Information Item:
Chloride Impacts

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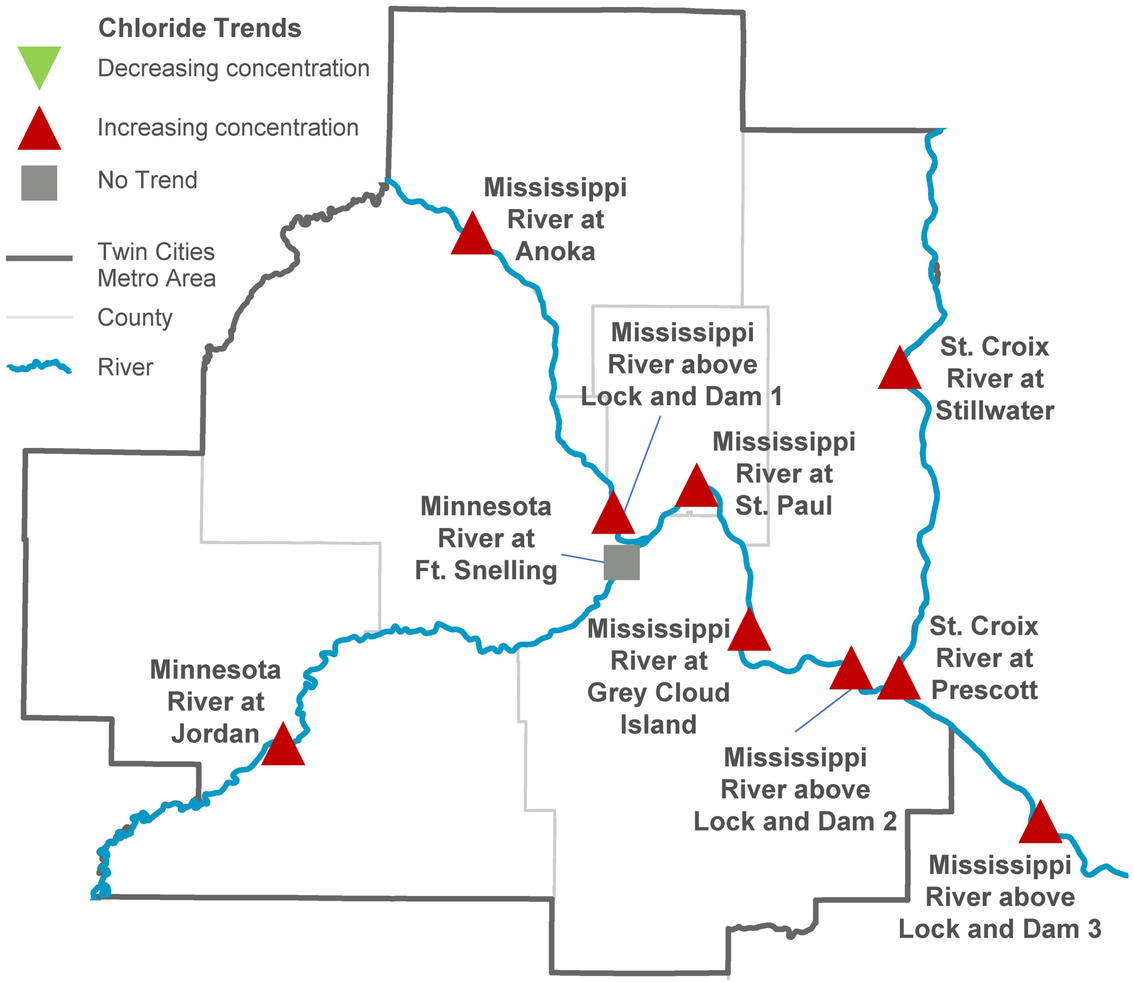
Environment Committee: September 28, 2021

