Bassett Creek Chloride Assessment

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Overview

- Chloride
  - What is it?
  - How does it affect creeks and lakes?
- Water quality impairments
- Monitoring results
  - Comparisons with water quality standards; trends
  - Snowmelt/spring runoff monitoring—watershed-wide
- Salt diet ↔ Total Maximum Daily Load (TMDL)
  - How do current sources contribute to impairment?
  - Determines assimilation capacity; management strategies

What is chloride? Where does it come from?

- Chloride occurs naturally in water
  - Dissolution of soil, rock and mineral formations
- Significant component of most deicers and water softeners
  - Sodium chloride
  - Magnesium chloride
  - Calcium chloride

- Component of some fertilizers, dust suppressants and industrial process waters
- Chloride stays in solution, travels with water flow
  - Roads, parking lots, driveways, sidewalks and salt storage
  - There are no treatments, only source control

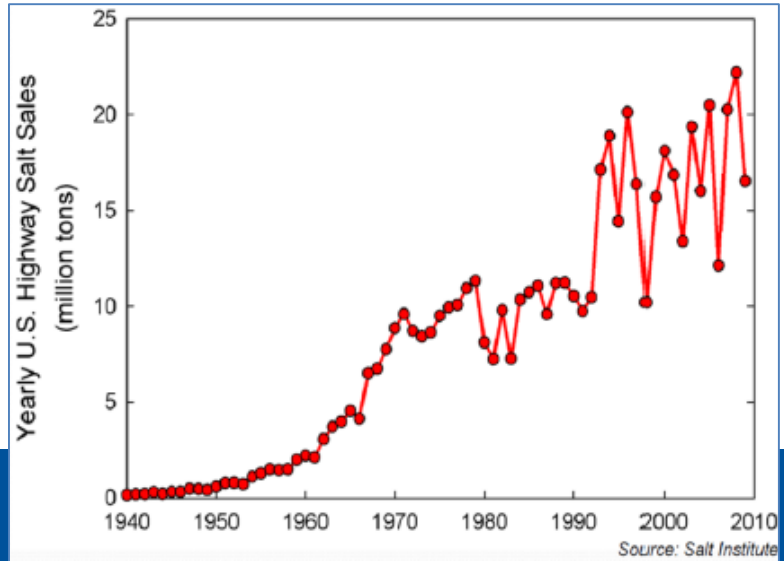
Adverse surface water impacts of chloride

- High levels of chloride are toxic to sensitive organisms
  - Fish
  - Invertebrates
  - Plants
  - Soil quality, pets/wildlife

- Disrupts natural lake mixing
  - Leads to lower dissolved oxygen in bottom waters and associated impacts on benthic organisms and nutrient cycling
- Drinking water supplies—human health concerns

Road salt dilemma

- Chloride-containing deicers are almost exclusively being relied on for public safety
  - Use has gone up significantly in recent past
  - No economic alternative without negative impacts on the environment
  - Increasing trends in surface and groundwater concentrations, especially in more developed portions of Twin City Metro Area
  - About 74% of applied chloride is retained in the watershed
  - Infrastructure/vehicle corrosion



Chloride impairments—lakes and streams

- 230 mg/L chronic standard (four-day average), no more than one sample exceedance within 3-year period
- 860 mg/L maximum standard, once in 3 years

1 tsp. of road salt pollutes

5 gallons of water

urally.

