



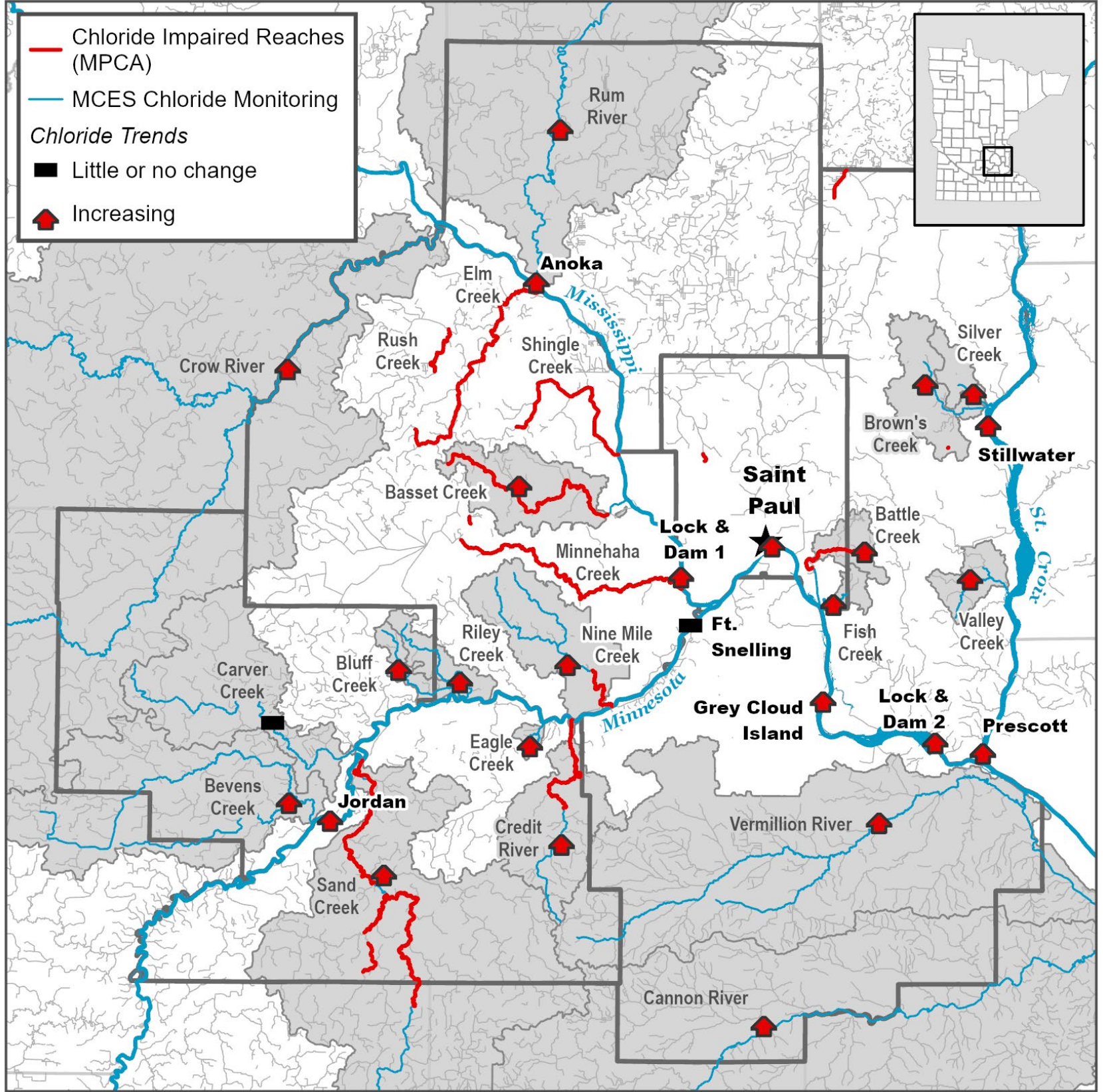
Information Item: Regional Chloride Trends on Metro Area Streams



