

Southeastern Wisconsin **Regional Planning Commission**



Chloride Impact Study for the Southeastern Wisconsin Region

TAC Meeting
November 9, 2022

#265585

1

●●●●● **Speakers**

2


- Laura Herrick, Chief Environmental Engineer
- Nick Neureuther, Specialist-Biologist
- Karin Hollister, Principal Engineer
- Joe Boxhorn, Principal Planner
- Aaron Owens, Senior Planner
- Dave Strifling, Director, Water Law and Policy Initiative, MU Law School



2

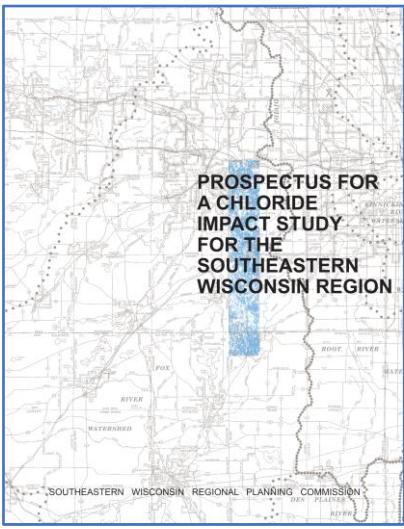
●●●● Outline 3

- Study Background and Scope
- Field Monitoring and Sampling
- Data Collection and Management
- Preliminary Analysis
- Planned Study Reports
- Working Group Signup
- Next Steps



3


●●●● Study Background 4



Prospectus developed 2014-2016

- Explore the need for a regional chloride impact study
- Recommend a potential scope and content of a study
- Propose a study schedule
- Recommend a budget
- Propose potential funding

www.sewrpc.org/chloridestudy



4

●●●● Study Scope

5

Chloride loading analyses and forecasts

- Existing and planned 2050 conditions
- Evaluate potential effect of climate change on winter road maintenance operations under planned 2050 land use conditions

Review State-of-the-Art

- Identify and evaluate best practices and technology
- Develop performance and cost information for practices
- Explore legal and policy aspects

Develop alternate chloride management scenarios

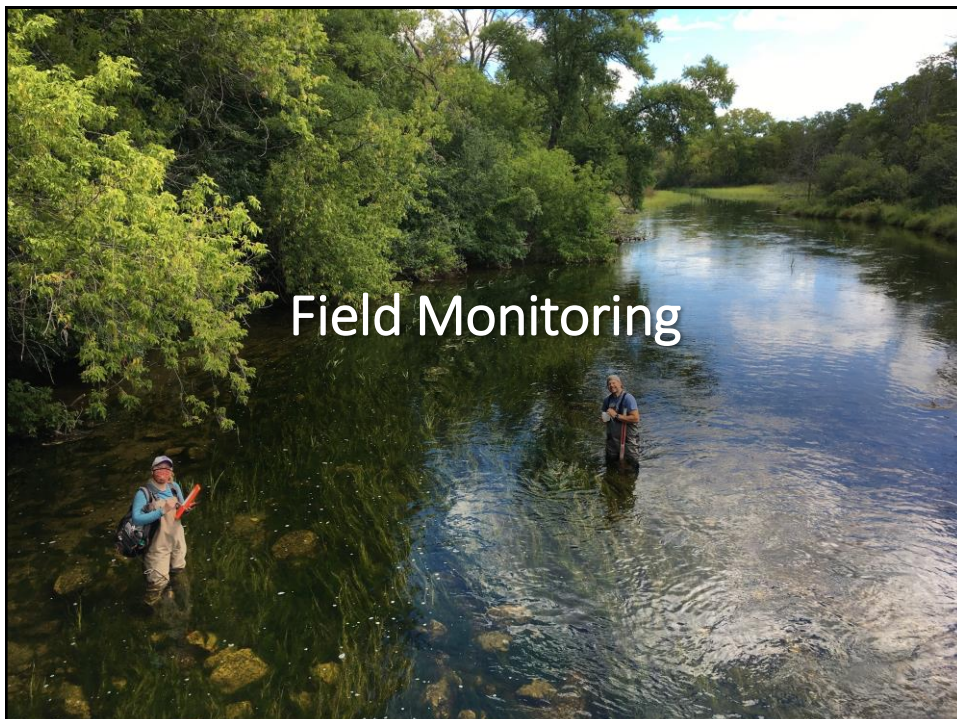
- Meet public safety objectives
- Minimize harm to the environment
- Cost effective