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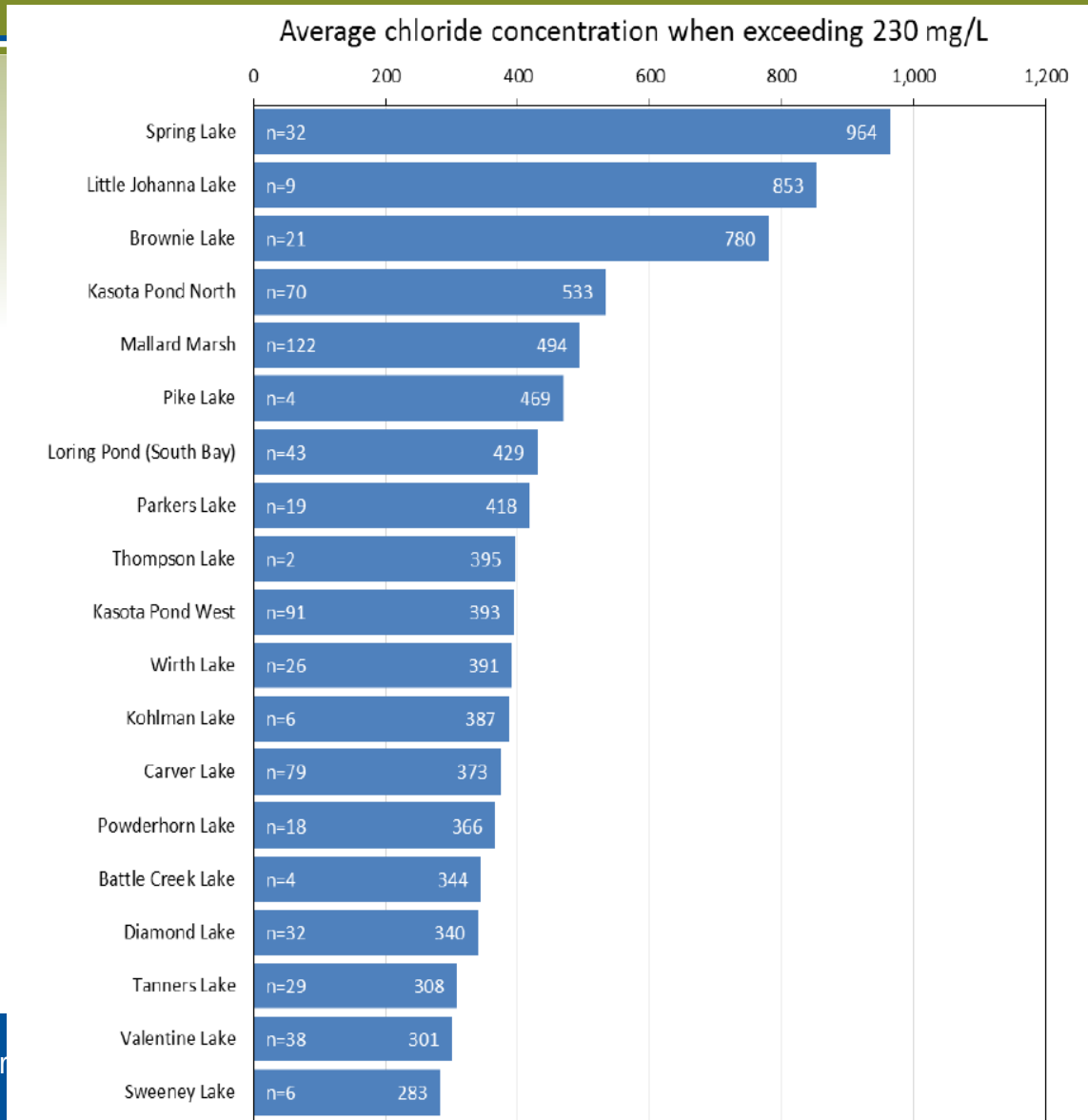
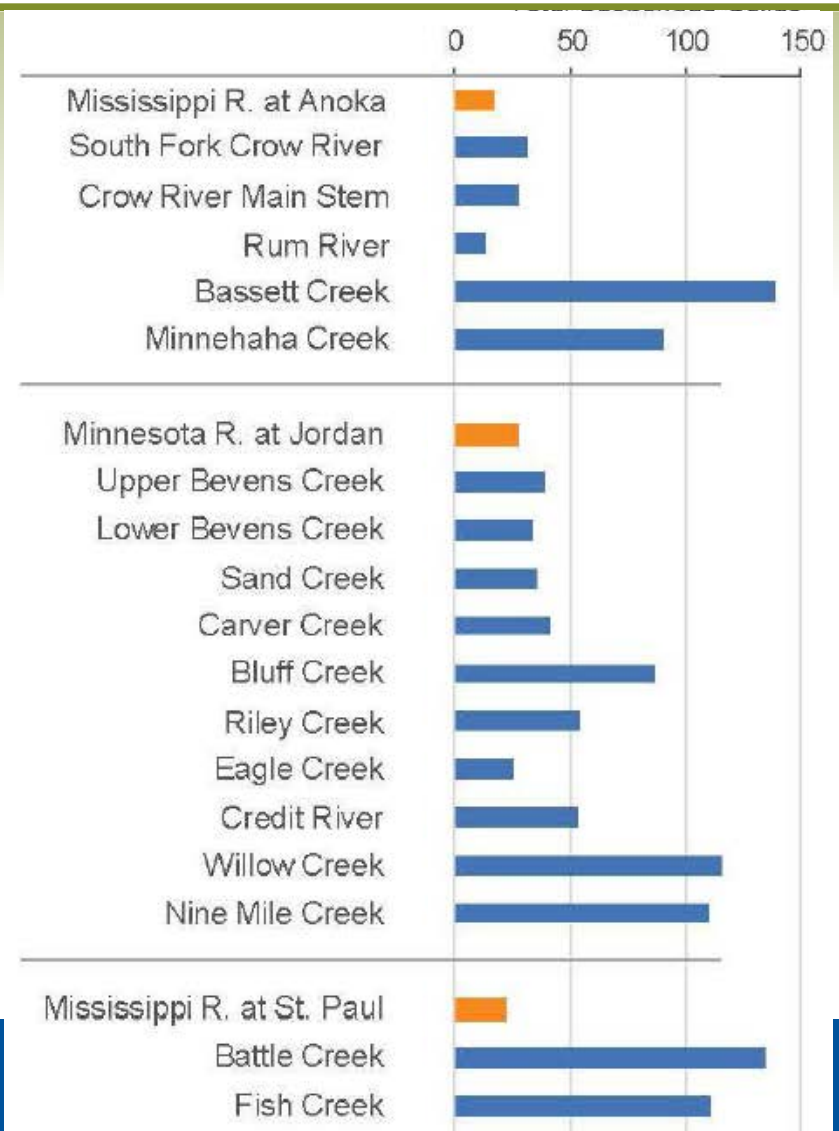
Bassett Creek watershed chloride impairments—lakes and streams