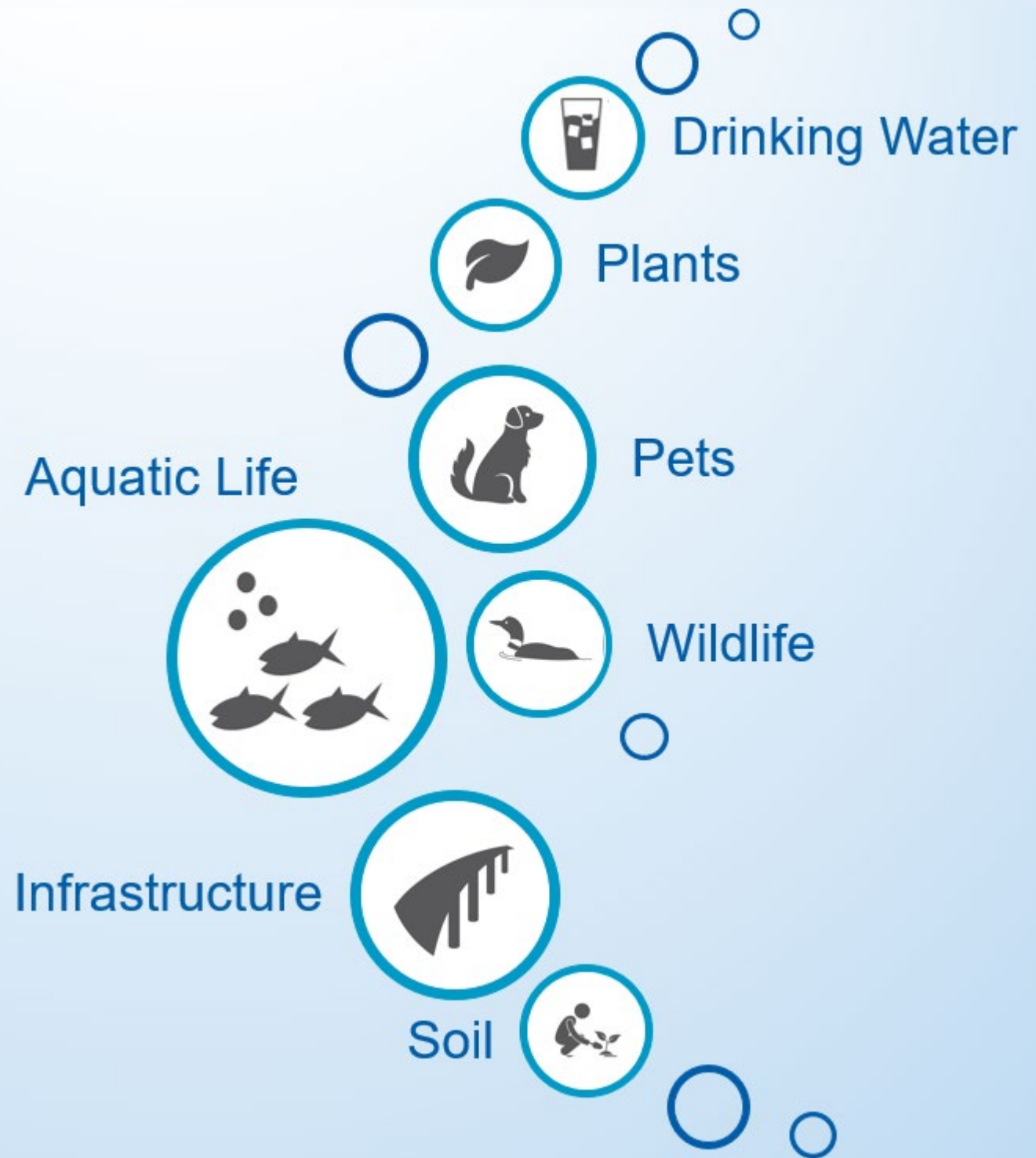
Environment Committee: August 23, 2022

Casandra Champion and Hong Wang
Metropolitan Council Environmental Services

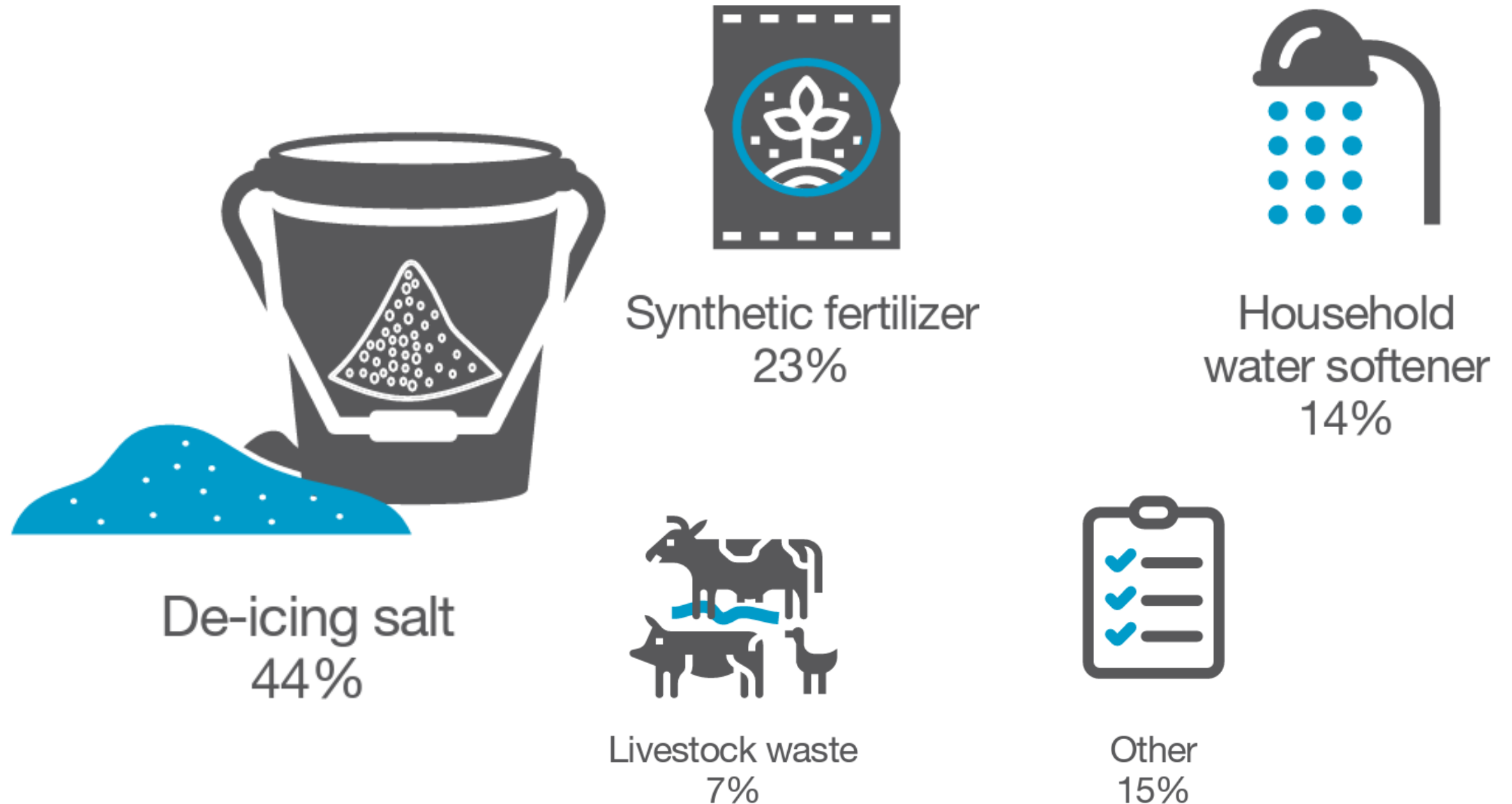
Twin Cities Tributary River and Stream Chloride Pollution