METROPOLITAN COUNCIL

Chloride: Toxic to Aquatic Life

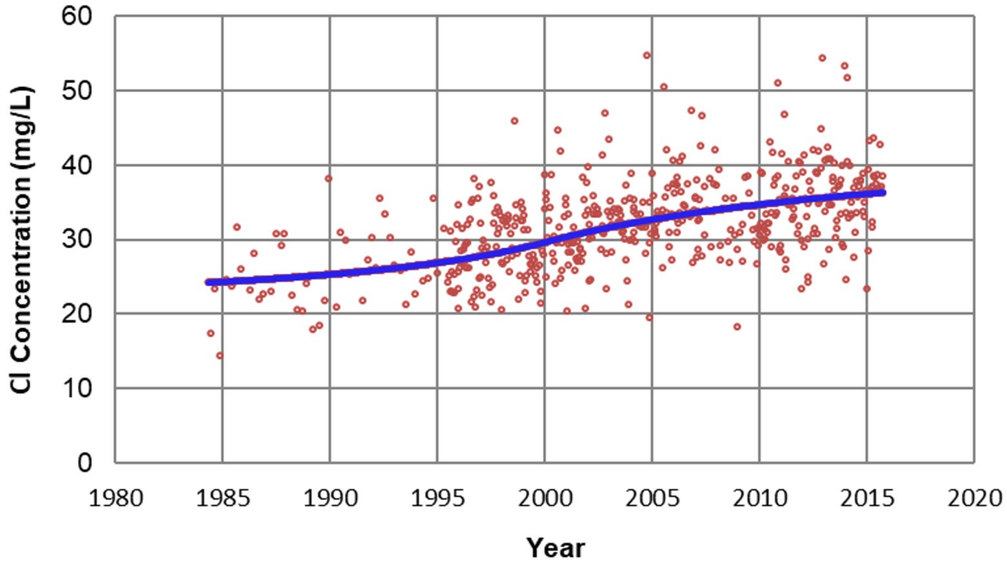
- **Macroinvertebrates:** Mussels, Mayflies, Amphipods (side-swimmers)
- **Fish:** Least darter, Pugnose shiner, Walleye, Northern pike
- **Plants:** Canada Bluejoint, Lake Sedge, Spike Rush, Bulrush
- **Amphibians:** Wood frogs, Tiger salamander, Eastern newt