- Bassett Creek
- Plymouth Creek
- Parkers Lake
- Spring Lake ↑
- Sweeney Lake
- Wirth Lake ↑

- Medicine Lake “high risk water”

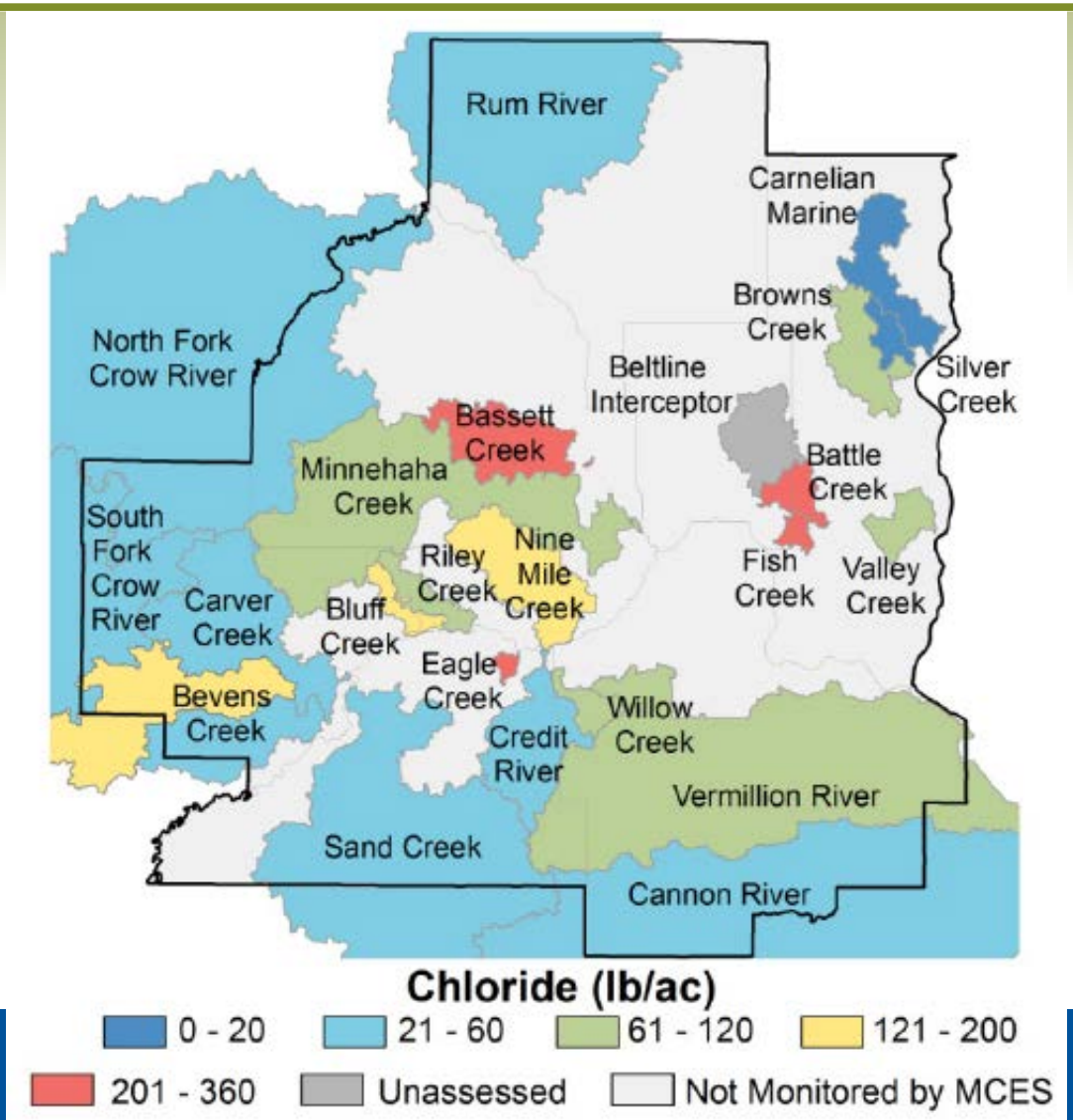


Median Annual Chloride Levels for Some Metro Streams