Hazards of Chloride



Chloride Sources in Minnesota Waters



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

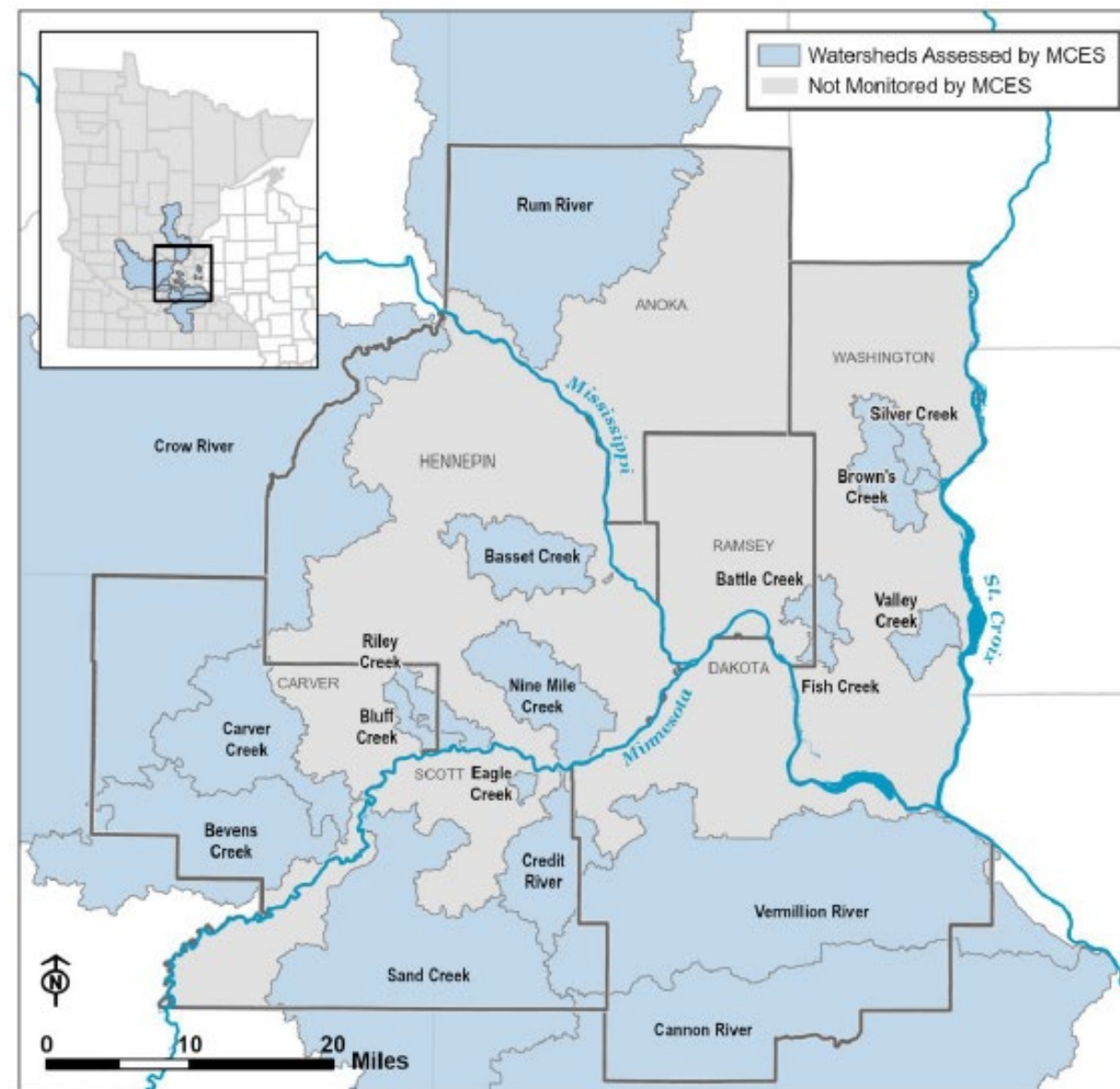
Study Objectives and Watersheds

To understand

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

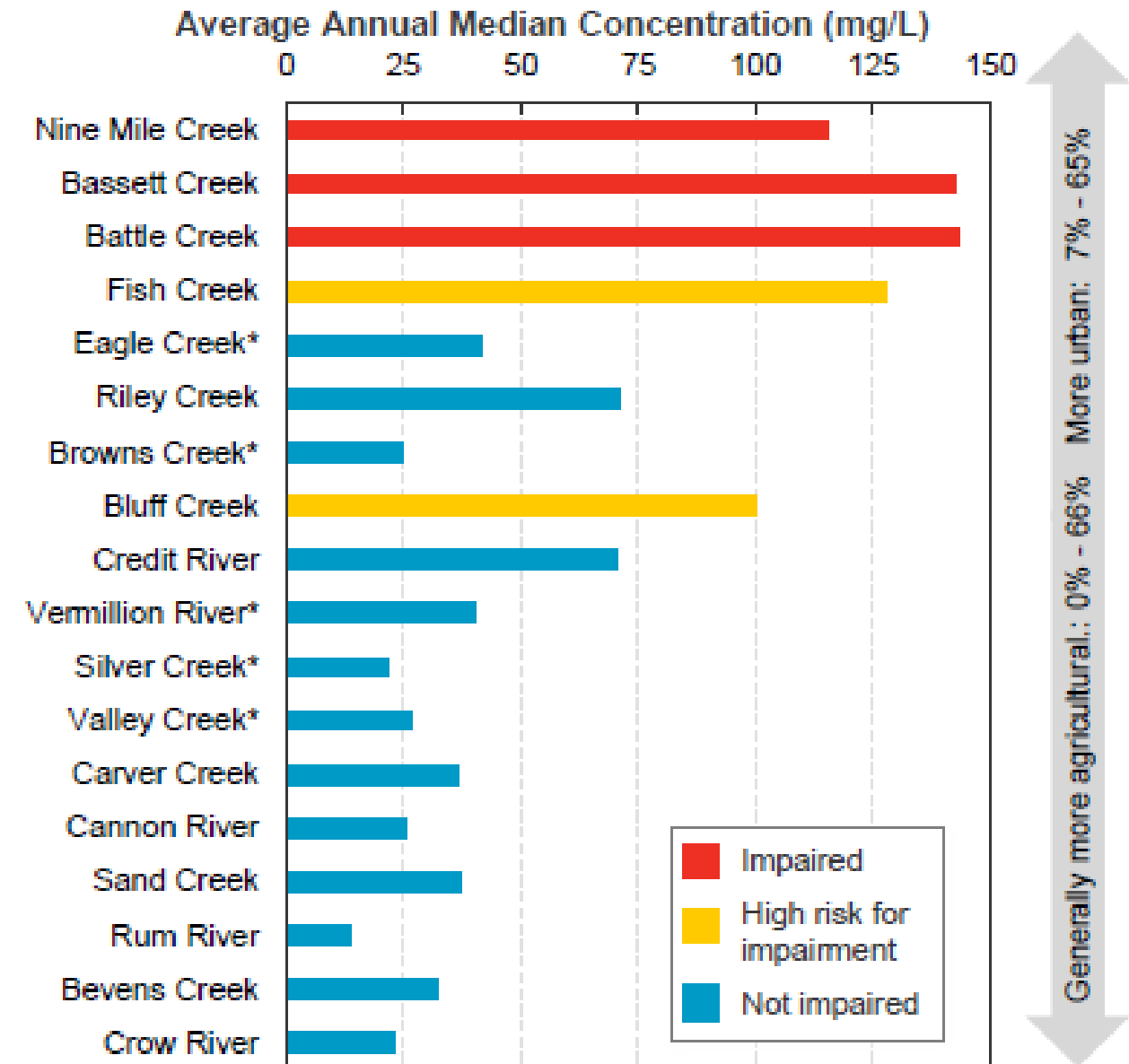
