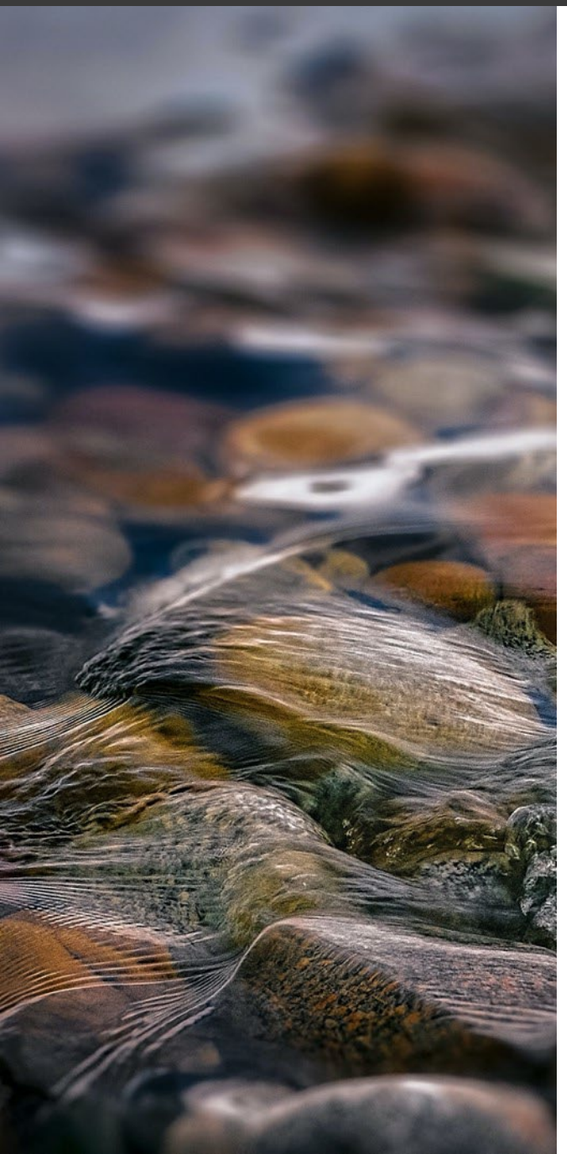
Information Item: Regional Chloride Trends on Metro Area Streams

