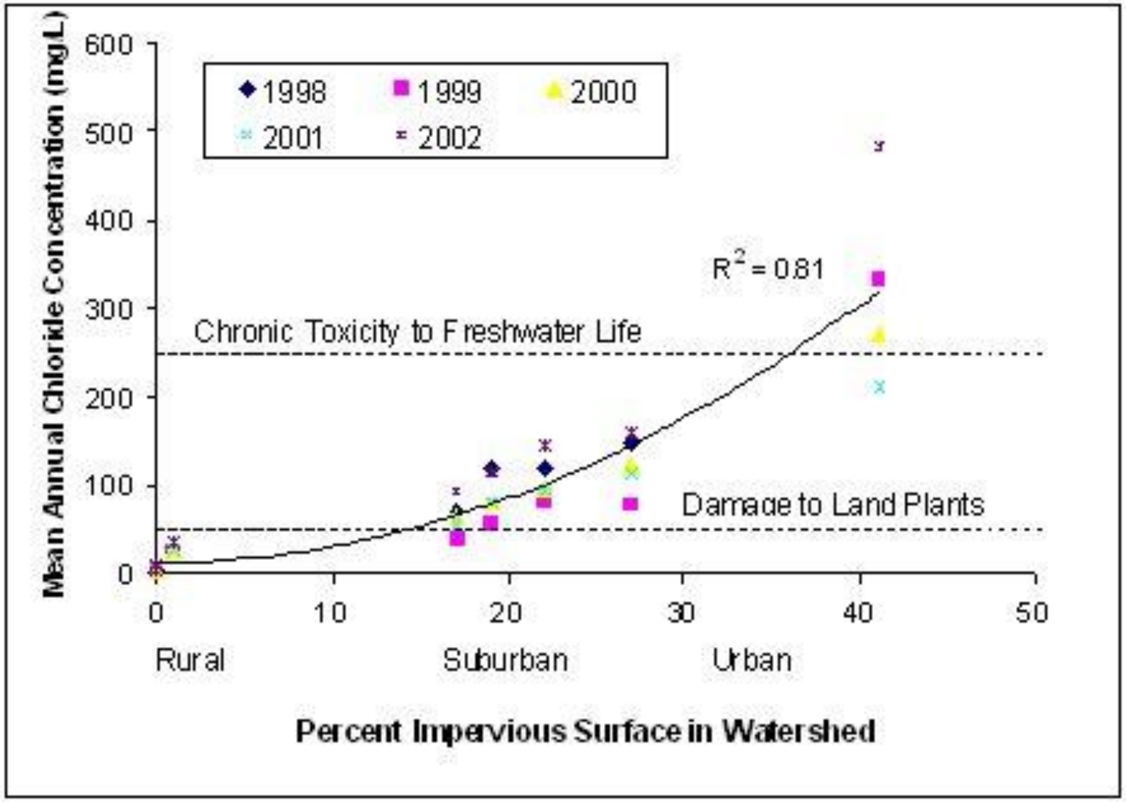
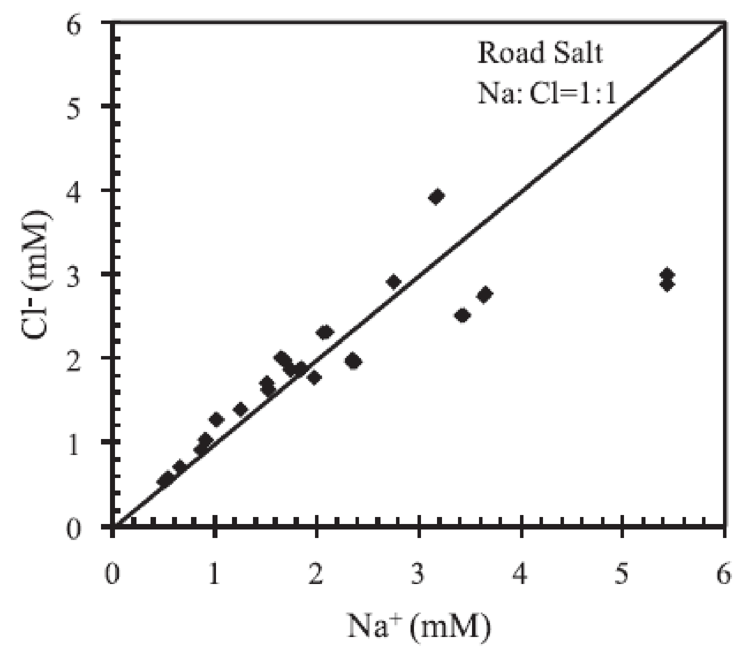


Figure 2. Relationship between impervious surface and mean annual concentration of chloride in BES streams during a five-year period (R2 = 0.81). Sites are located along a gradient of