18 metro streams

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



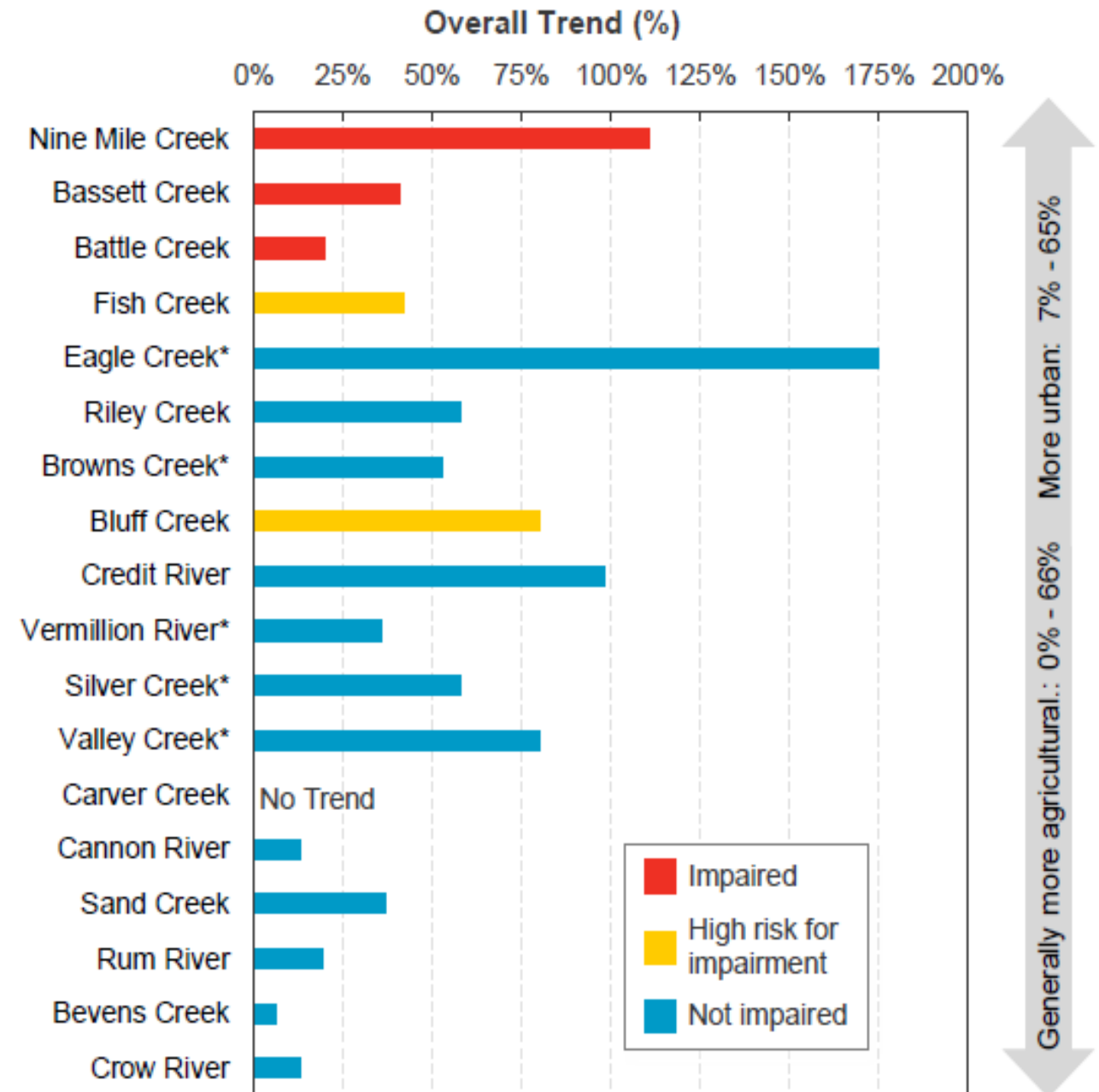
Stream Chloride Conditions

- 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



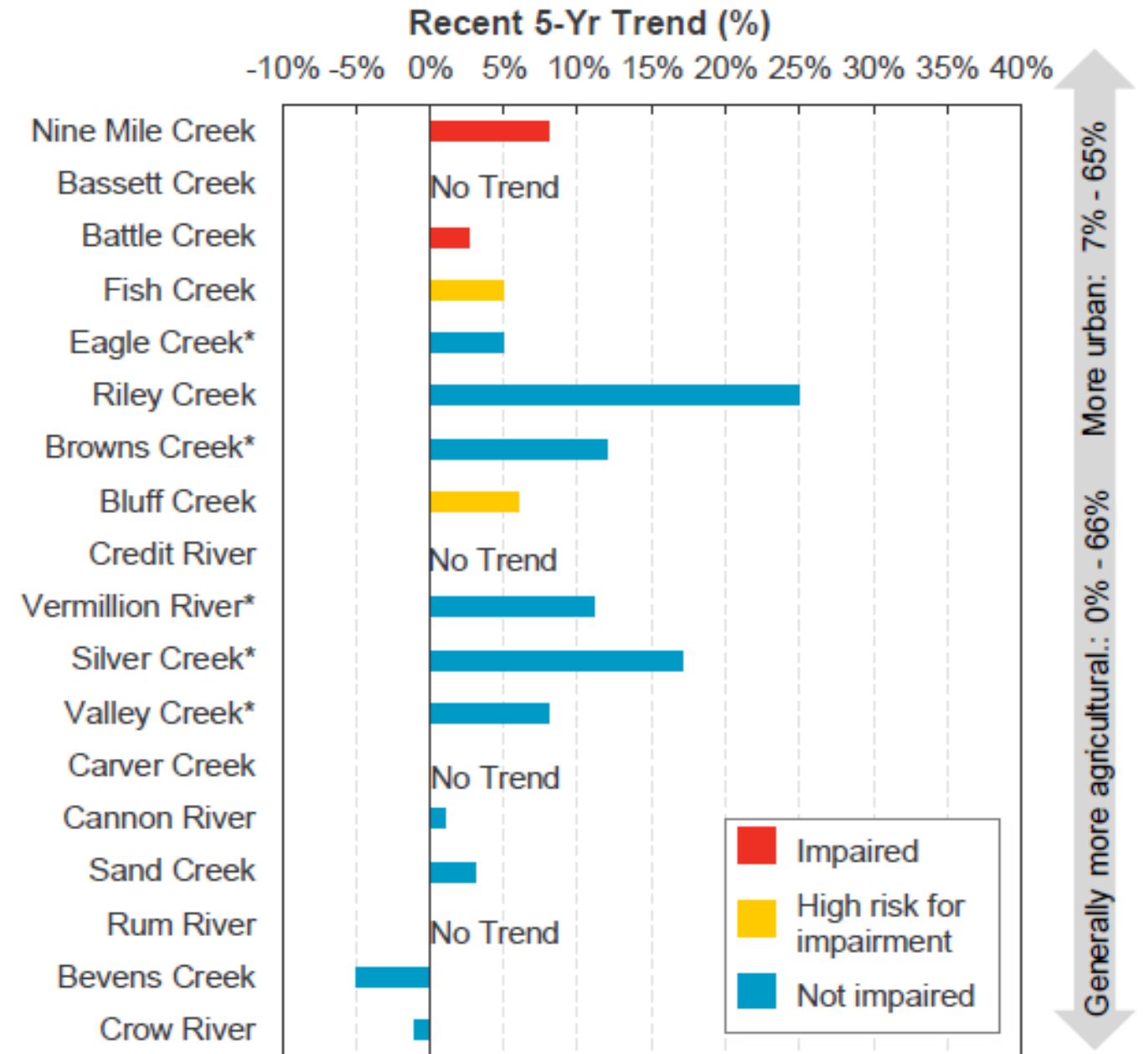
Overall Trends (1999 – 2019)