METROPOLITAN COUNCIL

Environment Committee, July 26, 2022

Casandra Champion and Hong Wang

Chloride Sources in Minnesota Waters



De-icing Salt

Synthetic Fertilizer

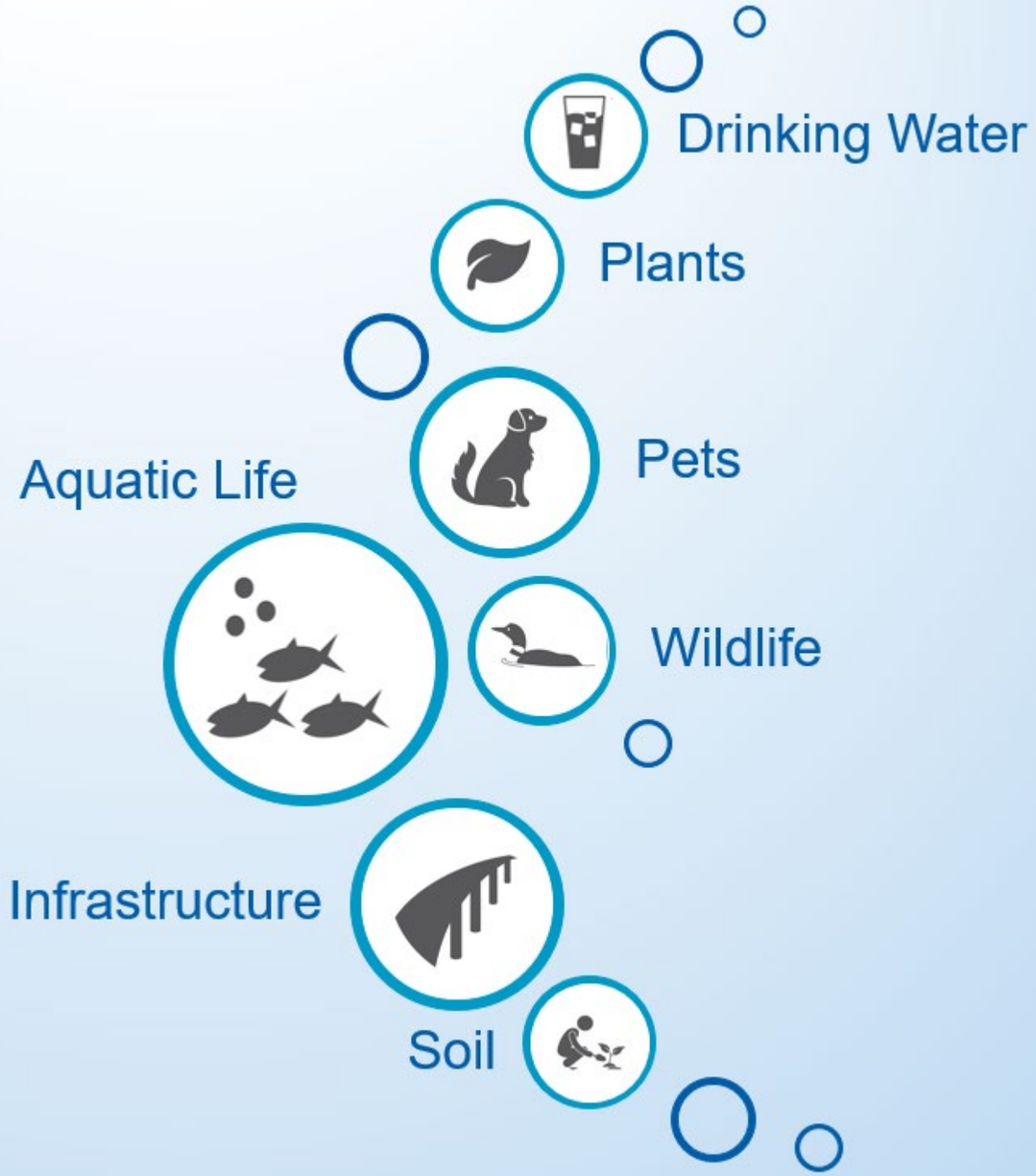
Household Water Softening

Other

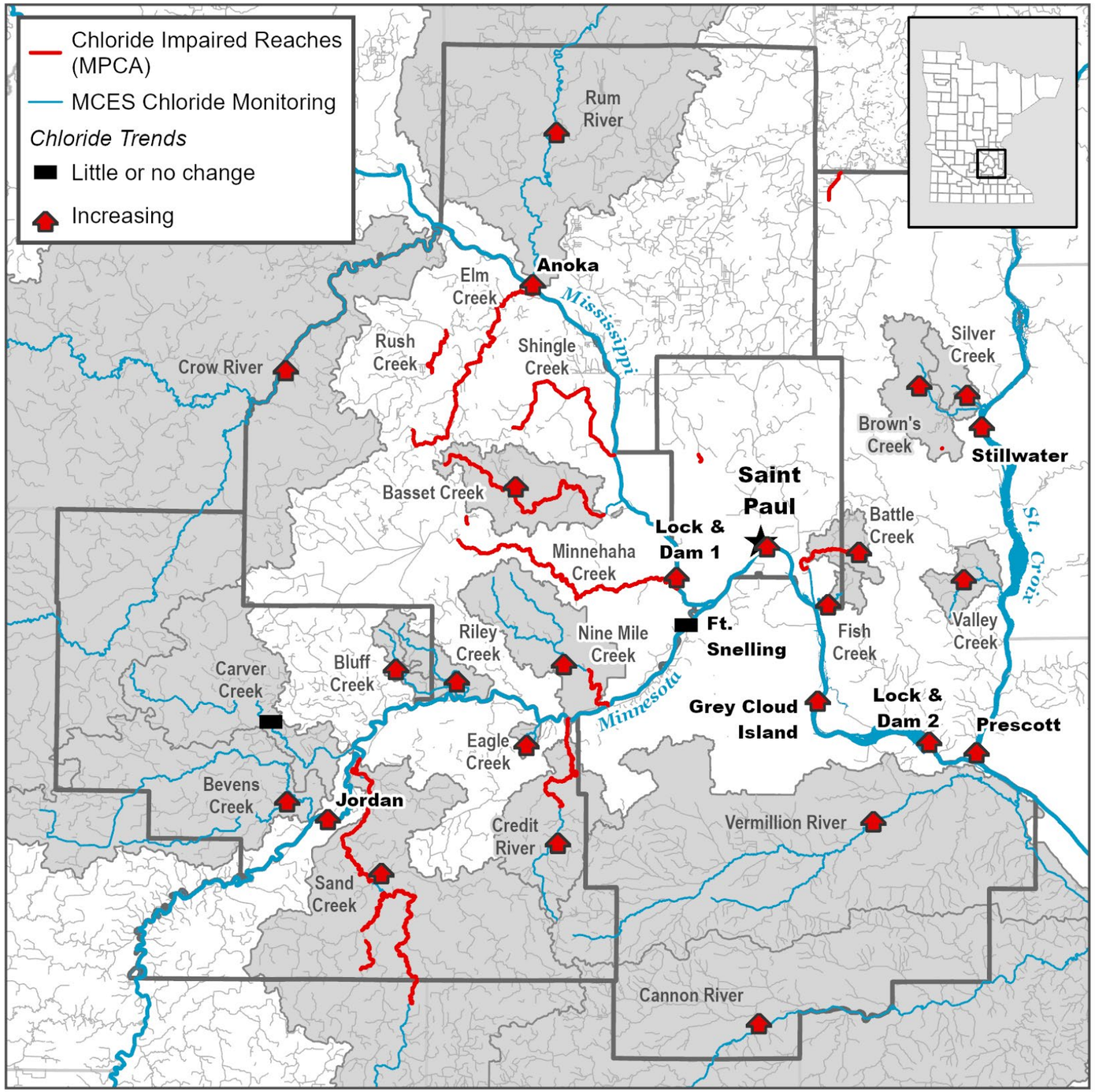
Livestock Excretion

Source: Overbo and Heger, n.d. Estimating annual chloride use in Minnesota. Water Resources Center. <wrc.umn.edu/chloride>

Hazards of Chloride



Twin Cities River and Stream Chloride Pollution



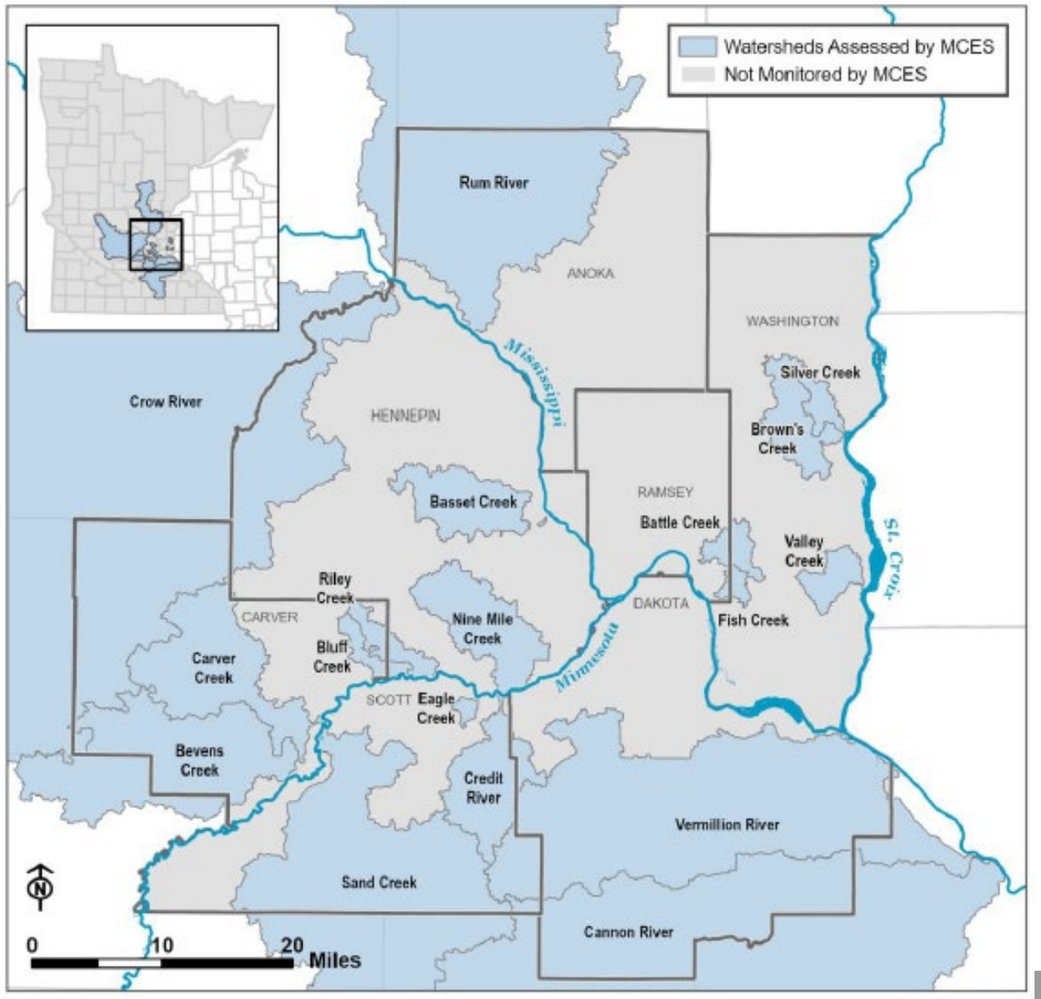
Study Objectives and Watersheds

To understand

- Current chloride conditions and changes over time
- Major impact factors
- Chloride budgets in metro area