urbanization(Kaushal et al. 2005). Dashed lines indicate thresholds for damage to some land plants and for chronic toxicity to sensitive freshwater life (EPA 1988)

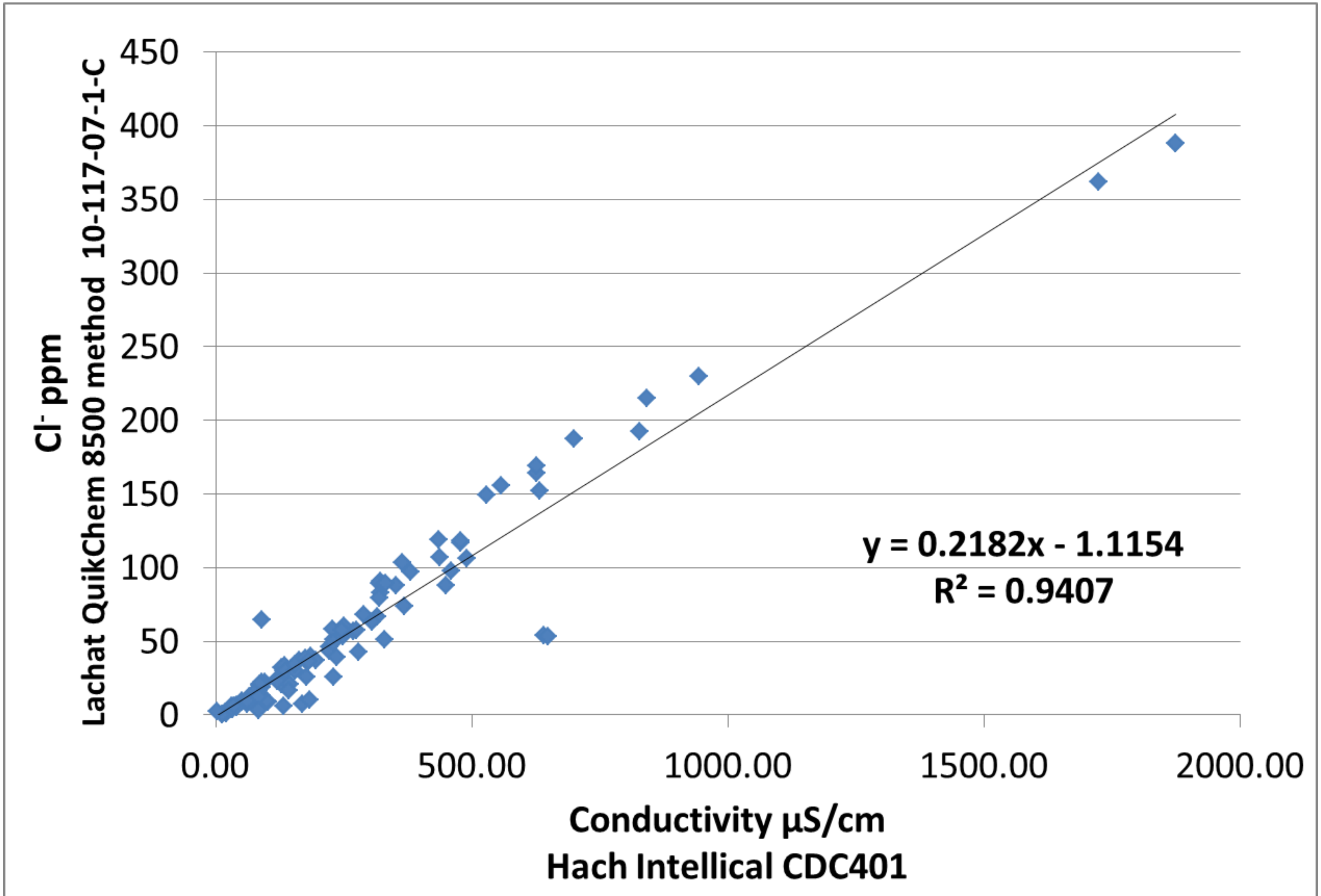
http://www.beslter.org/frame4-page_3f_08.html

Tracking Chloride Sources