Chloride Trends in Major Metro Rivers

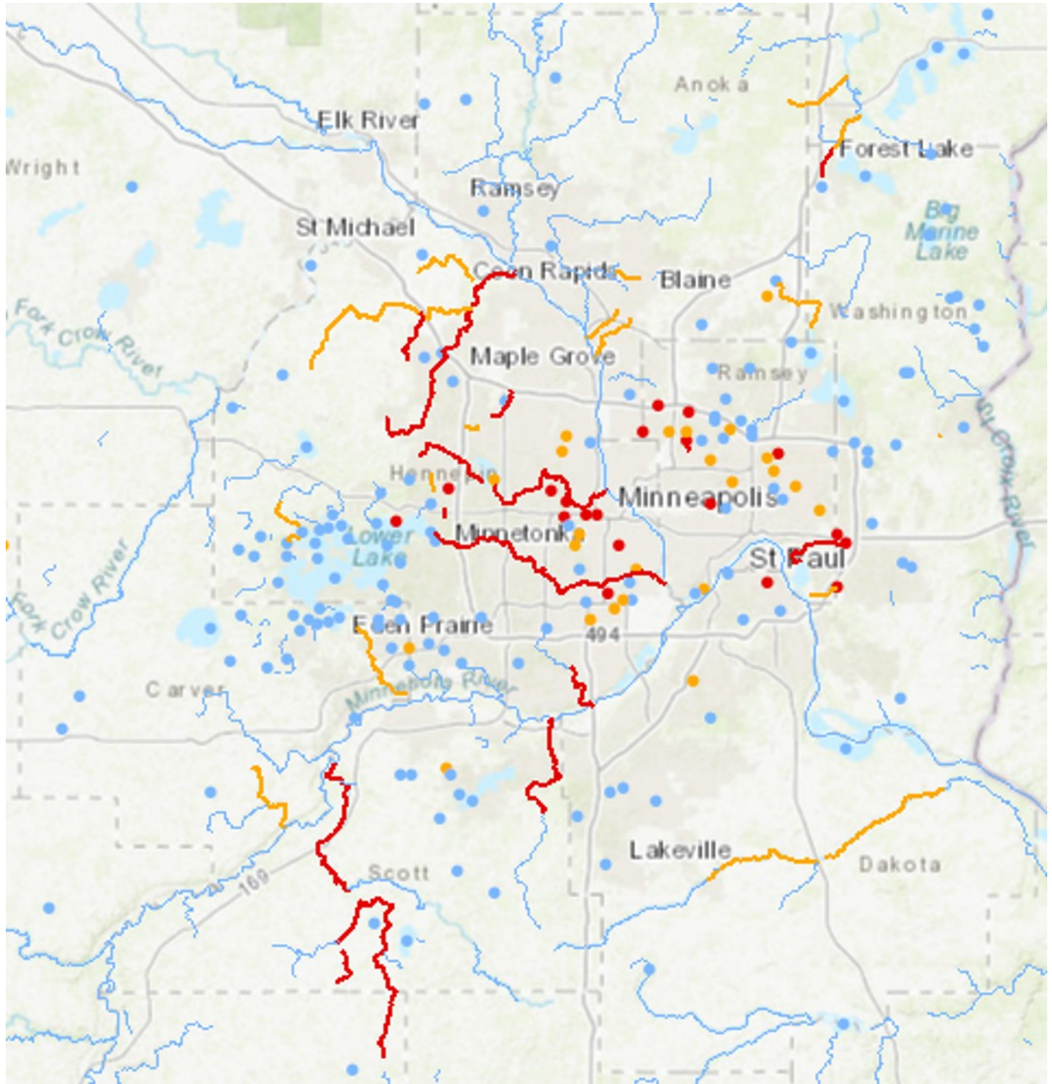


Mississippi River at Grey Cloud Island

- 50% increase in concentration since 1985
- Average Rate of Change= 0.4 mg/liter/year