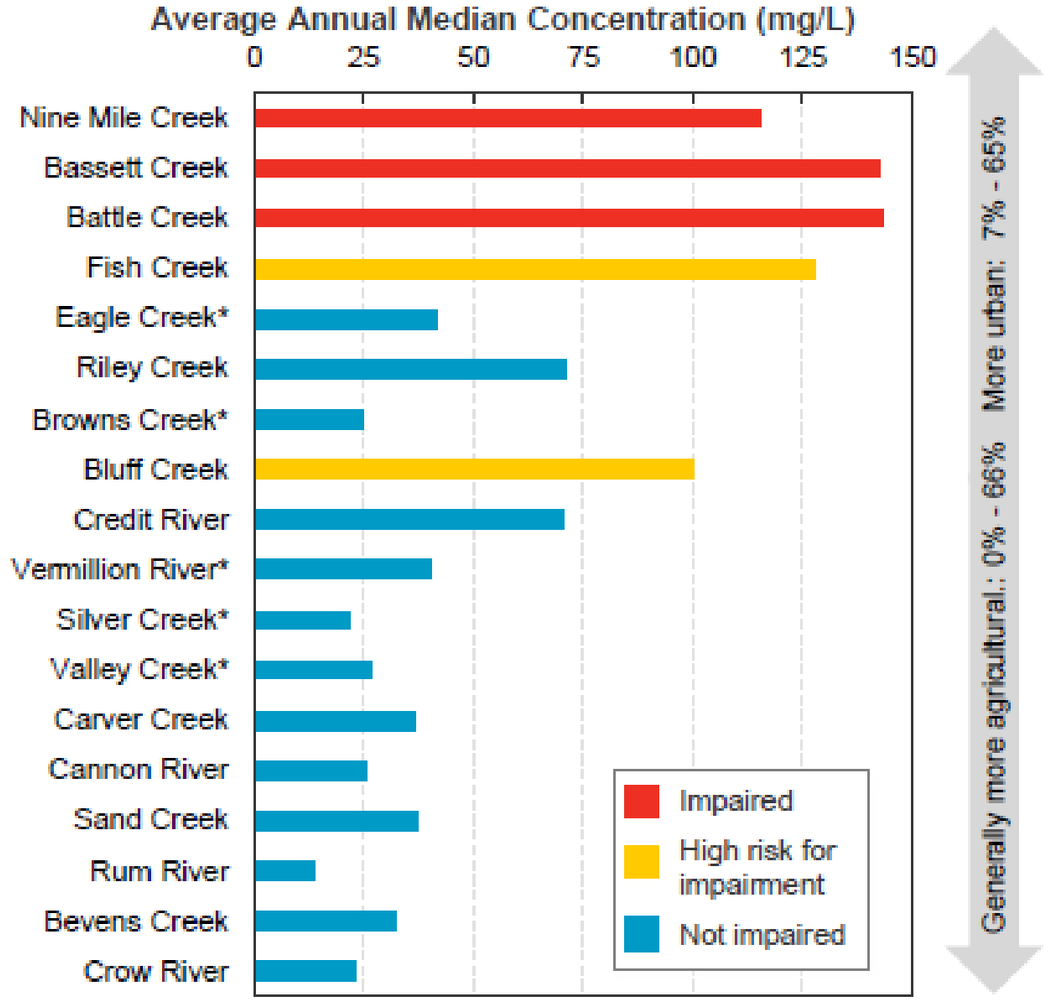
18 metro streams

- Various watershed sizes and locations
- Urban, agricultural and mixed natural land uses
- Three chloride impaired streams
- Five groundwater-dominated streams