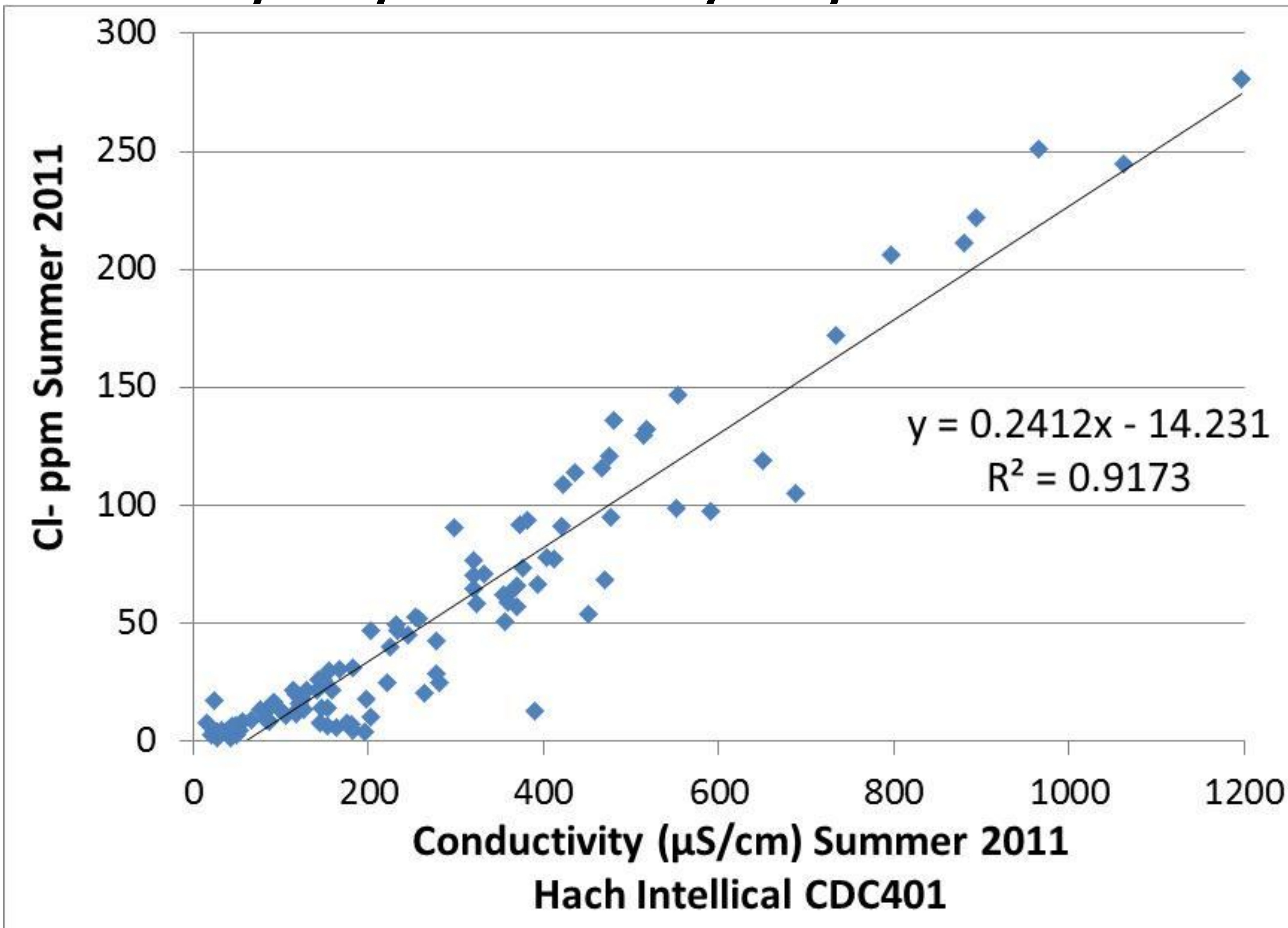
- Cl^- source was tracked in Fishkill Creek, NY using elemental ratios (Jin et al. 2011)
  - Cl:Br <2000 indicates marine influences (Mullaney et al. 2009)
  - Na:Cl - 1:1 indicates road salt influences and direct flowpaths.