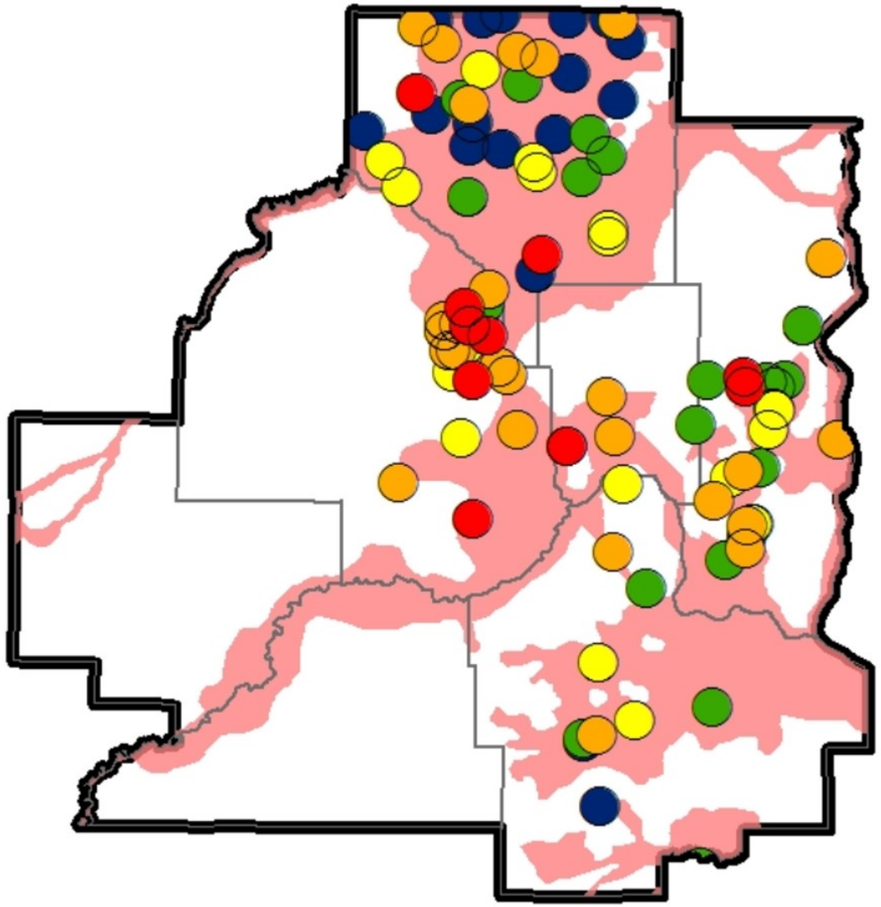


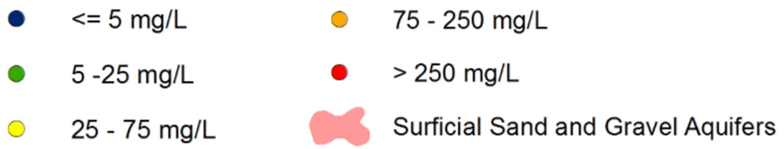
Chloride-Impaired Rivers and Streams: Twin Cities Metro Area



- Red: Impaired
- Orange: High risk but not impaired
- Blue: Not impaired/not assessed

Chloride in Twin Cities Metro Area Groundwater



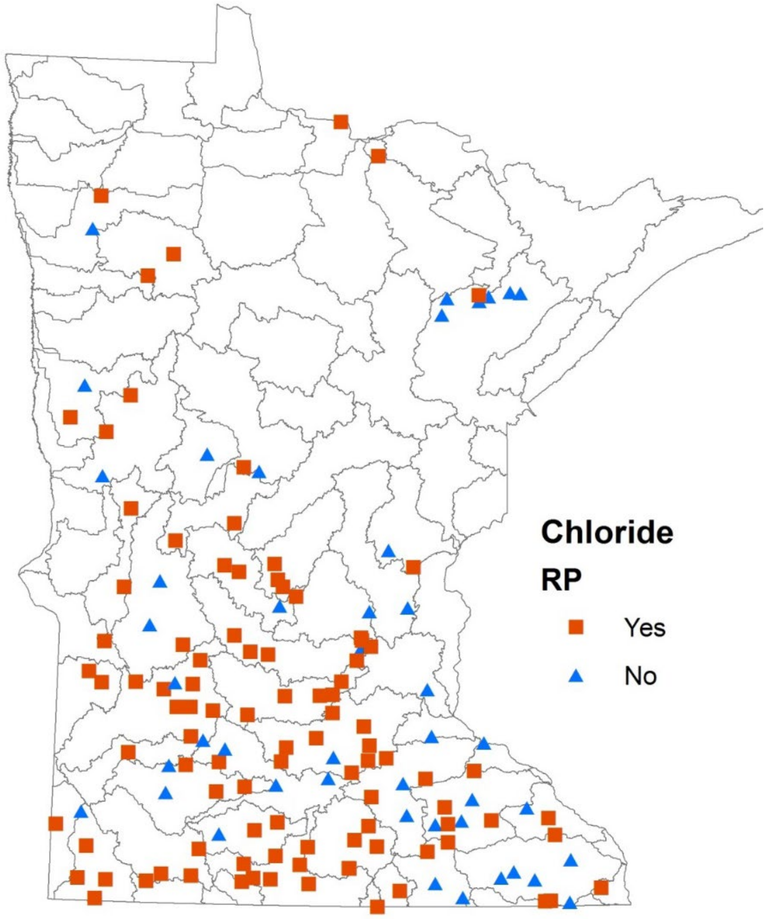


Note: > 250 mg/liters exceeds National Secondary Drinking Water Standard

Source: *The Condition of Minnesota's Groundwater Quality 2013-2017*, MPCA July 2019