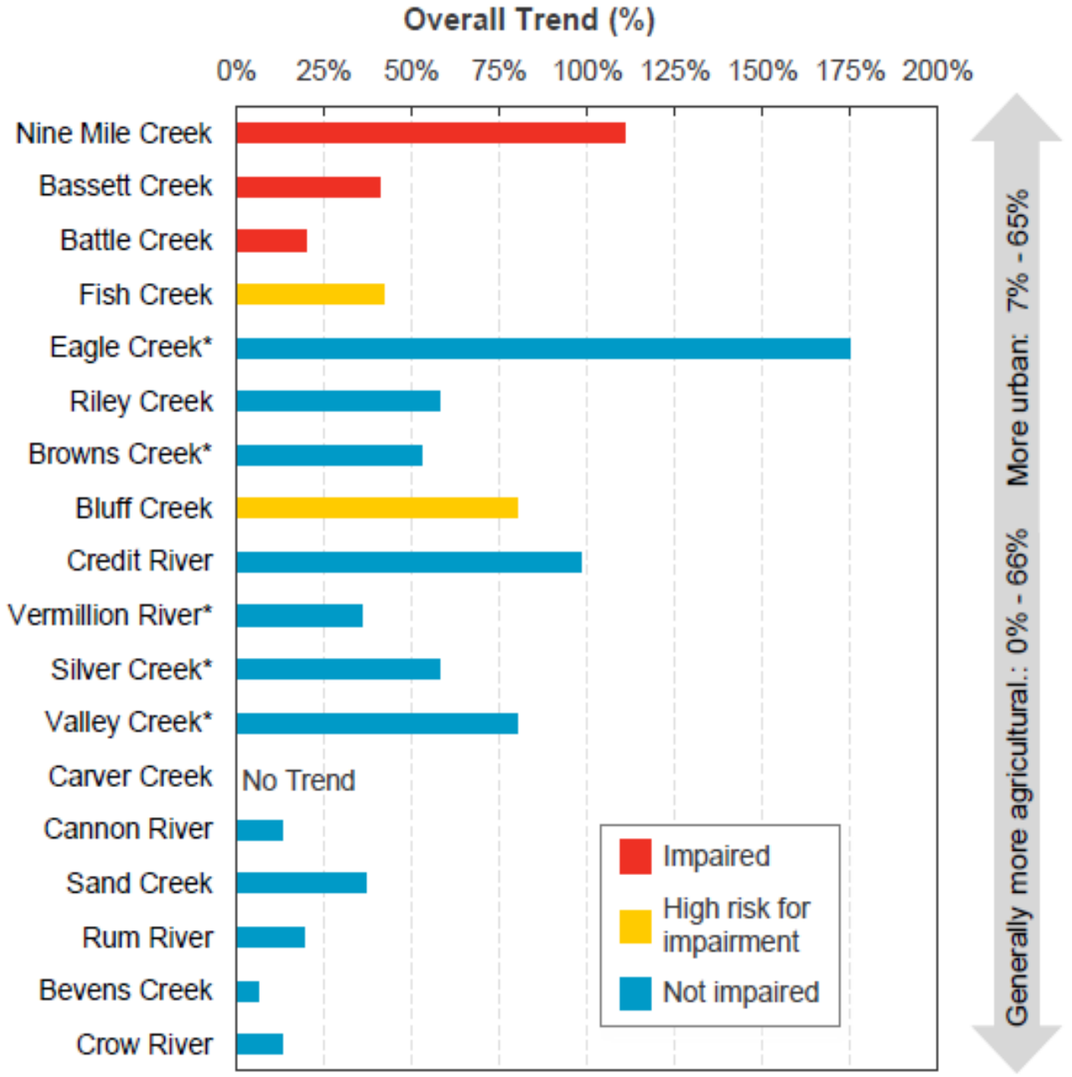
Stream Chloride Conditions

- Chloride concentrations varied significantly in streams
- High chloride concentrations found in more urbanized watershed streams
- Relatively low chloride concentrations in groundwater-dominated streams
- No apparent difference in three major river basins



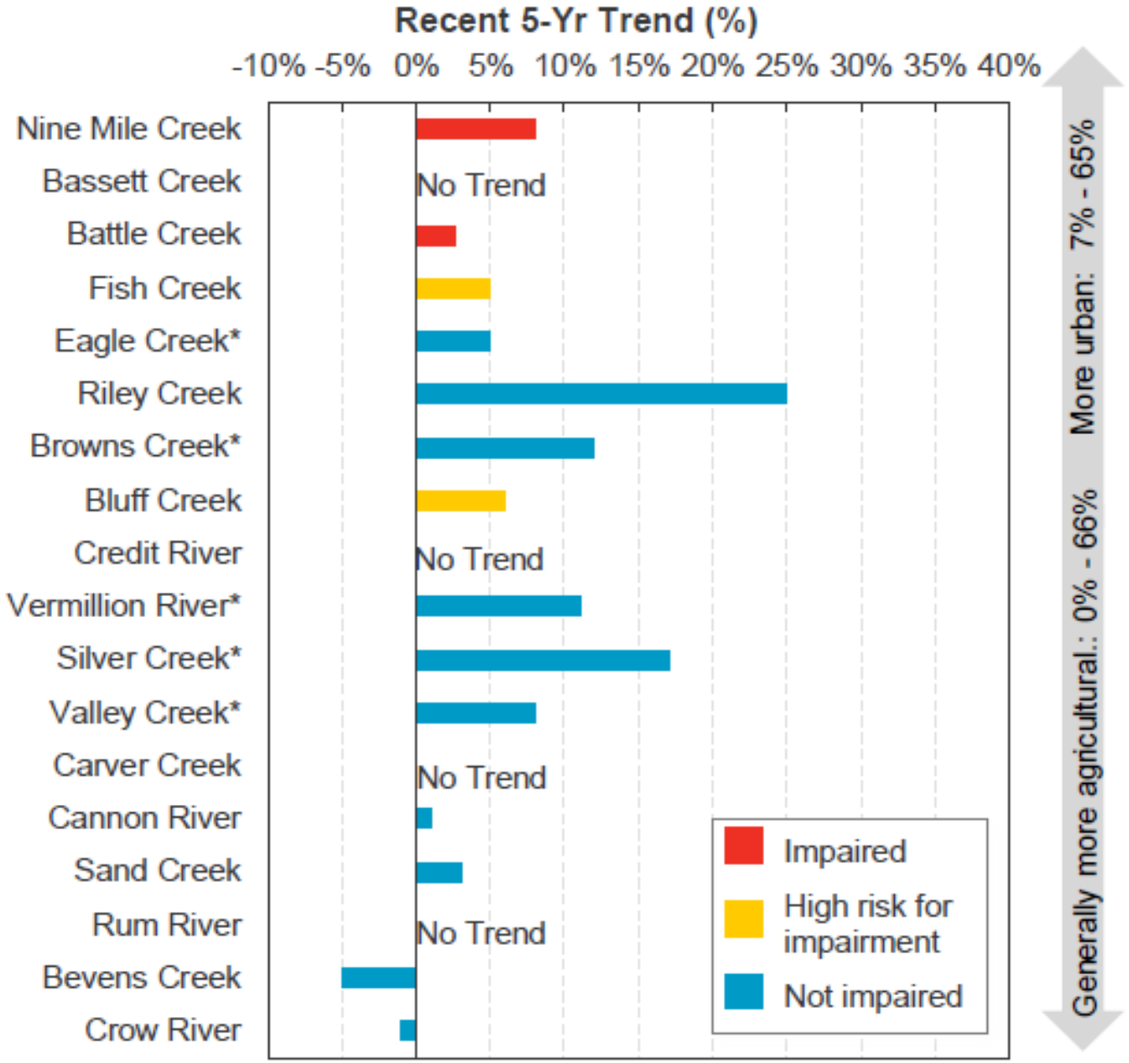
Overall Trends (1999 – 2019)

- Increases across all region except Carver Creek
- Chloride more than doubled during the last ten years in three streams
- Relatively large increases in groundwater-dominated streams
- No apparent difference in three major river basins