- 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



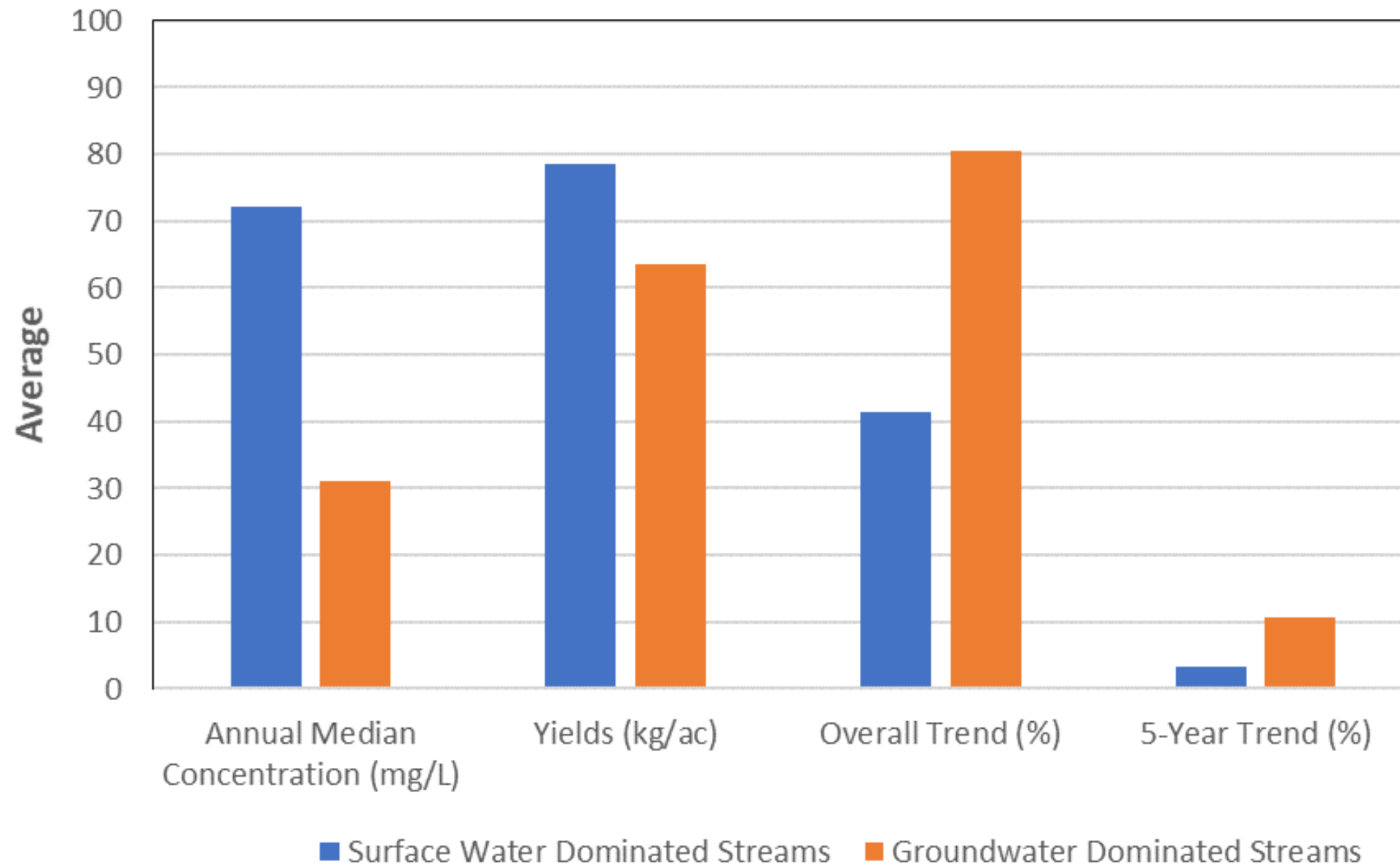
Recent 5-Year Trends (2015 – 2019)