MPCA Chloride Standard - Over 100 Wastewater Treatment Plants Impacted

- MPCA's Chloride Standard in Receiving Water Body
  - Chronic: 230 mg/liter chloride
  - Acute: 860 mg/liter
- Receiving water bodies for over 100 wastewater treatment plants (WWTP's) statewide have reasonable potential (RP) to exceed chloride water quality standard due to WWTP's discharge



Source: MPCA

Chloride Management Challenges

- Chloride does not break down in environment or with treatment
- Treatment technology infeasible for large WWTP such as MCES’
- Typical treatment (reverse osmosis) results in a concentrated brine waste with no feasible disposal option in Midwest
- Source control is best option

WWTPs: Conduit for, Not Sources of Chloride

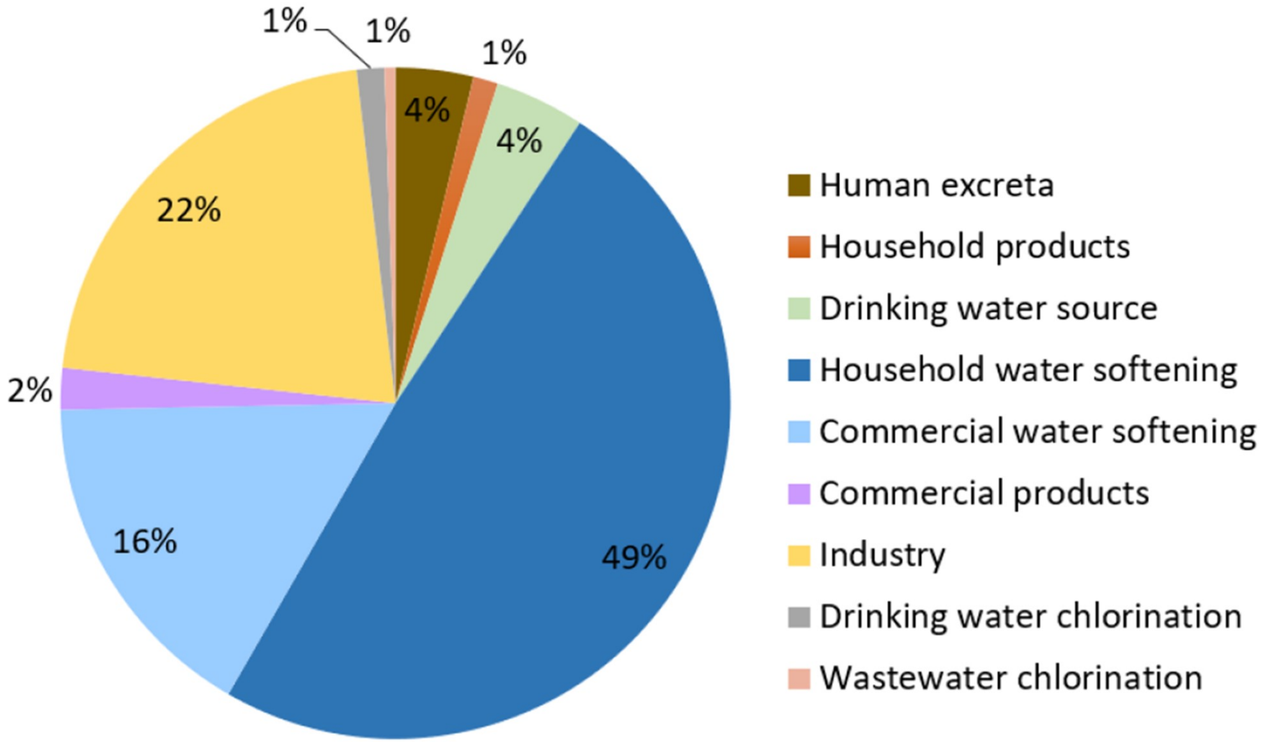
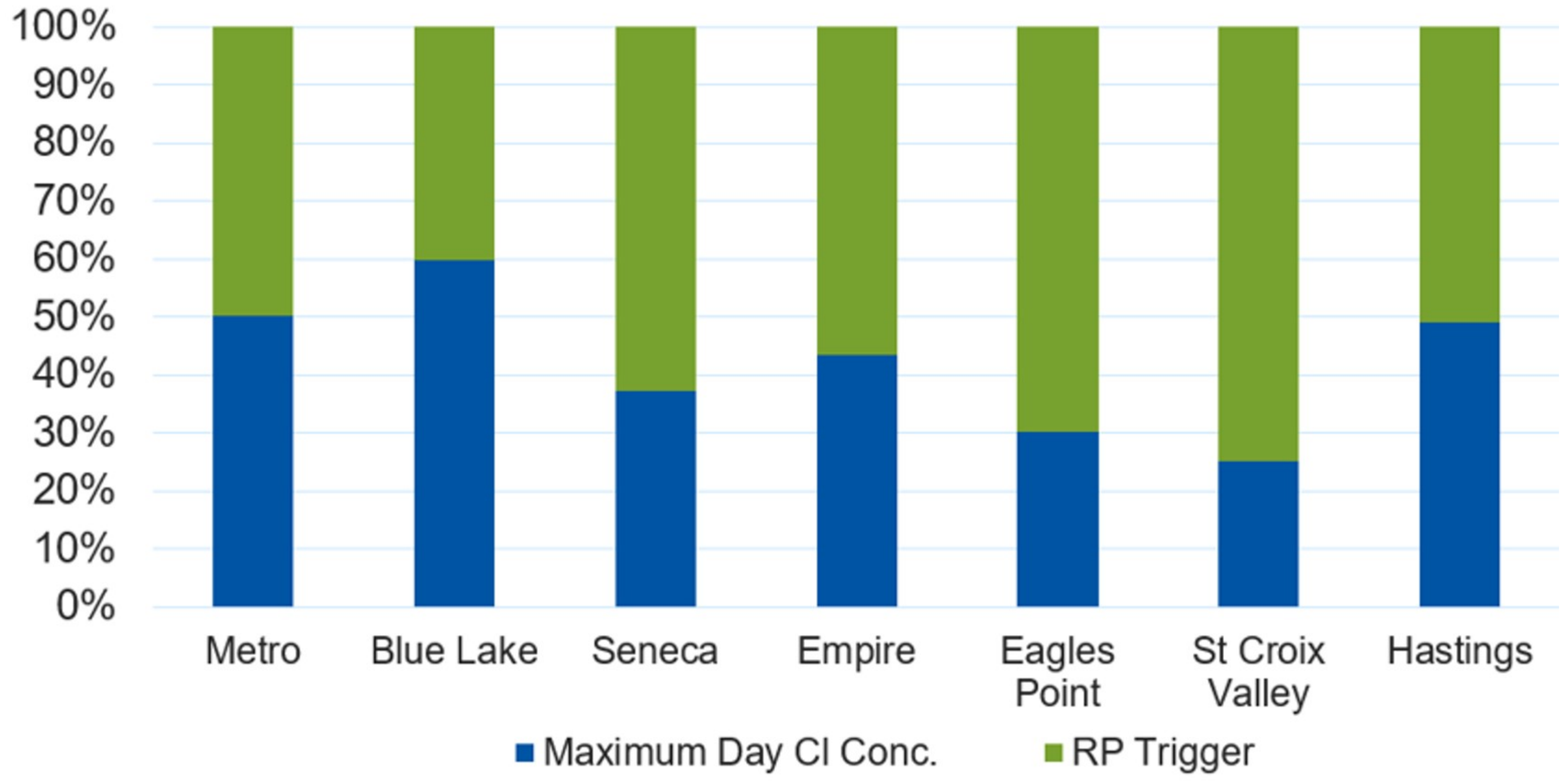


Figure 12. Fraction of chloride contributed from domestic, commercial, and industrial sources to all WWTPs in state of Minnesota.