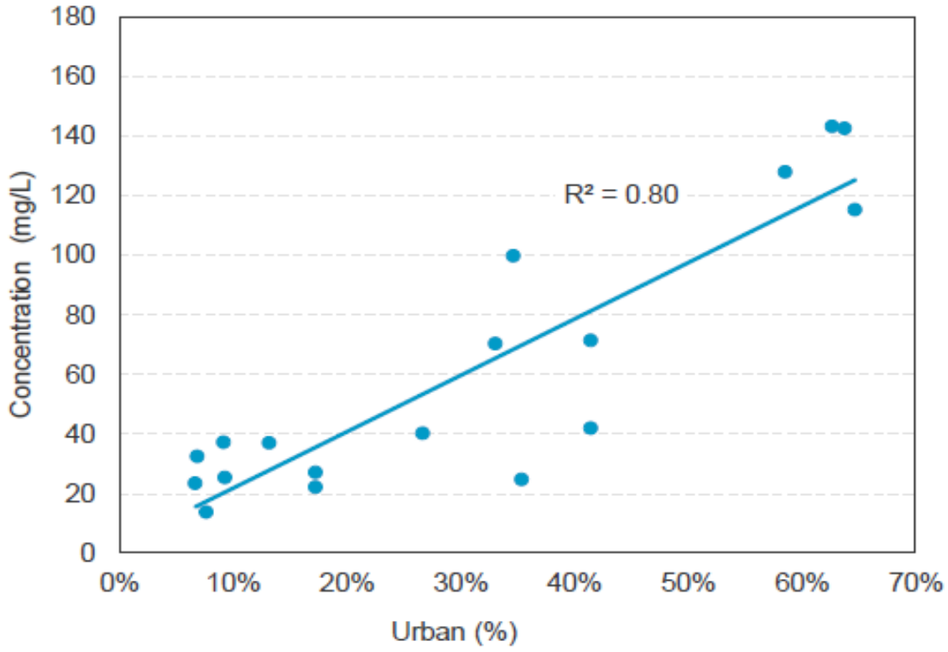
Recent 5-Year Trends (2015 – 2019)

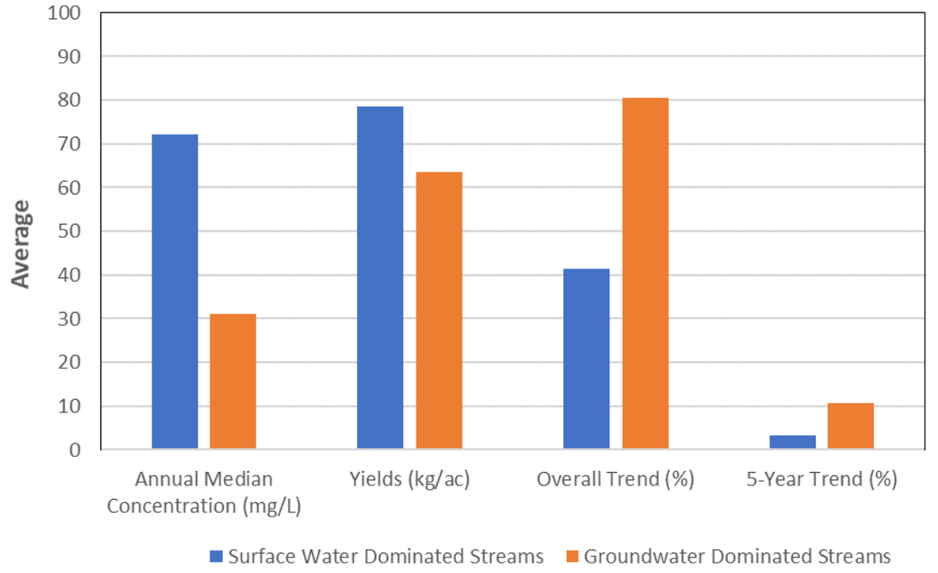
- Mixed trends
  - 12 increase
  - 4 stable
  - 2 decline
- Slower increasing rates except one stream
- Relatively large increases in groundwater-dominated streams



Impact of Urbanization and Groundwater

- Chloride concentration is highly correlated to urban land use ($R^2 = 0.80$)

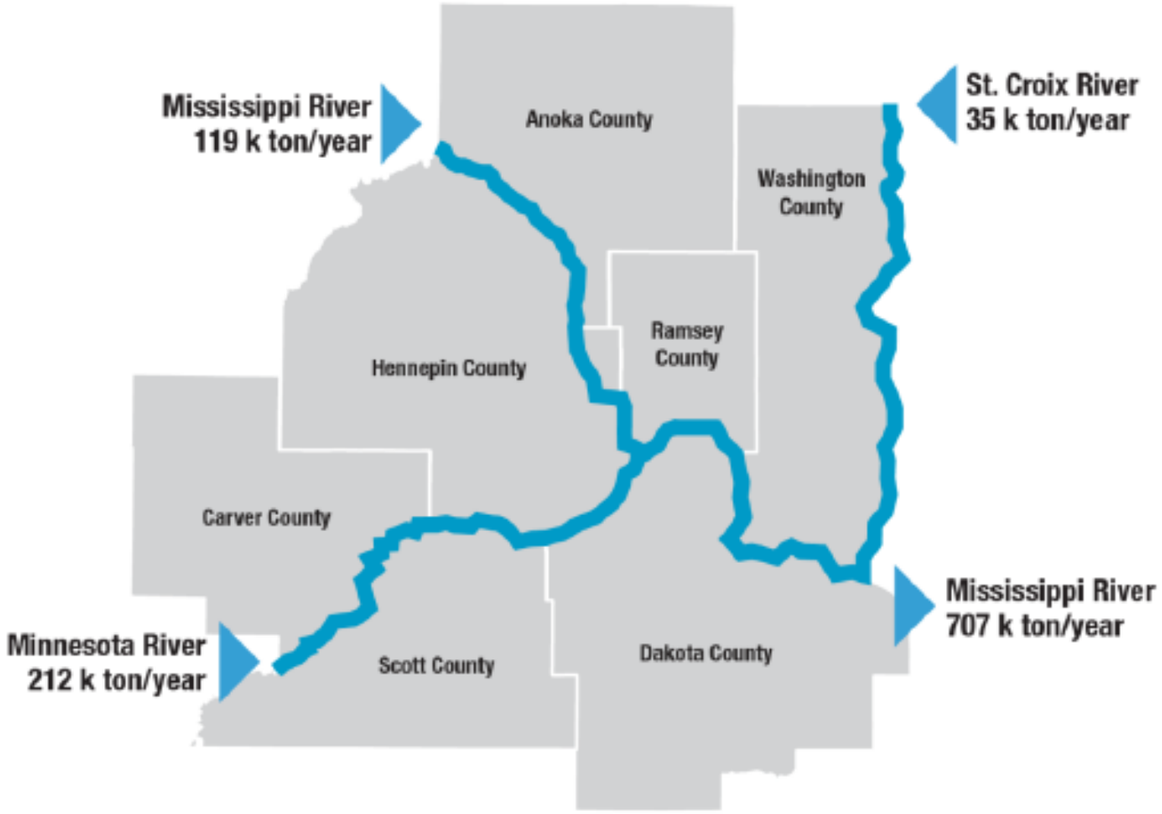




- Lower concentration but larger increase generally observed in the groundwater-dominated streams