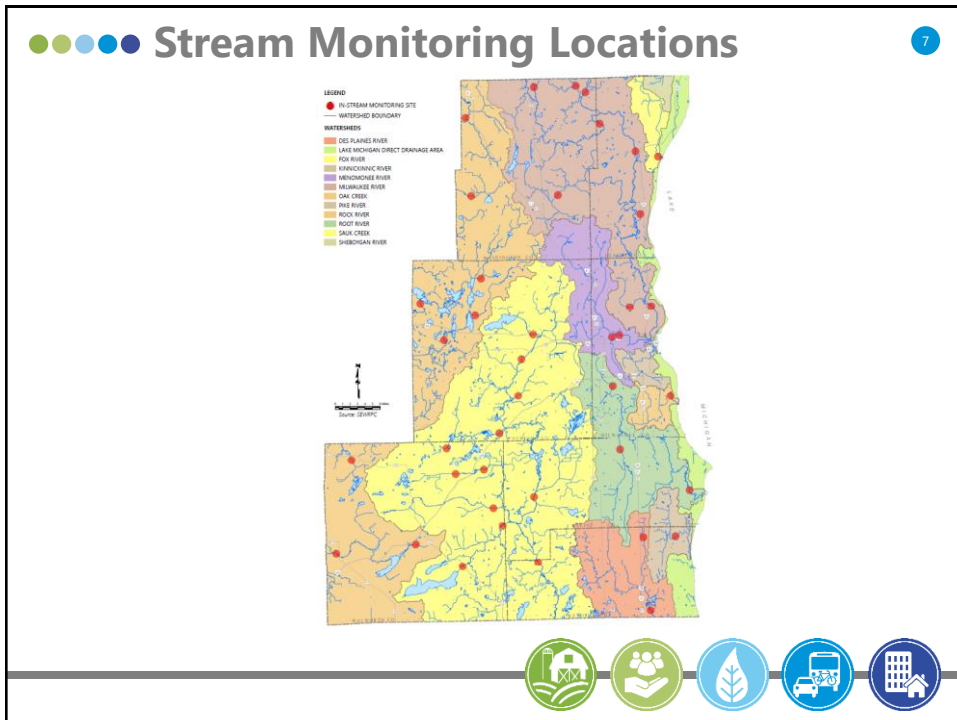
Source: Public Works Magazine



5



6



7

Stream Monitoring Equipment

8

Data collection began during Summer 2018, continued into 2021

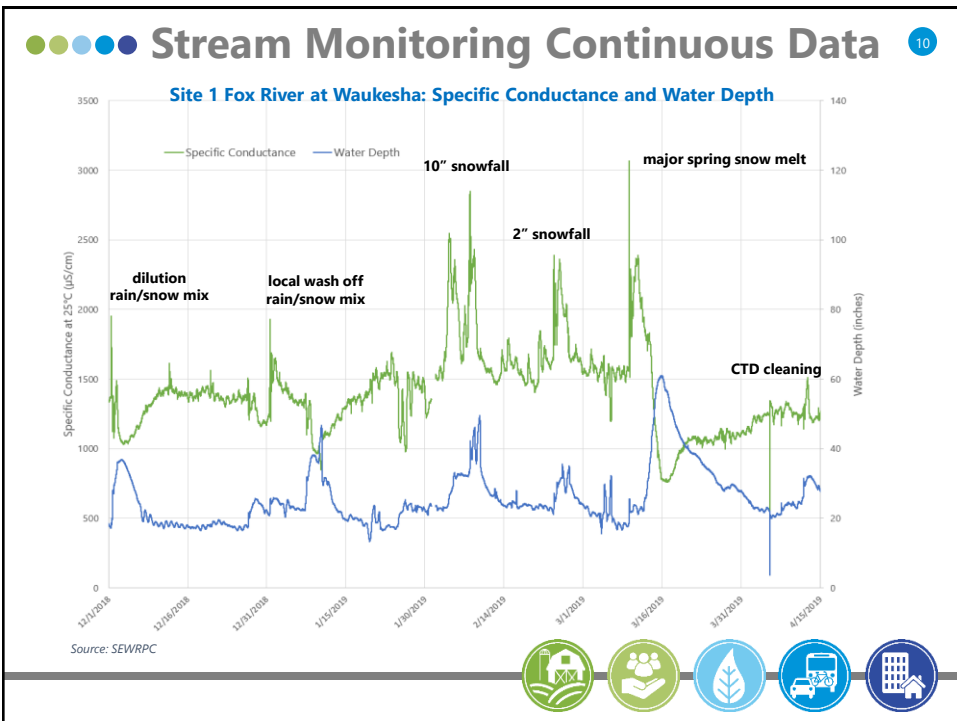
- Continuous monitoring – 5-minute interval
 - specific conductance
 - water temperature
 - water depth above the sensor
- Online data access and retrieval