Info source: *Chloride Contributions from Water Softeners and Other Domestic, Commercial, Industrial, and Agricultural Sources to Minnesota Waters.* Alycia Overbo, et. al, U of M Water Resources Center, MPCA, and U of M. Dept. of Civil, Environmental and Geo-Engineering, January 2019.

MCES WWTP Chloride Limits: Not Anticipated in Foreseeable Future



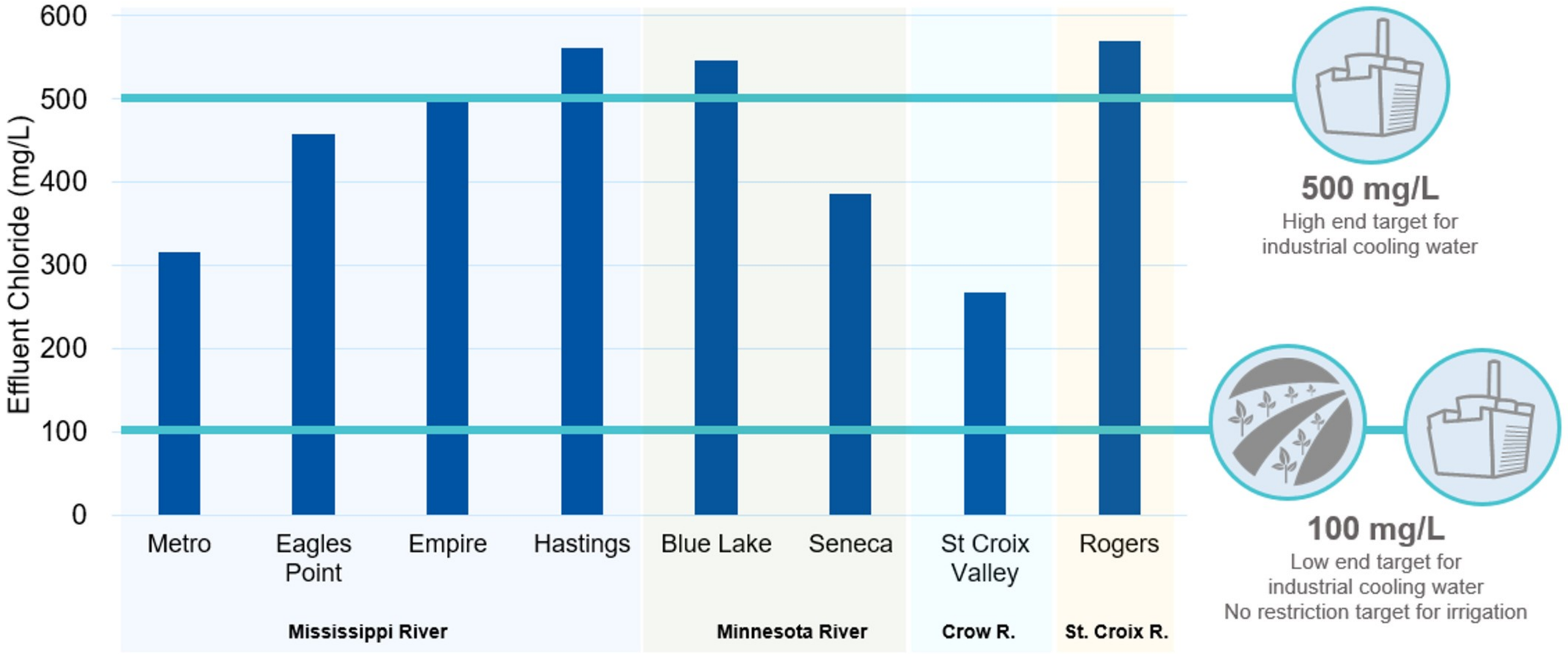
Rogers WWTP Permit Compliance Plan with Intervention Limit