Metro Chloride Budgets

- Flow-in: 366k ton/year
  - Minnesota River: 30%
  - Mississippi River: 17%
  - St. Croix River: 5%
- Flow-out: 707k ton/year
- Chloride load almost doubled when flowing through the metro area
- Metro area: 340k ton/year
  - 18 Stream: 118 k ton/year
  - Other sources: 222 k ton/year

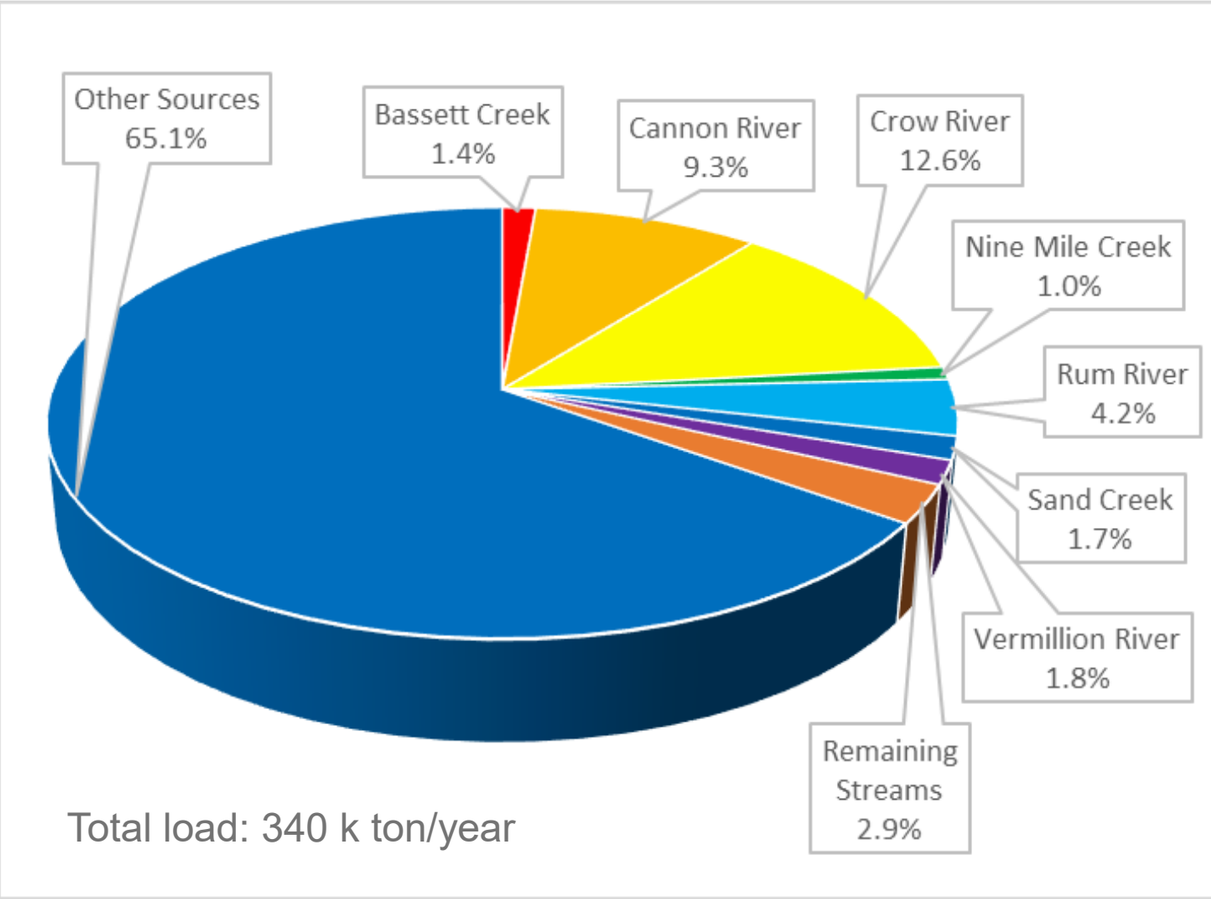


Metro Area Contributions: 340 k ton/year
- 18 streams: 118 k ton/year
- Other sources: 222 k ton/year

Metro Chloride Sources

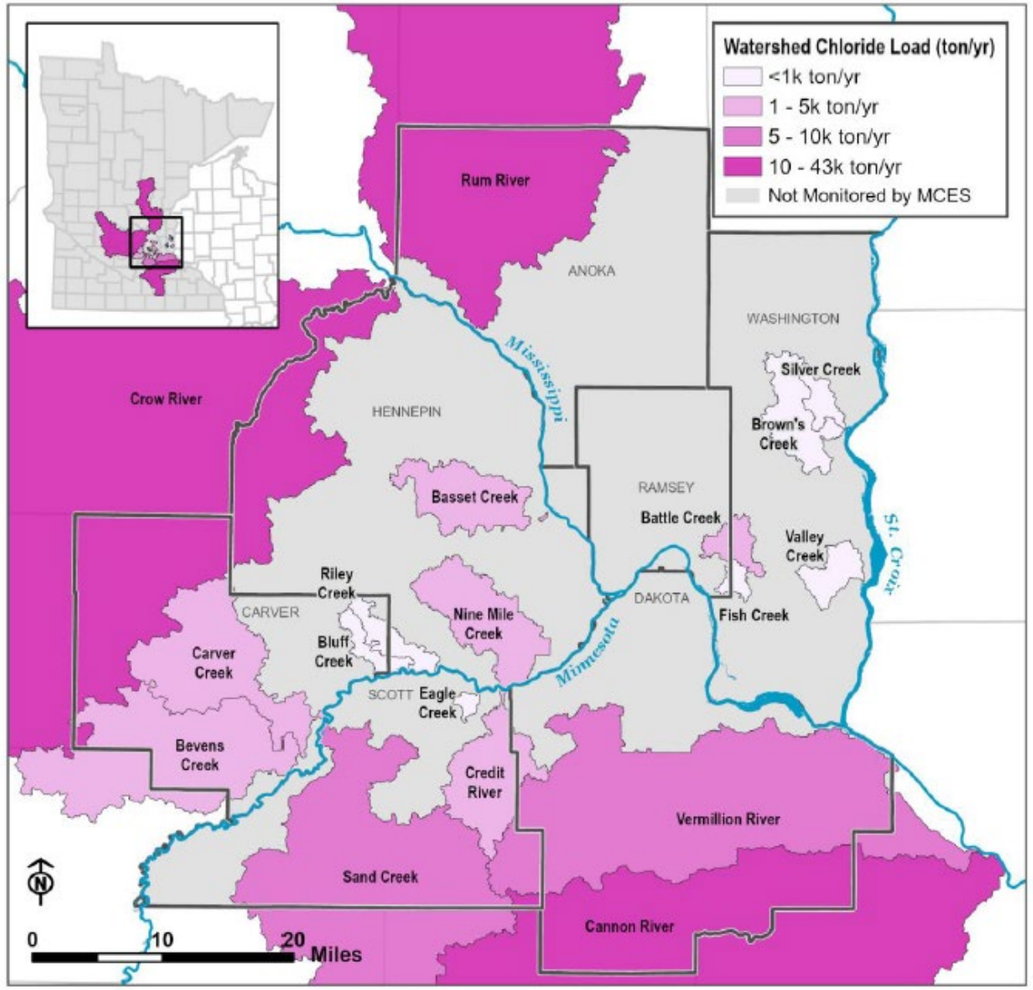
- Studied streams: 35%
  - Three large rivers: 26%
  - The remaining 15 streams: 9%