    - Other deicers will be different
  - Cl^- from road salt 85%
  - Cl^- from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



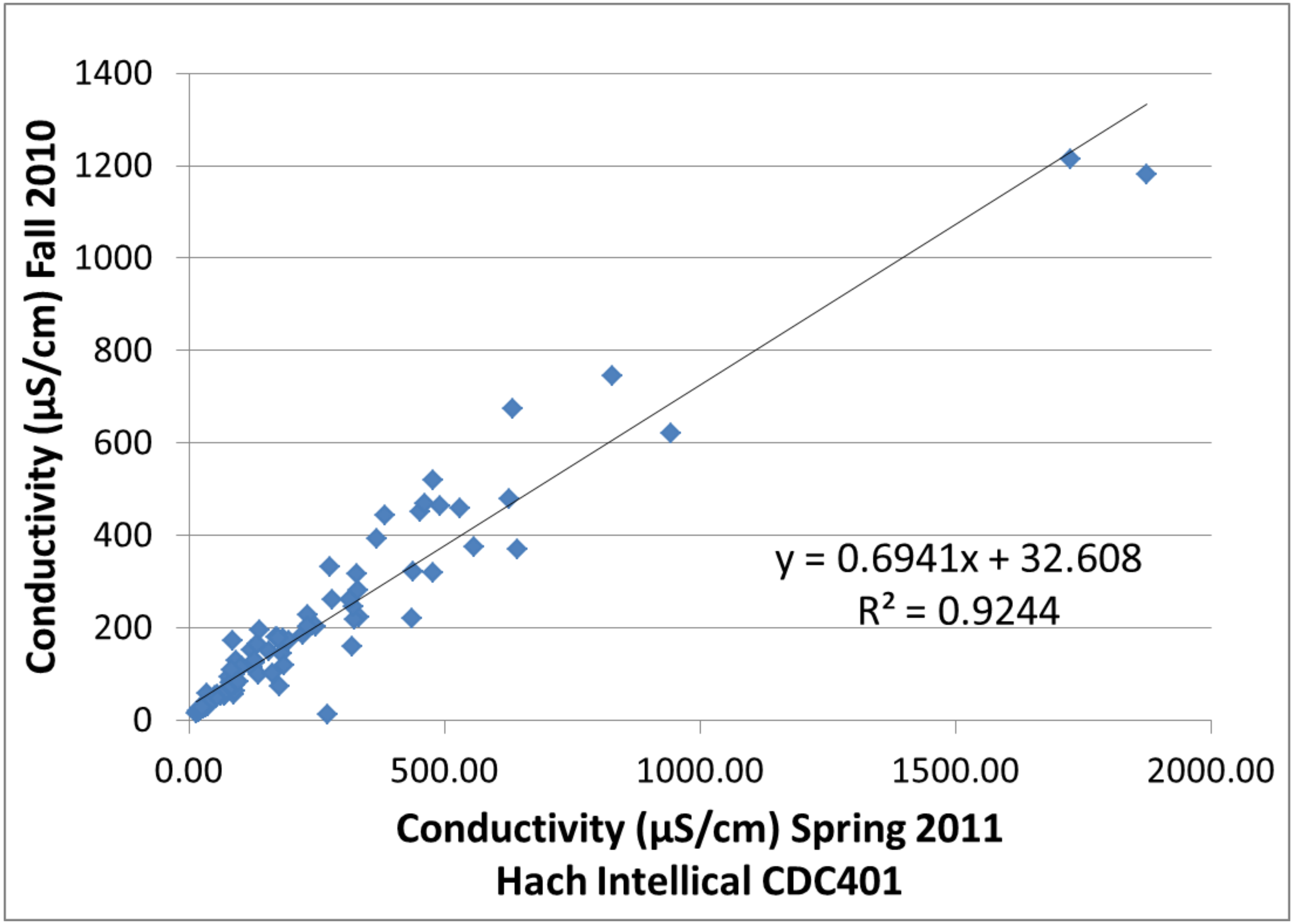