After Effective Date of Permit	Permit Requirement
Year 1, Qtr. 1	Chloride monitoring report
Year 3	Chloride reduction plan
Years 4, 5, 6	Chloride reduction progress reports
Year 7	Chloride reduction progress report Chloride compliance update
Years 8 & 9	Chloride reduction progress reports
Year 10	Chloride reduction progress report Chloride compliance update
Year 11	Chloride compliance

Intervention Limit:

- Max – 784 mg/liter
- If intervention limit is exceeded, MCES must take certain permit-defined actions, but exceedance is not a permit violation
- Ultimate plan for compliance: build new Crow River WWTP with discharge to larger water body

Chloride - Major Challenge for Wastewater Reuse



Two Approaches if Chloride Regulated in MCES WWTP Permits or Need for Reuse Increases

- End of pipe approach: Attempt to treat chloride at MCES WWTPs
  - Cost and technologically infeasible for large WWTP such as MCES'
  - Results in a concentrated brine waste with no feasible disposal option in Midwest
- Source control approach: MCES and region's communities, watersheds, and industries work together to reduce chloride at the source
  - Draws on region's success with other source control initiatives
  - Dental amalgam source reduction initiative
  - Infiltration/inflow mitigation program

Current Chloride Team Charter: Outcomes

- Lead in building understanding of chloride issues & developing chloride reduction strategies by collaborating with regional customers and stakeholders
- Prepare for a chloride section of *2050 Water Resources Policy Plan* and collaborate in Water Resources Policy Team's stakeholder outreach
- Resolve how to address requests for receiving salty discharge from:
  - Industries inside & outside of the region
  - Customer communities, or watershed organizations

  In a manner that is acceptable to MCES' customers

Current Chloride Team Results to Date

- Potential future chloride limits: chloride reduction concepts and costs
  - At WWTPs
  - By source control:
    - Residential, commercial, and industrial water softener improvements
    - Municipal softening alternatives
    - Collaborating with City of Robbinsdale on study of chloride reduction resulting from municipal softening
- Potential future wastewater reuse: chloride reduction concepts and costs
  - At WWTPs
  - By source control
  - Collaborating with City of Rosemount on potential wastewater reuse
- Potential ways to work with communities and watersheds to address surface water chloride challenges

Conclusion

- **Overall chloride picture**
  - ✓ Chloride toxic to aquatic life
  - ✓ Chloride does not break down in environment or with treatment
  - ✓ Chloride concentrations increasing: surface water, shallow groundwater
  - ✓ MPCA set water quality standard

- **Chloride and MCES WWTPS**
  - ✓ WWTPs are conduits for, not sources of, chloride
  - ✓ Chloride effluent limits in MCES WWTP NPDES permits not anticipated in foreseeable future
  - ✓ Rogers WWTF: permit requirements = intervention limit + chloride reduction plan
  - ✓ Chloride very challenging for wastewater reuse

- **MCES: get ahead of chloride issue because chloride reduction at WWTPs**
  - ✓ Technically very challenging
  - ✓ Extremely expensive
  - ✓ Results in concentrated brine with no feasible disposal option
  - ✓ Source reduction is key and would involve partners

- **MCES: get ahead of chloride issue by**
  - ✓ Developing chloride management alternatives information
  - ✓ Engaging customers & stakeholders in solutions

Next Steps

- Chloride Team final results:
  - Internal review
  - Anticipate future presentation to Environment Committee after internal review
  - Incorporate in document for use by *2050 Water Resources Policy Plan* Team's Advisory Group & further stakeholder outreach

Questions

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