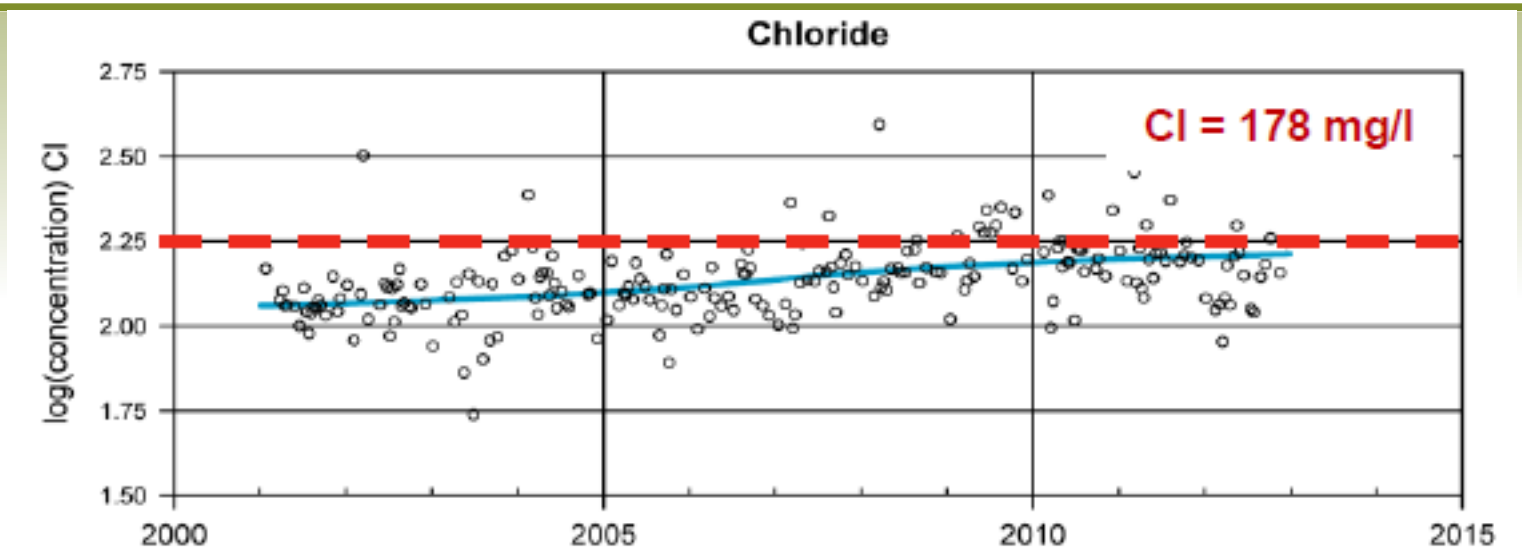
Source: Met Council

Average Annual Chloride Yield for Some Metro Streams



Source: Met Council

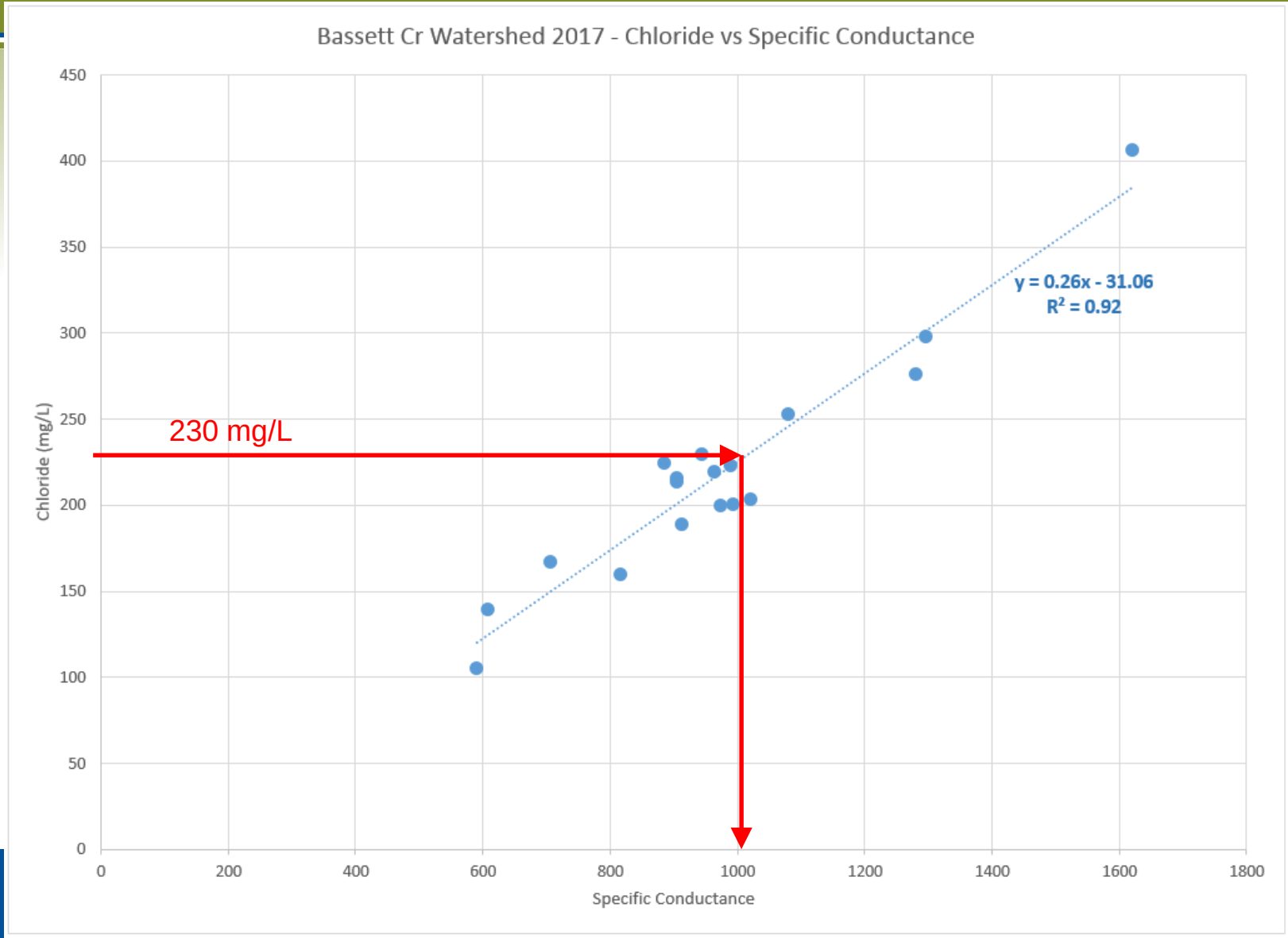