- Other unstudied sources: 65%



Impact of Metro Streams on Regional Rivers

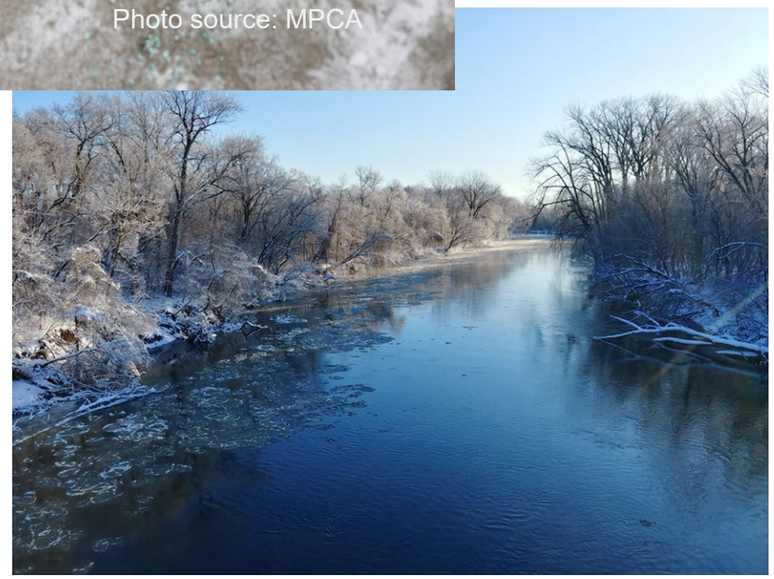
- 17 of 18 assessed streams showed a potential impact
- Three large rivers contributed most chloride loads
- Most of the streams had a small impact on overall river water quality



Key Findings

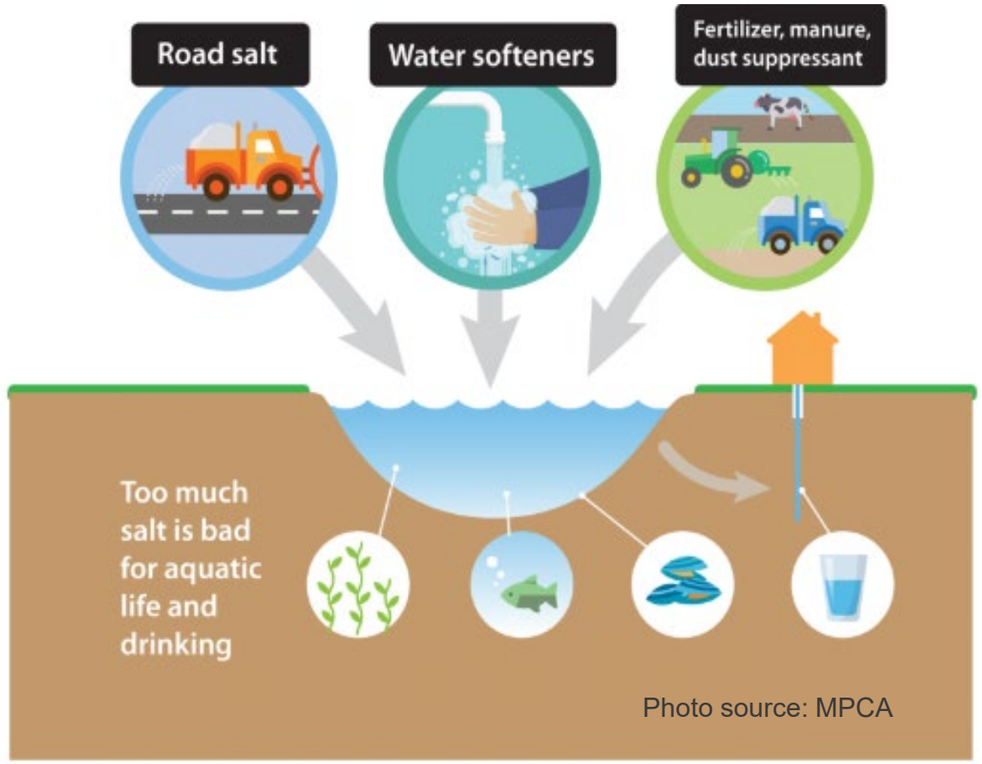
- Chloride concentration varied significantly in streams
- Chloride increased across region in the last 20 years
- The increases were mostly slowed down in the recent 5 years
- High chloride concentrations were related to urban land use