Maine Chloride – Conductivity 04/28/2011-5/14/2011

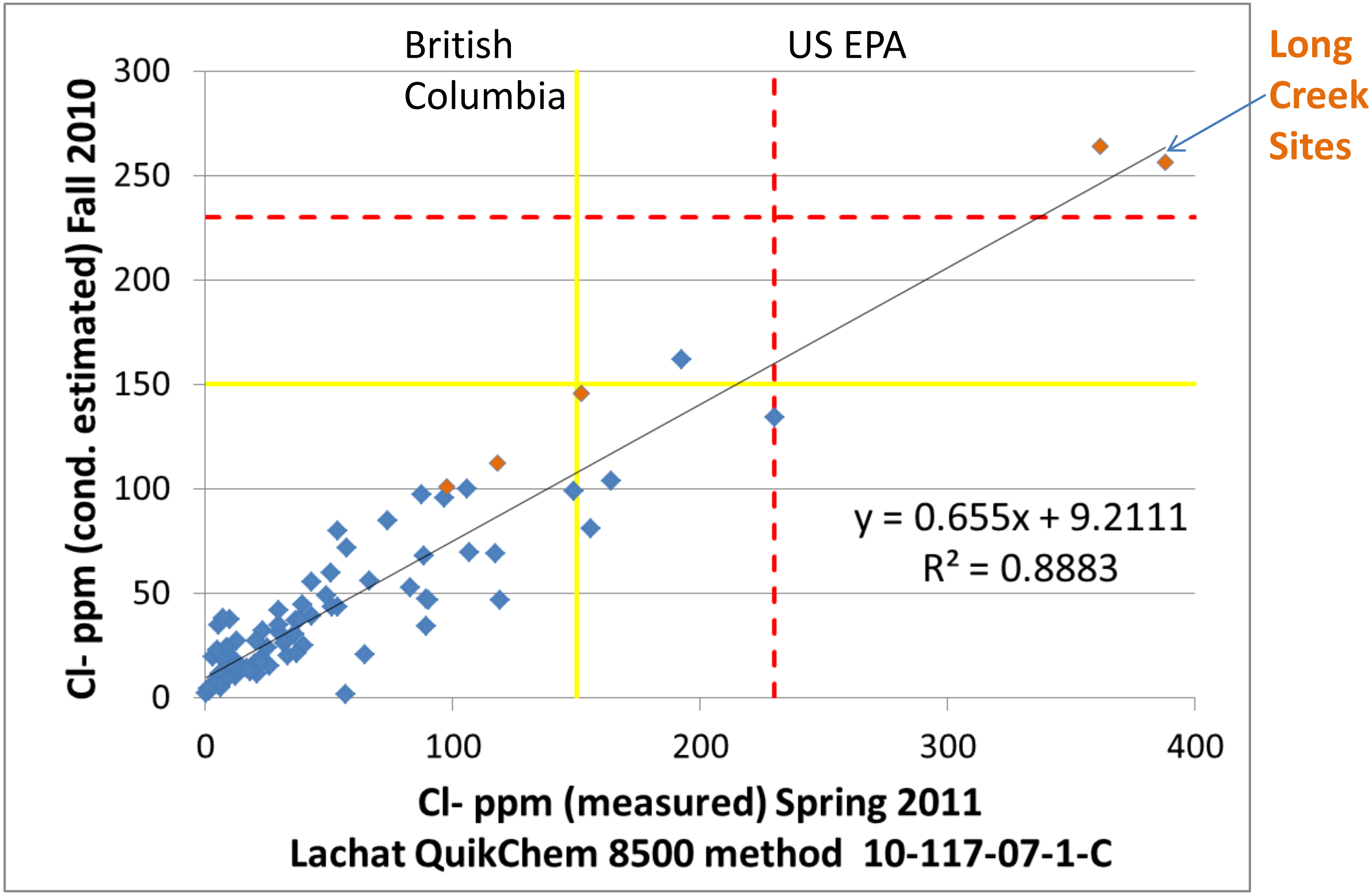


Maine Chloride Conductivity 8/17/2011-09/03/2011



2 Season Conductivity Relationship





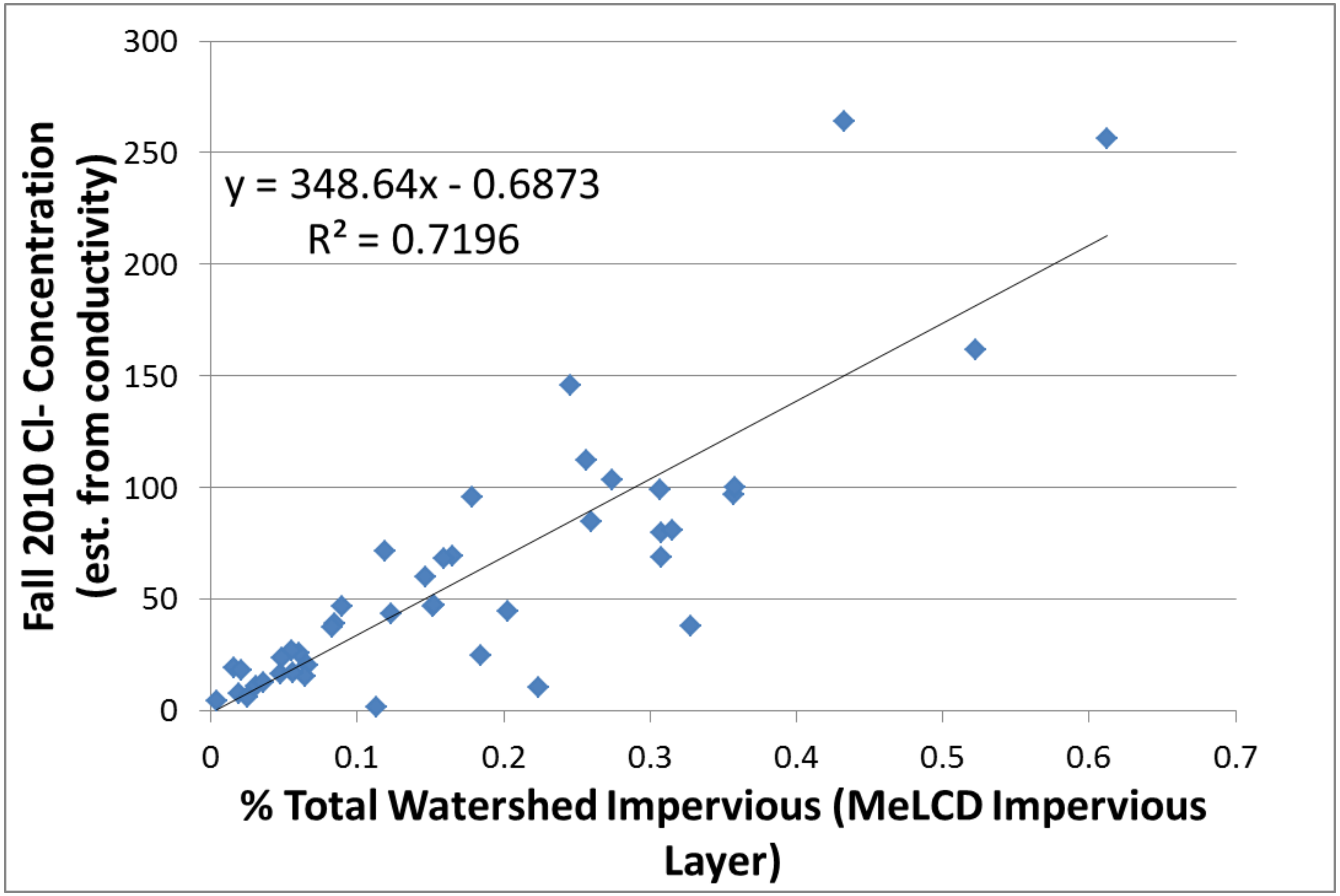
-Spring 2011 Cl^- is 1.52 times greater than fall 2010 Cl^-

-Only two sites consistently exceed the 230 ppm chronic toxicity threshold, and one reaches that threshold seasonally.