Chloride Trend for Bassett Creek



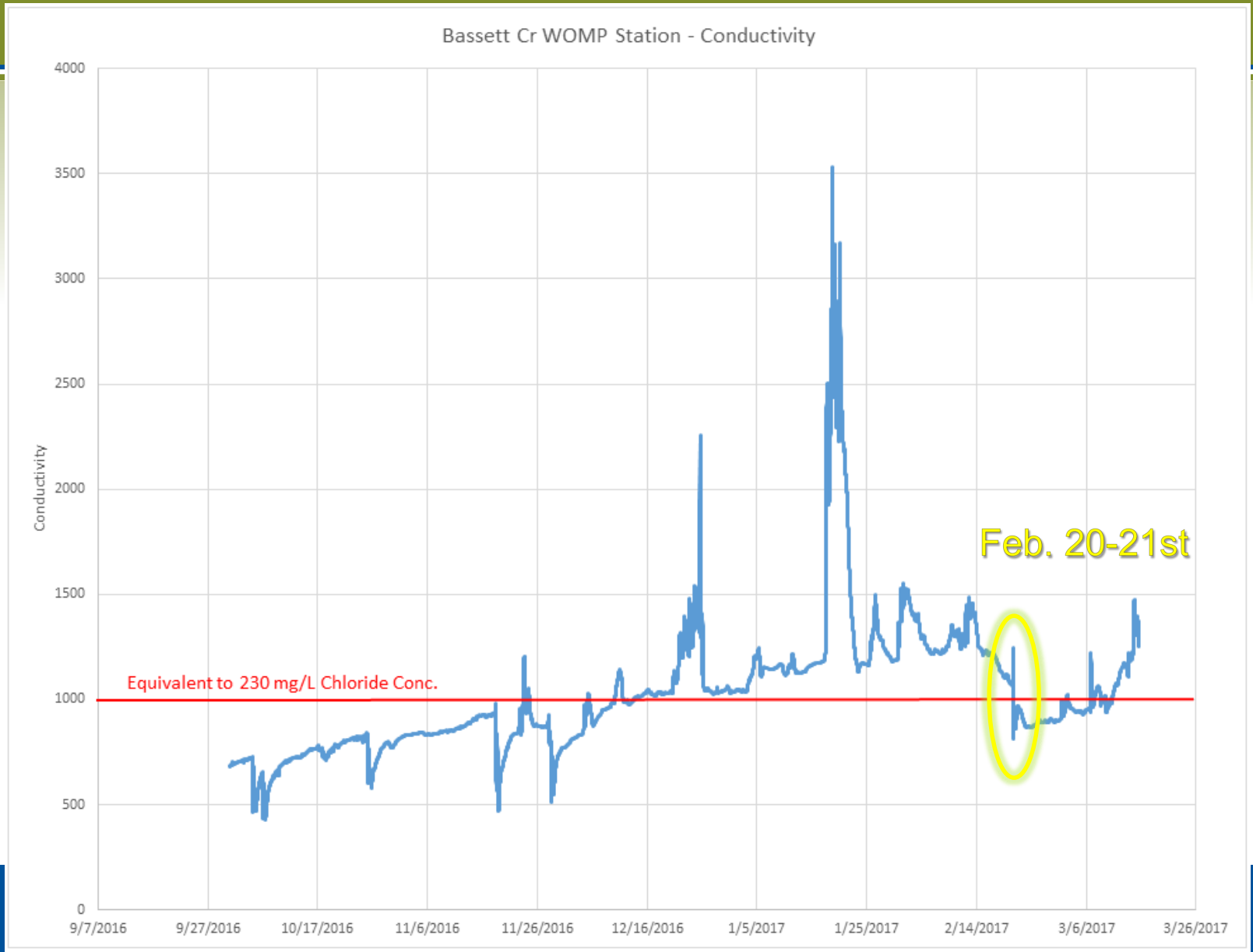
Parameter	Water Quality	Percent Change
Total Suspended Solids	↑	-30%
Total Phosphorus	↑	-17%
Nitrate	↑	-27%
Chloride	↓	13%