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



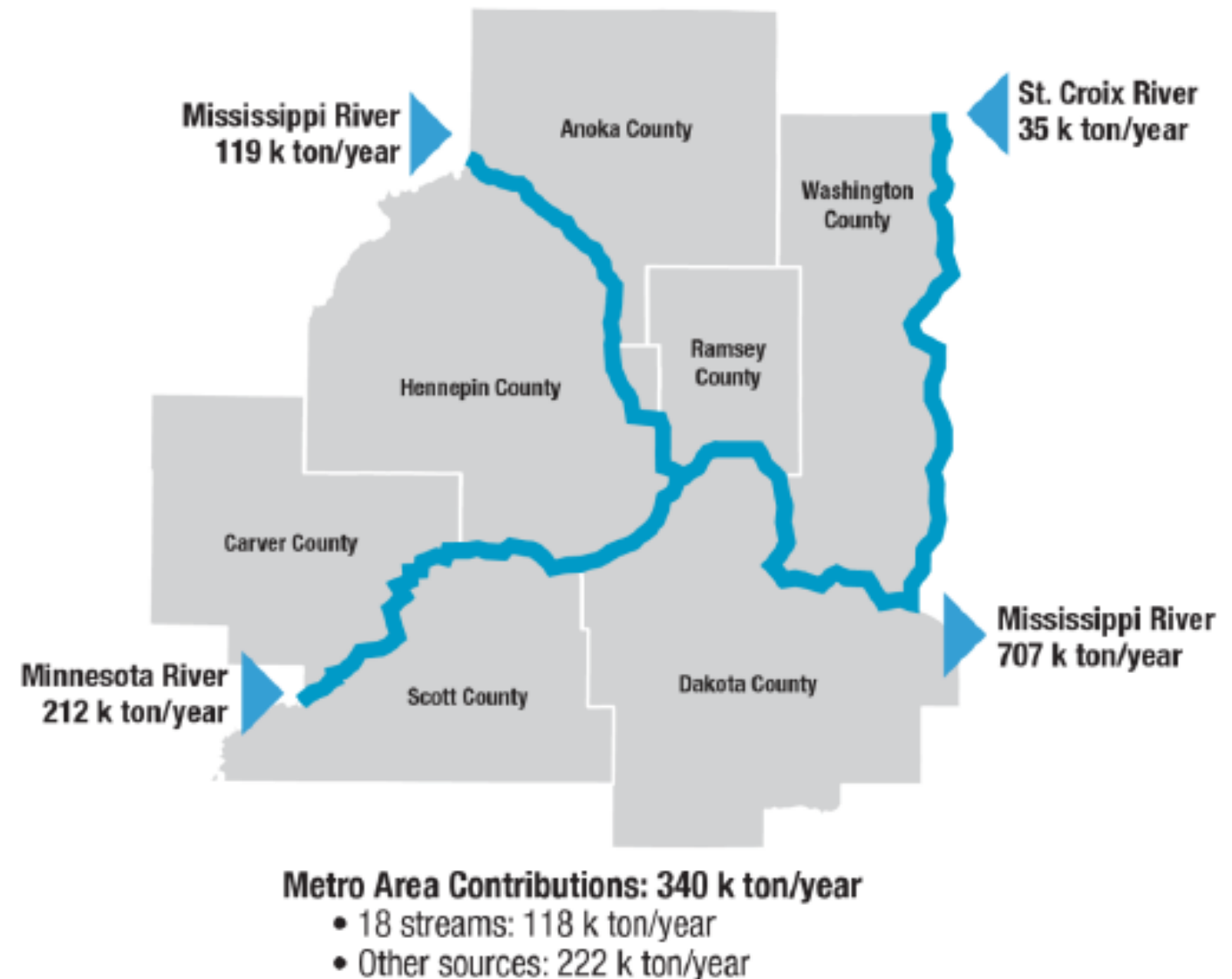
Impact of Groundwater

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



Metro Chloride Budgets

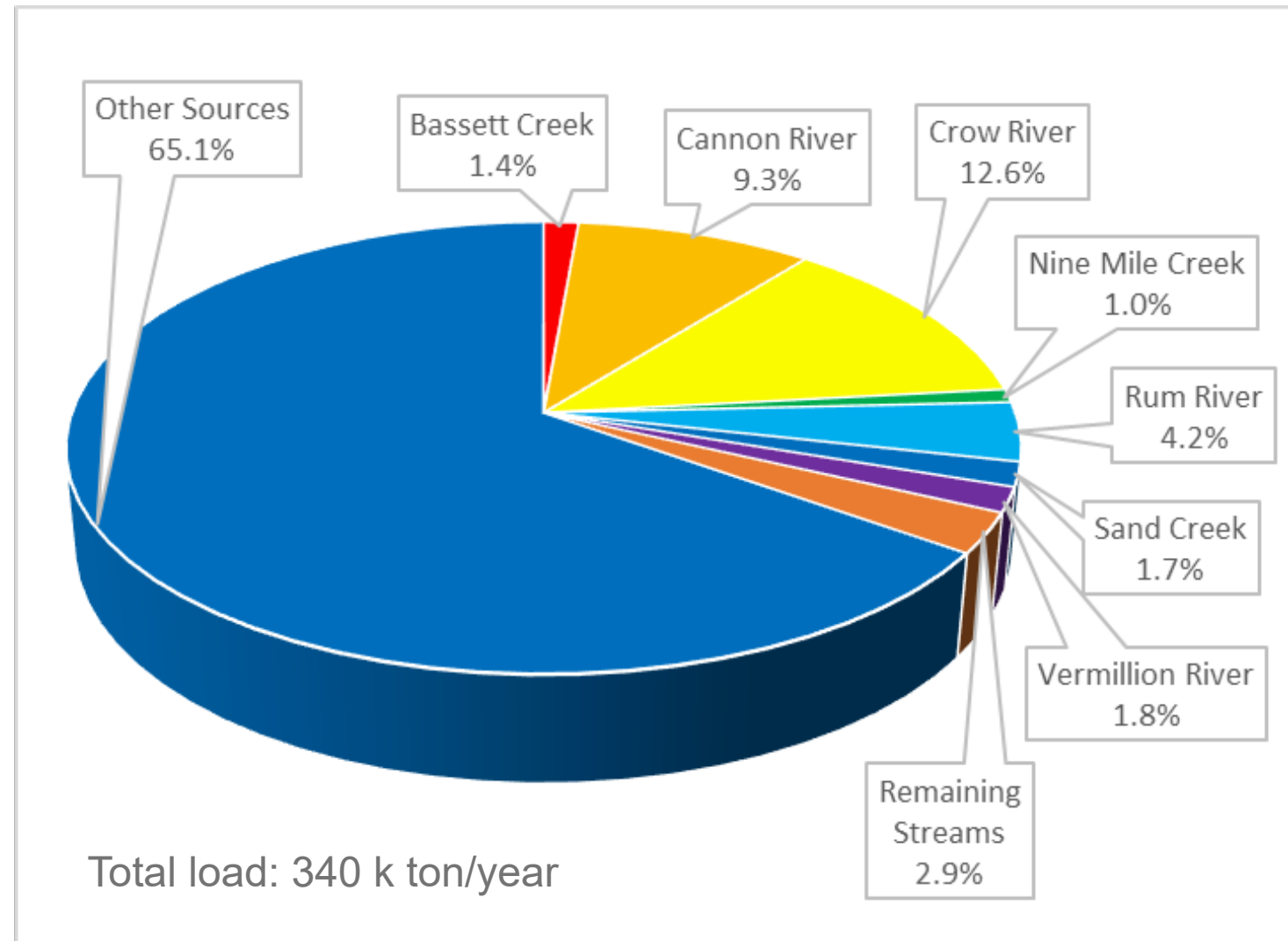
- Flow-in: 366k ton/yr
- Flow-out: 707k ton/yr
- Chloride load almost doubled when flowing through the metro area
- Metro area: 340k ton/yr
 - 18 Stream: 118 k ton/year
 - Other sources: 222 k ton/year



Metro Chloride Sources

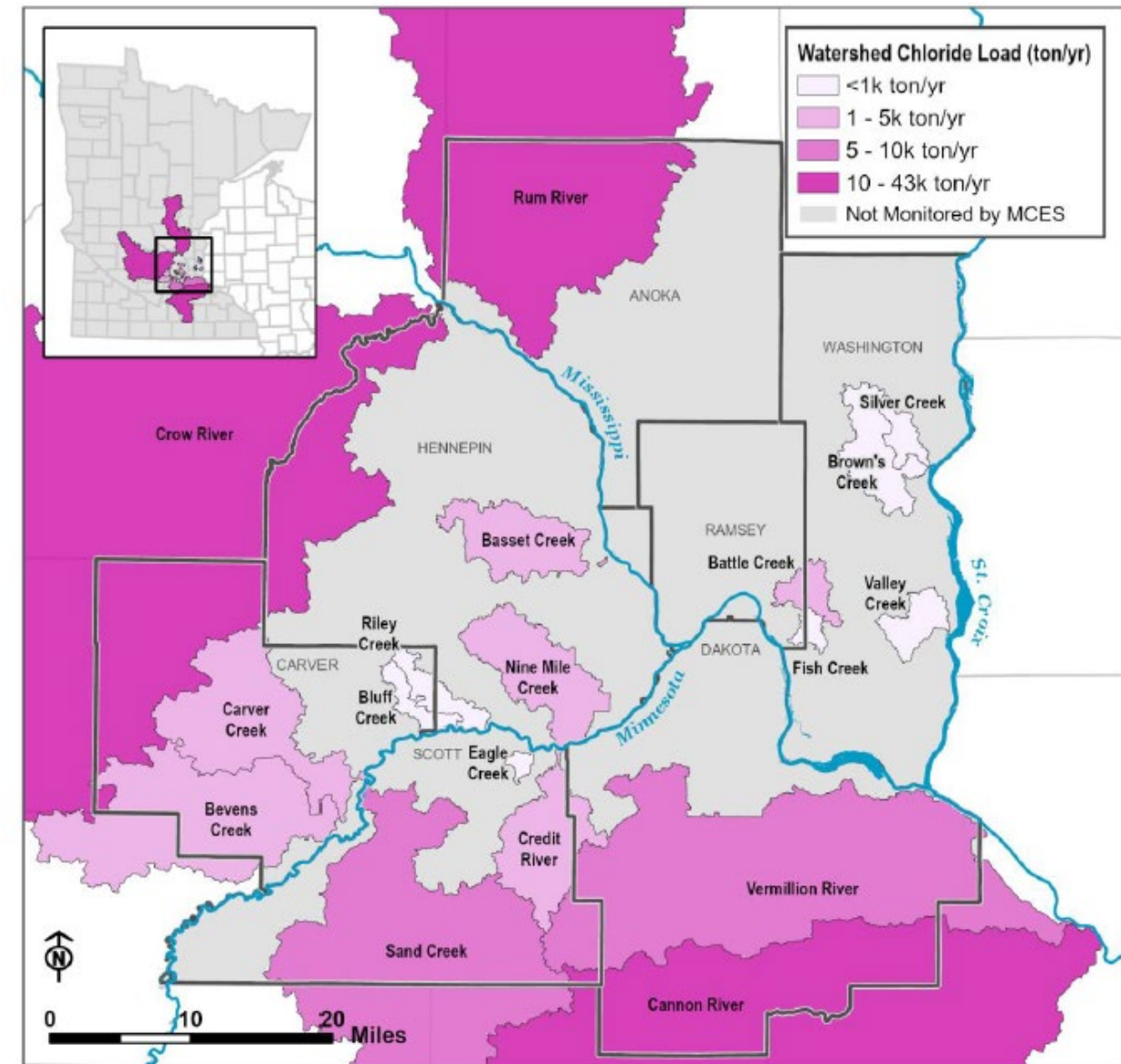
- Studied streams: 35%
- Three large rivers: 26%
- The remaining 15 streams: 9%