Icons: Farm, People, Leaf, Car, Building

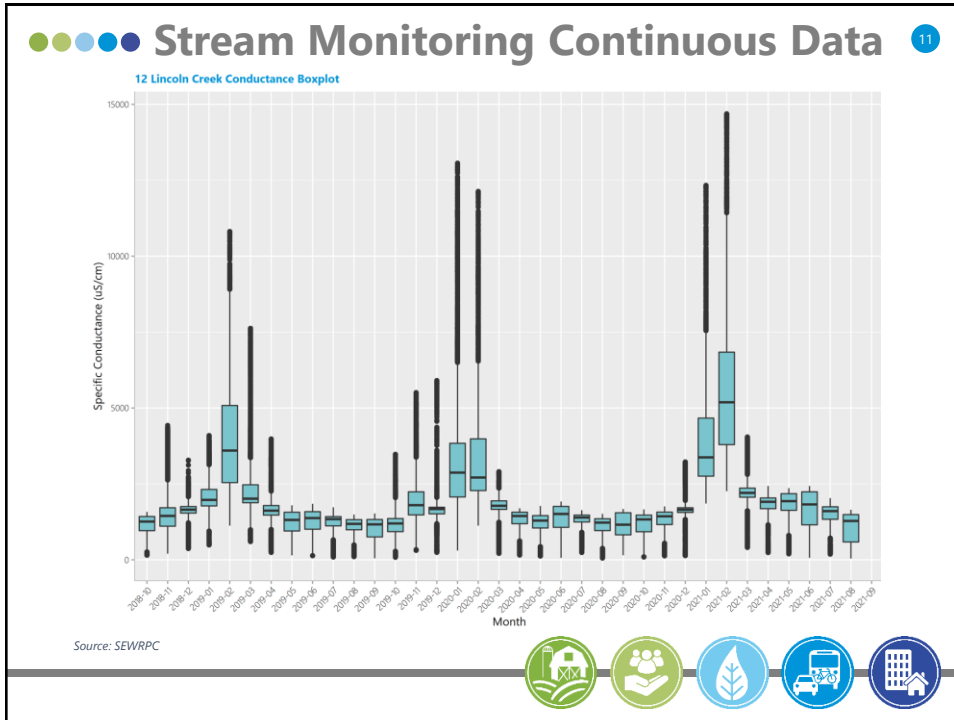
8

●●●● Stream Monitoring Site Maintenance 9

9



10




11

Water Sampling - Streams 12

Monthly grab samples collected at each site: October 2018 to October 2020


Samples tested at the Wisconsin State Lab of Hygiene

- Chloride, Sulfate (Anions)
- Metals (Cations)
 - Calcium
 - Magnesium
 - Potassium
 - Sodium