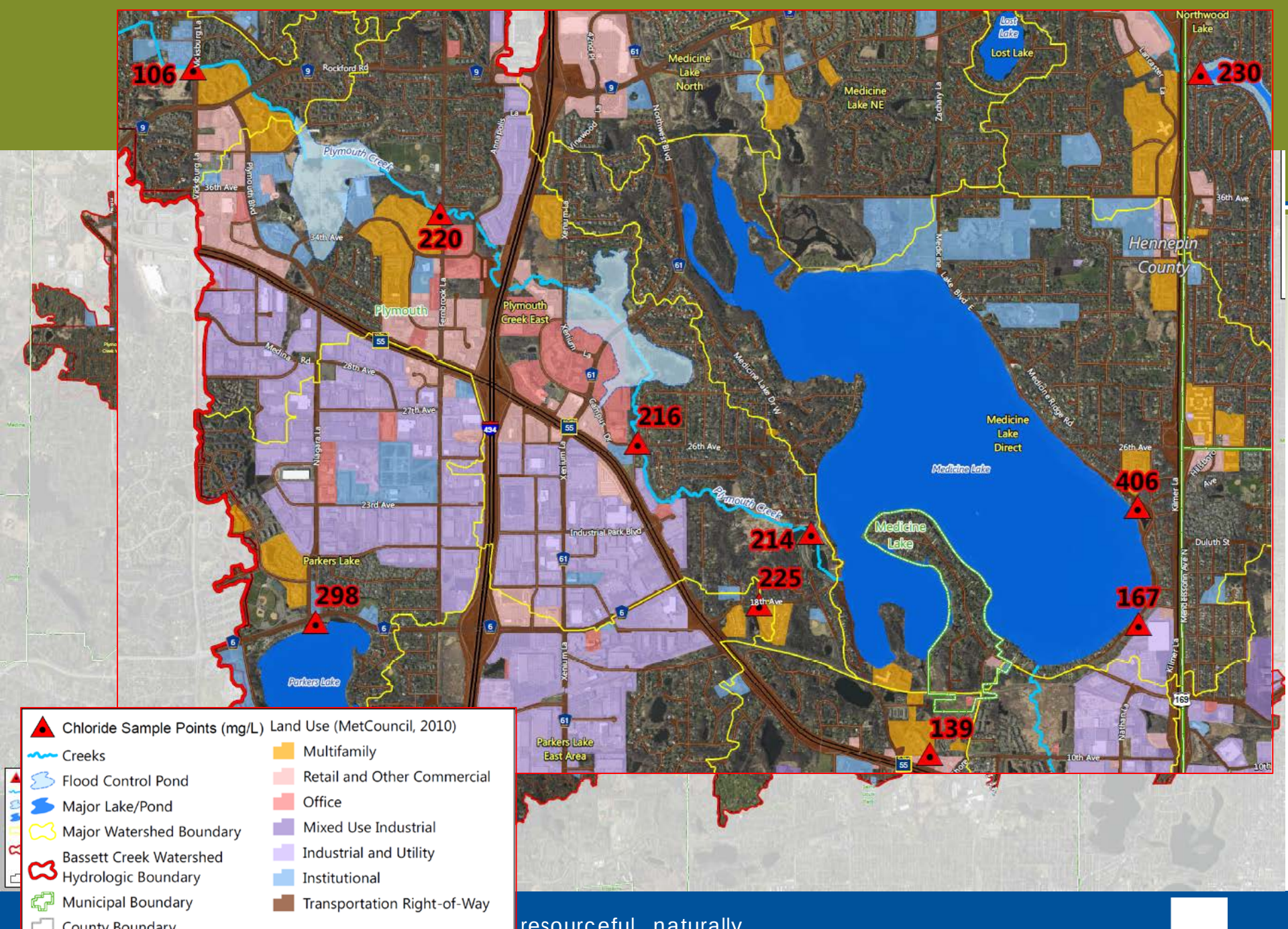
Source: Met Council

Chloride & Conductivity monitoring

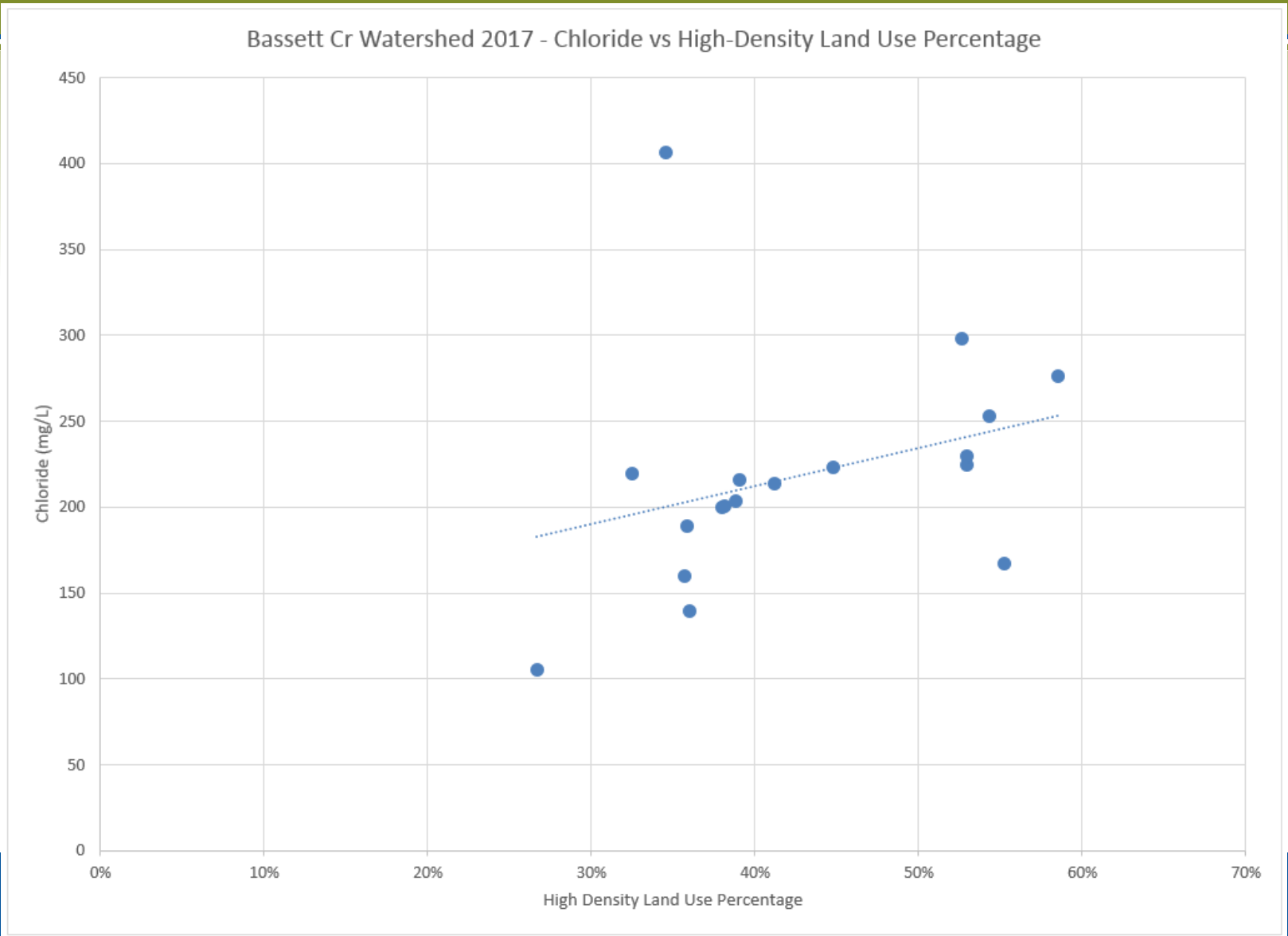


Chloride & Conductivity monitoring




106
220
216
214
225
298
230
406
167
139
Plymouth Creek
Medicine Lake North
Medicine Lake NE
Lost Lake
Northwood Lake
Hennepin County
Plymouth
Plymouth Creek East
Medicine Lake Direct
Medicine Lake
Parkers Lake
Parkers Lake East Area
Rockford Rd
36th Ave
34th Ave
28th Ave
27th Ave
26th Ave
23rd Ave
18th Ave
10th Ave
Industrial Park Blvd
Duluth St
Chloride Sample Points (mg/L)
Creeks
Flood Control Pond
Major Lake/Pond
Major Watershed Boundary
Bassett Creek Watershed Hydrologic Boundary
Municipal Boundary
County Boundary
Land Use (MetCouncil, 2010)
Multifamily
Retail and Other Commercial
Office
Mixed Use Industrial
Industrial and Utility
Institutional
Transportation Right-of-Way