- Other unstudied sources: 65%



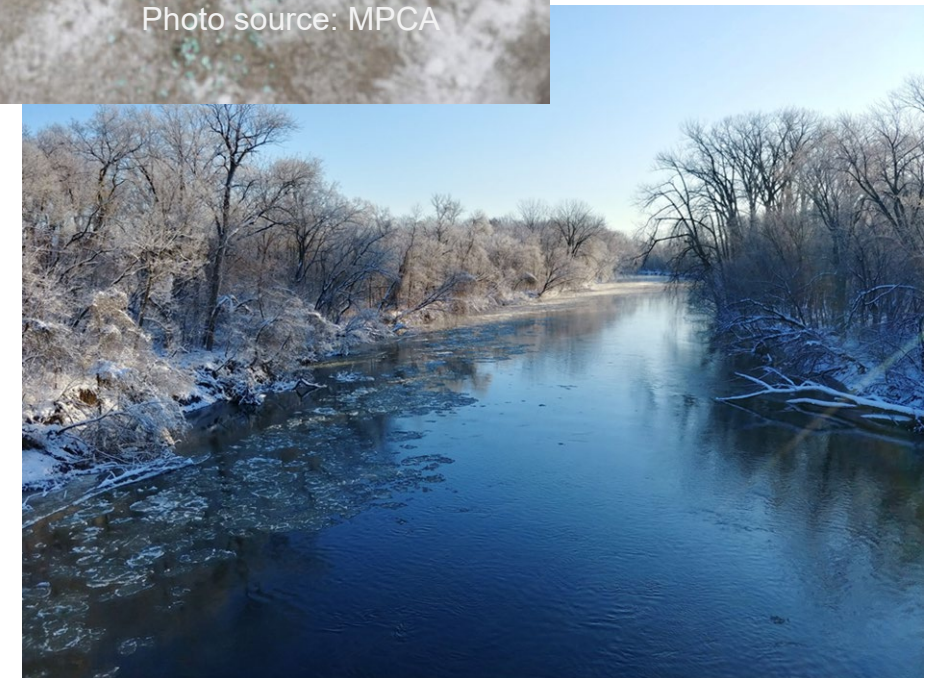
Impact of Metro Streams on Regional Rivers

- 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



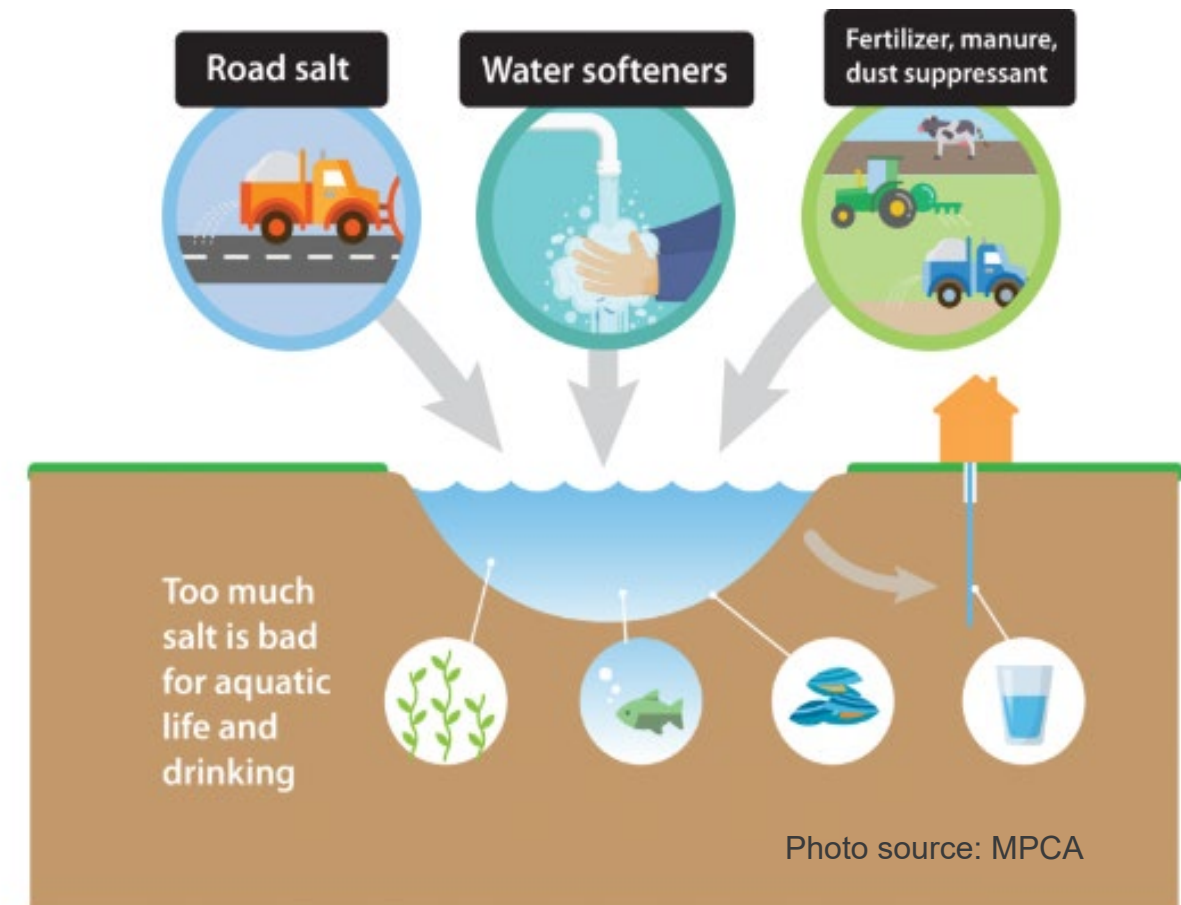
Key Findings

- 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



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 Communication



KEY FINDINGS

Chloride concentrations, after adjustment from 2013-2019. If so, this stabilization is of chloride best management practices.