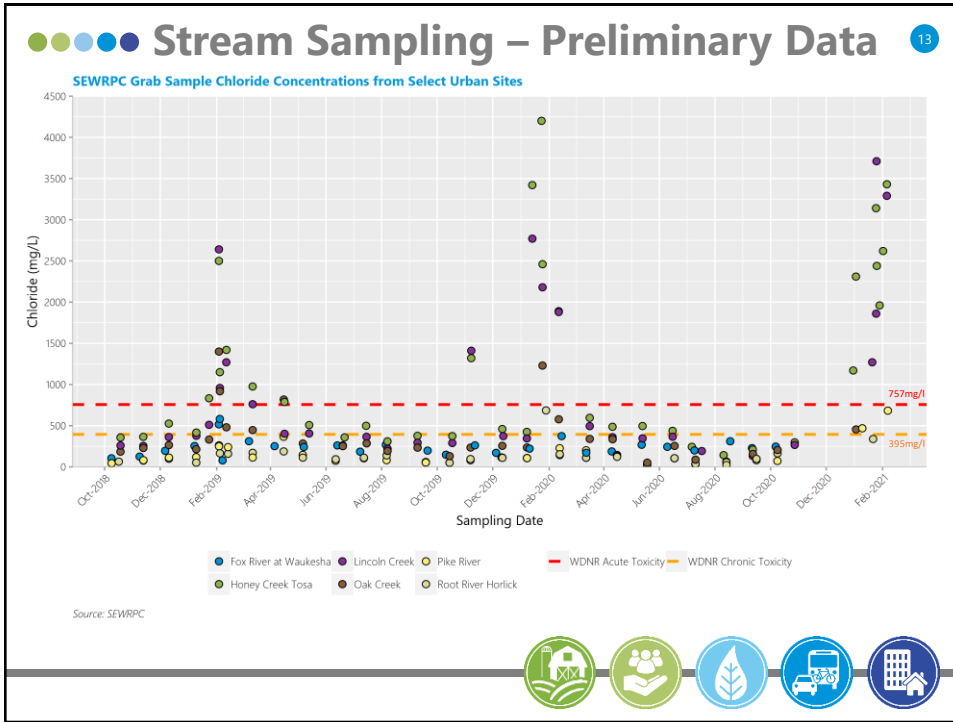


Winter Event Sampling

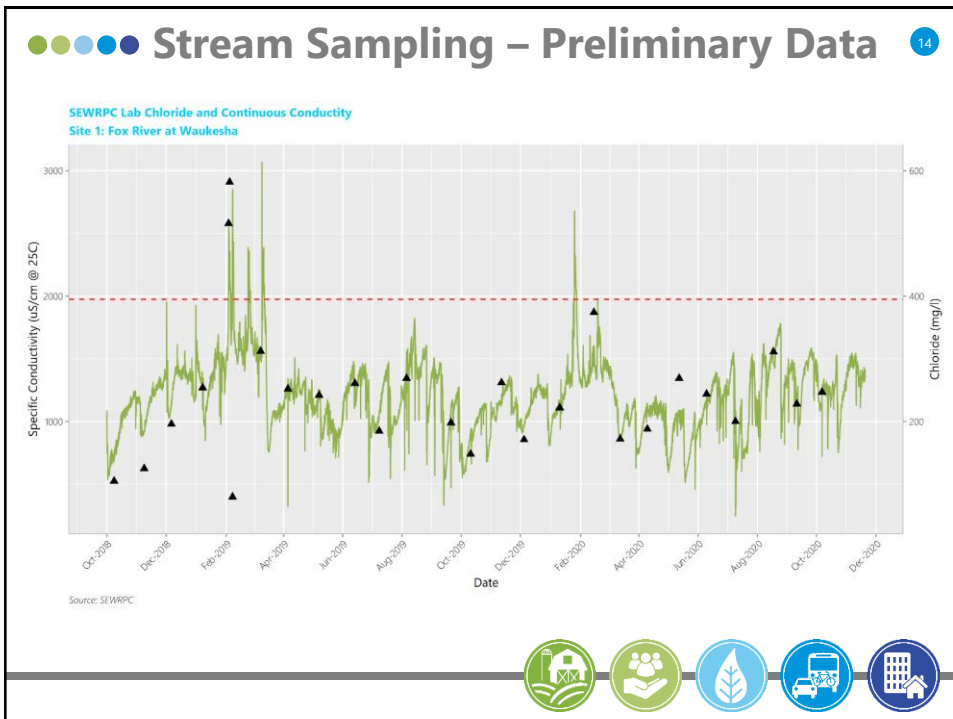
- Targeted high conductance
- Continued into 2021