Relationship Between Chloride Levels and Higher-Density Land Uses



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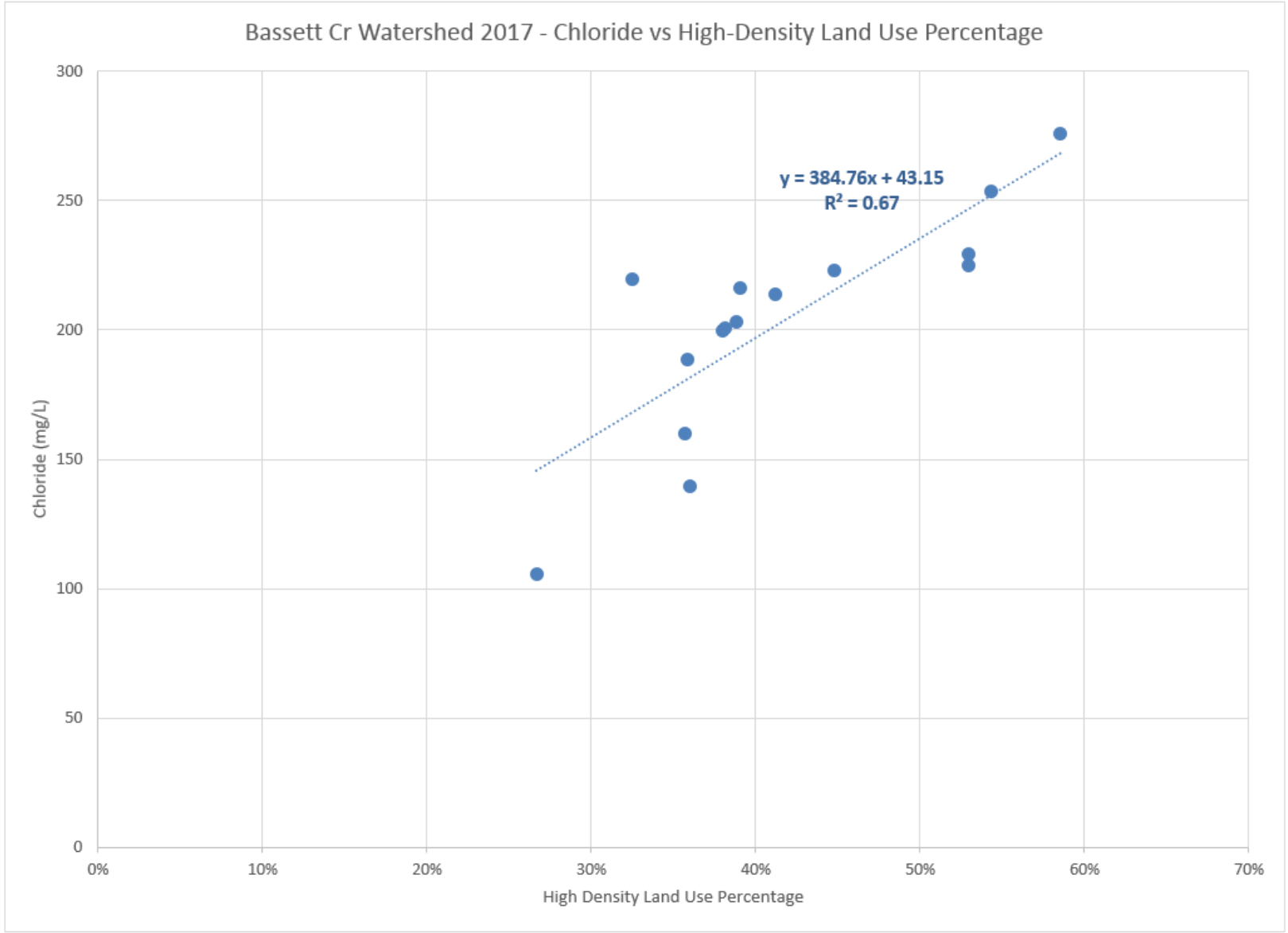
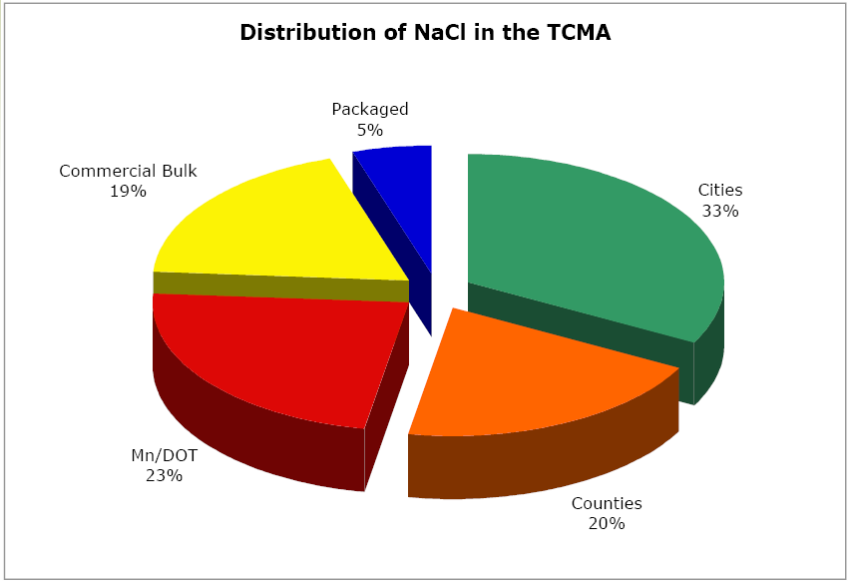


TMDL formula determines our salt diet

…or the maximum amount of chloride that can be discharged to a waterbody and still meet water quality standards

Existing road salt application rates

- Using SAFL data for salt applications and BCWMC/ TCMA proportional land uses
  - Overall percentage of higher-density land uses in Bassett Creek watershed is 4.7 times the percentage in TCMA
  - Affects commercial bulk and packaged estimates



Total Twin City Metro Area (TCMA) salt application estimates from St. Anthony Falls Laboratory (SAFL) study (Sander et al., 2007)

Allowable contributions/implementation strategies

- For TMDLs to be achieved, it will require significant reductions of chloride load and implementation of several management strategies:
  - Management of road salt inputs from both road authorities and commercial and private applicators
  - Education and training
  - Equipment upgrades

Questions??