Most chloride is exported from Bassett Creek watershed. We need to understand seasonal chloride dynamics in transport of chloride in shallow groundwater.

INTRODUCTION

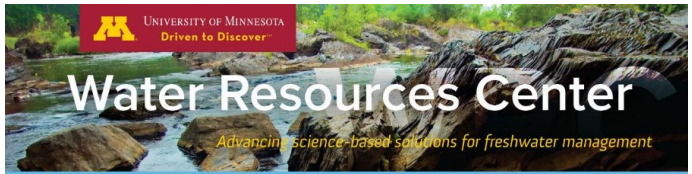
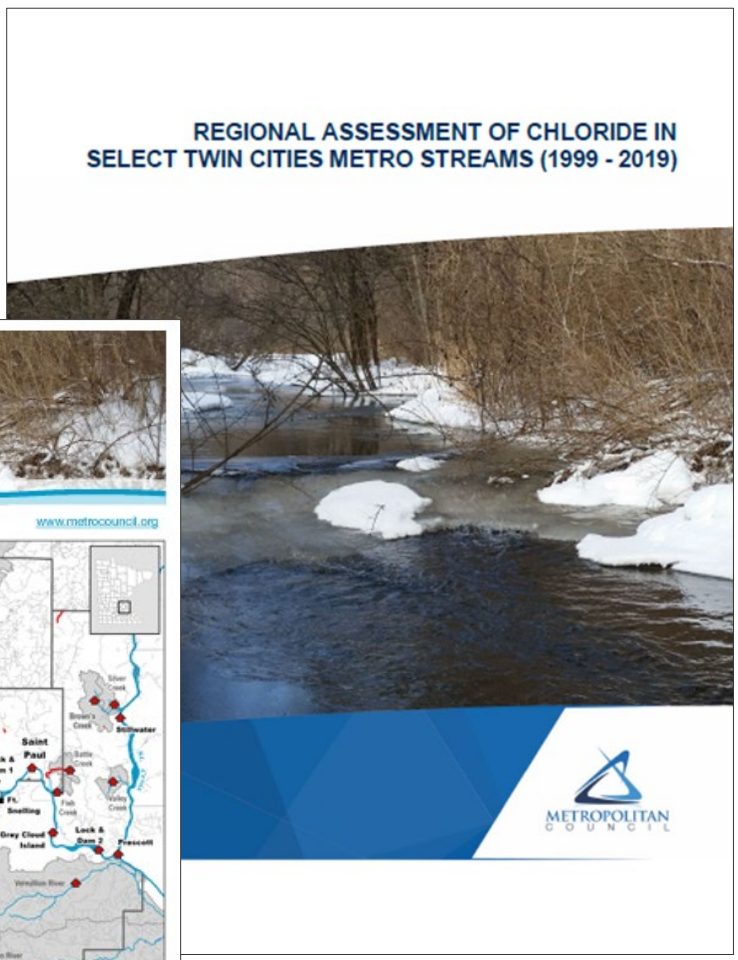
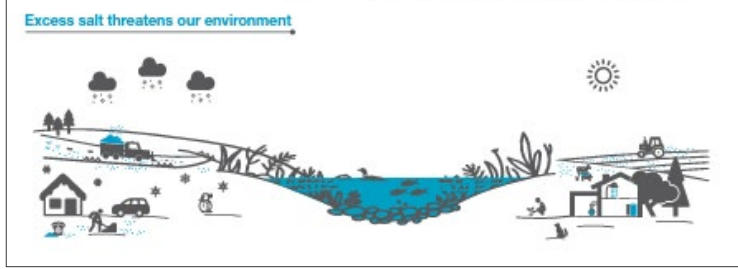
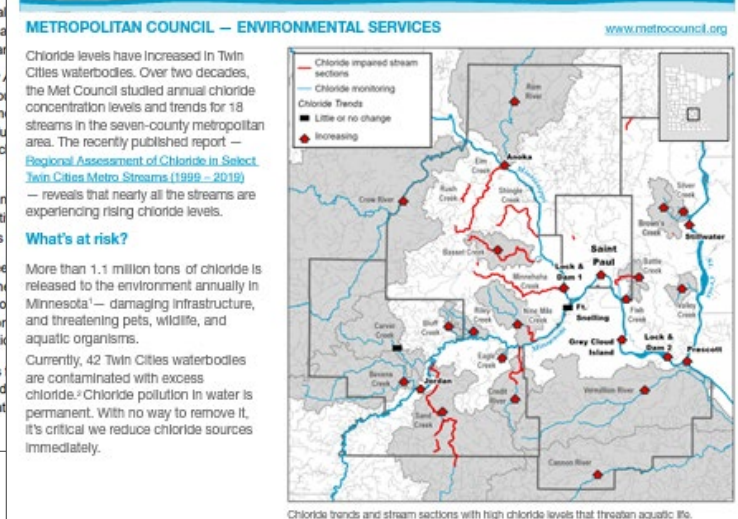
The Metropolitan Council Environmental Services (Met Council) and its partners are working to protect and improve the water quality of our streams and rivers. Our efforts are supported by the collection and analysis of water quality data.

In 2014, *Comprehensive Water Quality Assessment* was published, which analyzed water quality trends for streams and tributaries in the seven-county metropolitan area. Meanwhile, concern about chloride pollution has grown. This memo includes information about chloride pollution and answers the following questions:

- How has in-stream chloride changed?
- How have upland watershed activities changed?
- What can monitoring data tell us?

During the analysis period, Bassett Creek watershed (portions of the Robbinsdale, and Minneapolis, the major watersheds in the metropolitan area) was the primary source of chloride pollution. Minnesota Department of Transportation (MnDOT) equipment upgrades, salt application, and other activities have increased chloride levels in the watershed.

This memo provides data and analyses of chloride pollution. This information has prompted readers. This memo is intended to initiate discussions with partners about chloride pollution and its impacts on water quality.



Partner 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

Laura Jester, Administrator, Bassett Creek Watershed Management Commission

[we are] planning to summarize [the partner memo] and send it out in our creek fact sheets

Josh Maxwell, Riley Purgatory Bluff Creek Watershed District

I just got a call from *Grace Butler [Nine Mile Creek Watershed District board member]*. She thanked and complimented us profusely for the Nine Mile memo.

Questions

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