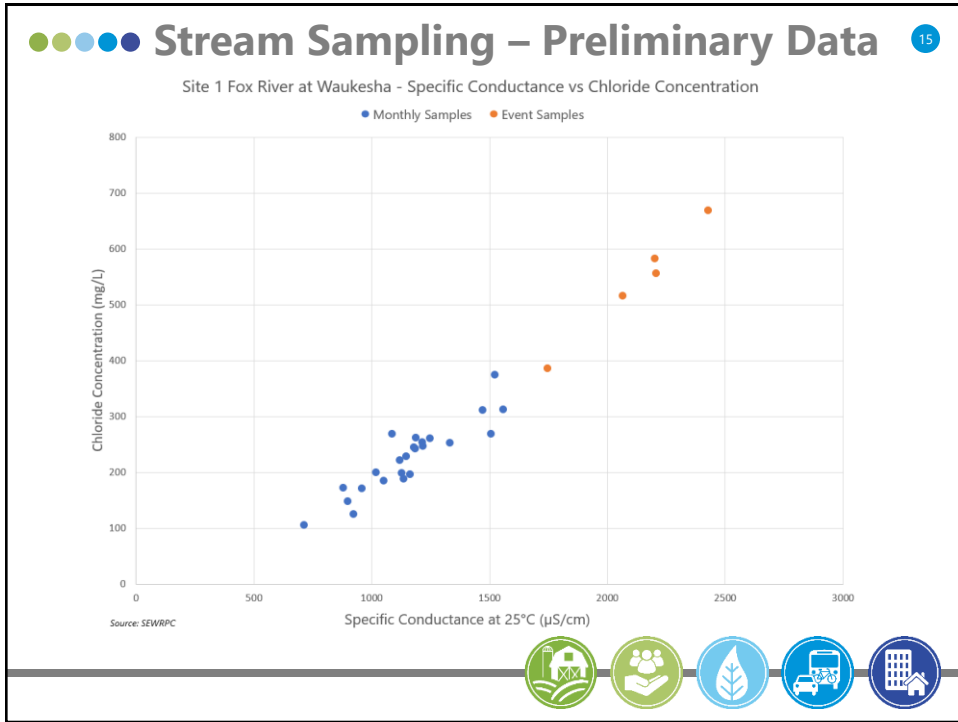
12



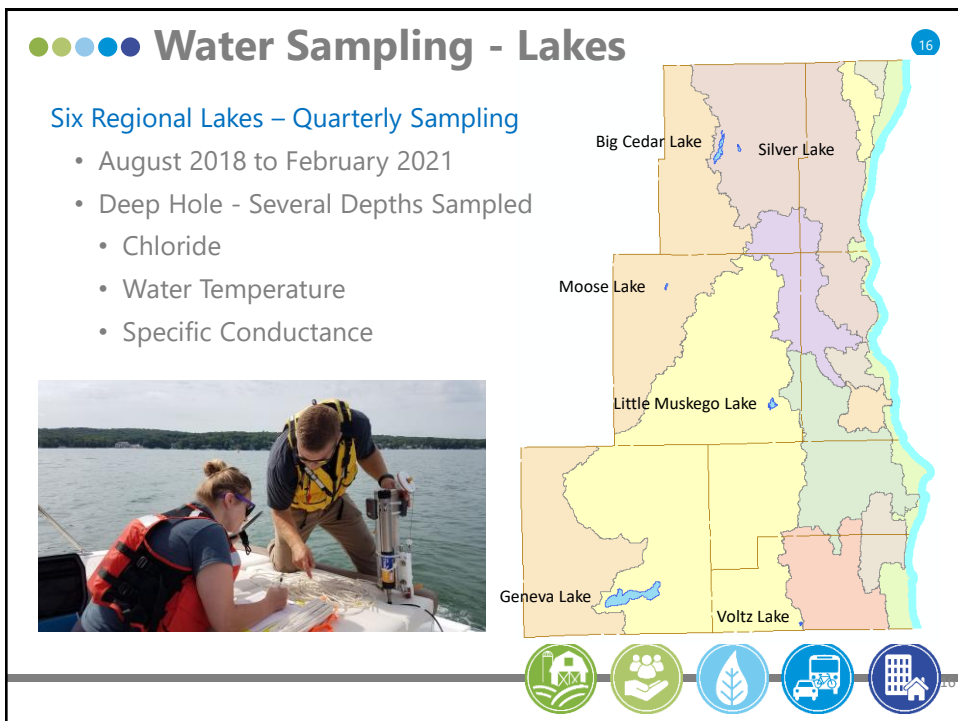
13



14



15

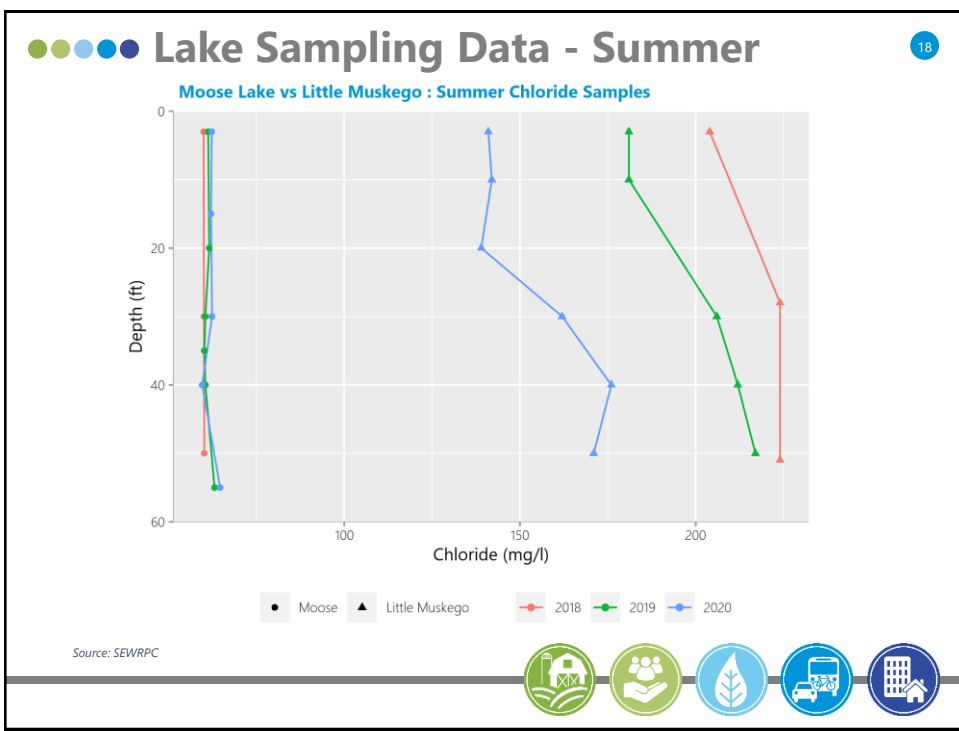


16

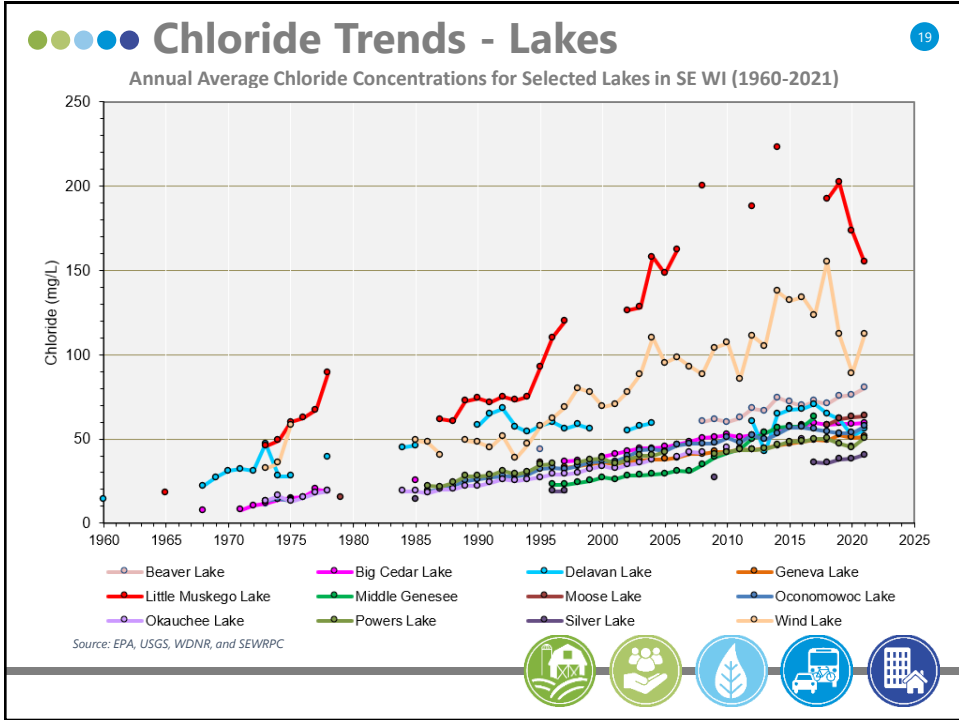
●●●● Winter Sampling - Lakes

17

17



18



19









20

●●●●● Project Data Collection Summary 21

Data Collection By the Numbers

- Stream Samples
 - Over 1,150 samples taken
 - October 2018 through October 2020 (into August 2021 select sites)
- Lake Samples
 - Over 350 samples taken
 - 11 separate sampling periods
 - August 2018 to February 2021
- Continuous Data Observations
 - Over 12.5 million observations
- Streamflow Measurements
 - 65 measurements at 20 sites