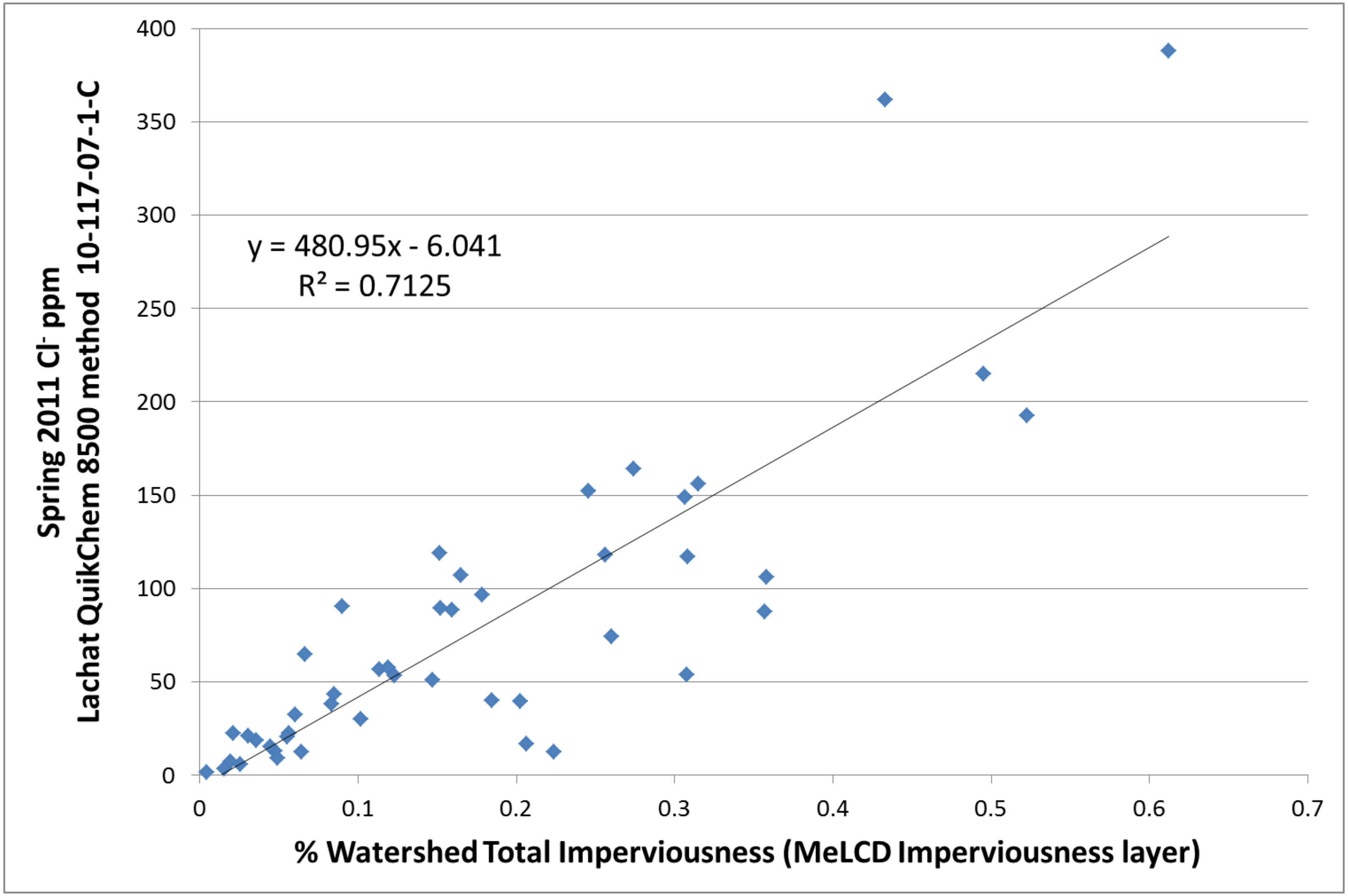
-Conductivity Cl^- is likely higher during spring snowmelt.

-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 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