Photo source: MPCA



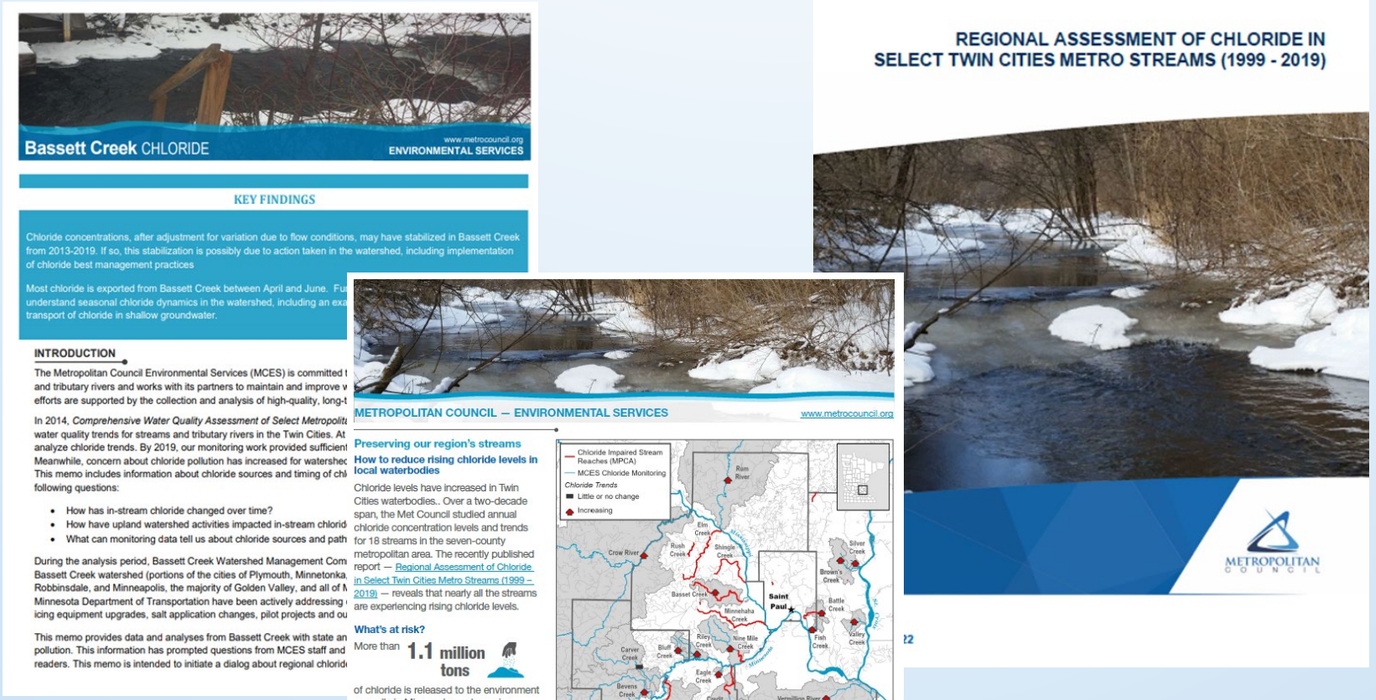
Key Findings

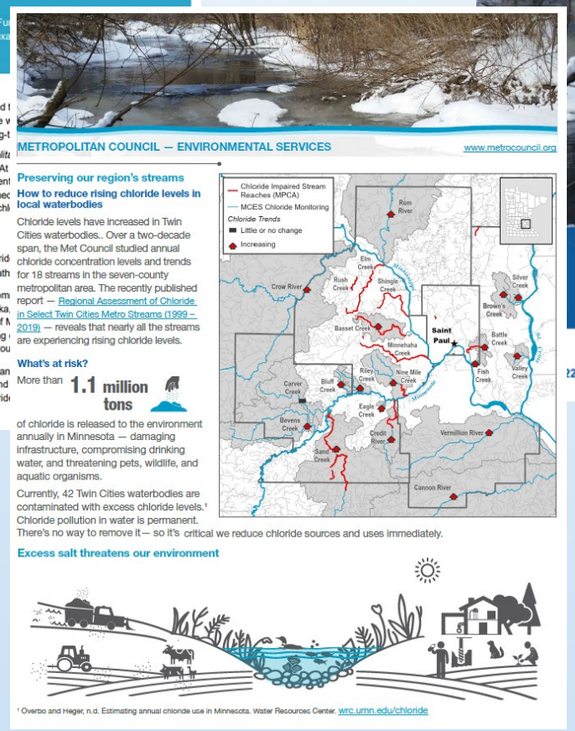
- Groundwater showed a potential impact
- Chloride load almost doubled in regional rivers when flowing through the metro area
- Major metro chloride sources:
  - Winter deicing
  - Fertilizer application
  - Household and industrial water softening
  - Atmospheric deposition



Partner Communications and Feedback

“Thank you for this great information! It's a very well-done memo and I included it in my [Bassett Creek WMC board] meeting materials this month as an informational item”

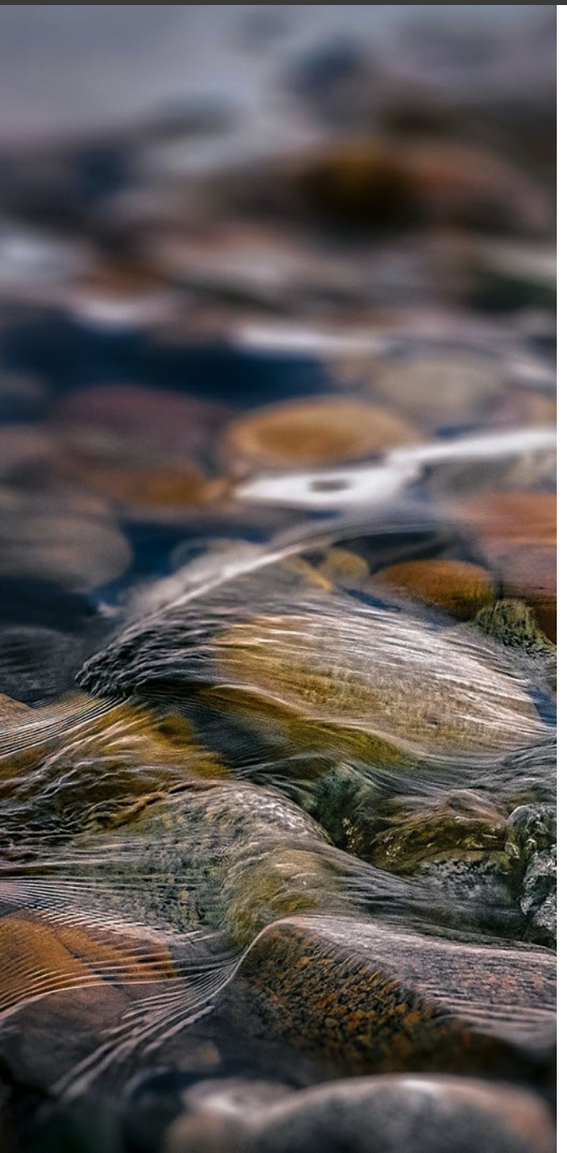




“…. a Nine Mile Creek WD board member...[called and] thanked and complimented us profusely for the Nine Mile memo”

“[we are] planning to summarize [the partner memo] and send it out in our [Riley, Purgatory and Bluff] creek fact sheets”

Questions



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