21

●●●●● Project Data Collection Summary 22

Maximum Chloride Concentrations (Stream Samples - Monthly)






1. 1890 mg/L – Site 53 Honey Creek at Wauwatosa, 2/11/2020
2. 1880 mg/L – Site 12 Lincoln Creek, 2/11/2020
3. 1460 mg/L – Site 60 Root River at Grange Ave, 2/10/2021

- Maximum chloride concentrations for winter event samples up to 3 times higher than regular monthly samples

Maximum Chloride Concentrations (Lake Samples - Quarterly)

1. 270 mg/L – Little Muskego Lake at 65 ft, 2/22/2019
2. 259 mg/L – Little Muskego Lake at 65 ft, 2/17/2020
3. 256 mg/L – Little Muskego Lake at 50 ft, 2/22/2019

Chloride Toxicity Criteria	Chronic	Acute
Wisconsin	395 mg/L	757 mg/L
US EPA	230 mg/L	860 mg/L

22

Project Data QA/QC

23

Data Quality – Consistency – Accessibility

- Project Protocols and Procedures
- Data Management and Documentation
- Equipment Operation Verification for Stream Monitoring Sites
- Lab Data Review
- Continuous Datasets – Equipment Malfunction, Fouling



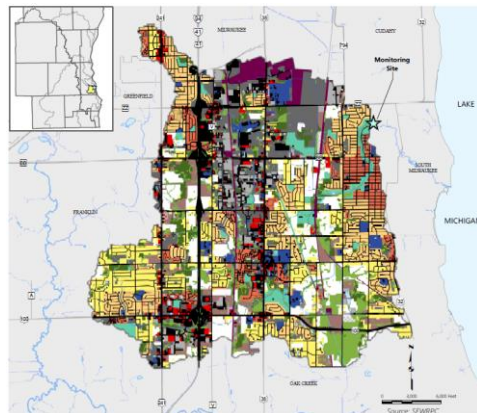
23

SEWRPC Inventory Datasets

24

Commission datasets used for site characterization and analysis

- Land Use Data
- Population and Households
- Topography
- Hydrography
- Watershed Boundaries
- Transportation System Data
- Municipal Boundaries
- Sewer Service Area Boundaries



24

●●●● Outside Data Collection

25

Water Quality Data

- MMSD
- SWIMS (WDNR, Water Action Volunteers, Milwaukee Riverkeeper, and others)
- Storet (EPA)
- NWIS (USGS)
- Local Lake Districts
- Municipal Governments



Additional Datasets

- USGS Stream Gage Data
- Streamflow Measurements (MMSD, WDNR)
- Meteorological Data



25

●●●● Outside Data – Chloride Sources

26

Chloride Source Data

- Road Salt/Deicers – (WDNR/MS4, WisDOT, request letter to non-MS4 communities)
- WWTP, Industrial Wastewater, and Land Spreading Data (WDNR)
- CAFO Data (WDNR)
- Crop Data and Fertilizer Usage (USDA/NASS, WDATCP, UW-Extension)
- Private Salting Data (Commission Staff Survey, Literature Review)
- Water Softener Usage Data (Commission Staff Survey)
- Atmospheric Chloride Deposition (NADP)



Source: Wikimedia/Badger Water Softener Co.

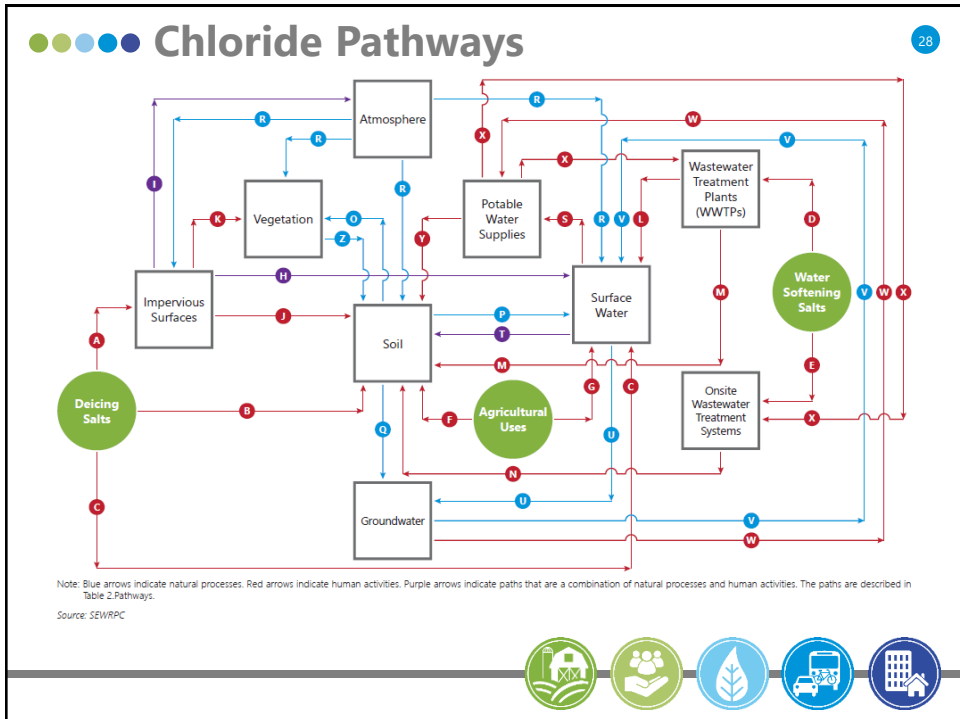


26



Preliminary Analysis

27



28

Regression Analysis

29

Use the observed in-stream Specific Conductance data to estimate chloride concentrations

- Evaluate data to establish a relationship between chloride and specific conductance
- Develop equation(s) for various scenarios
- Use equations to estimate chloride concentrations from our Specific Conductance dataset
- Use chloride concentration estimates to examine chloride conditions and trends across the Region and compute in-stream chloride loads

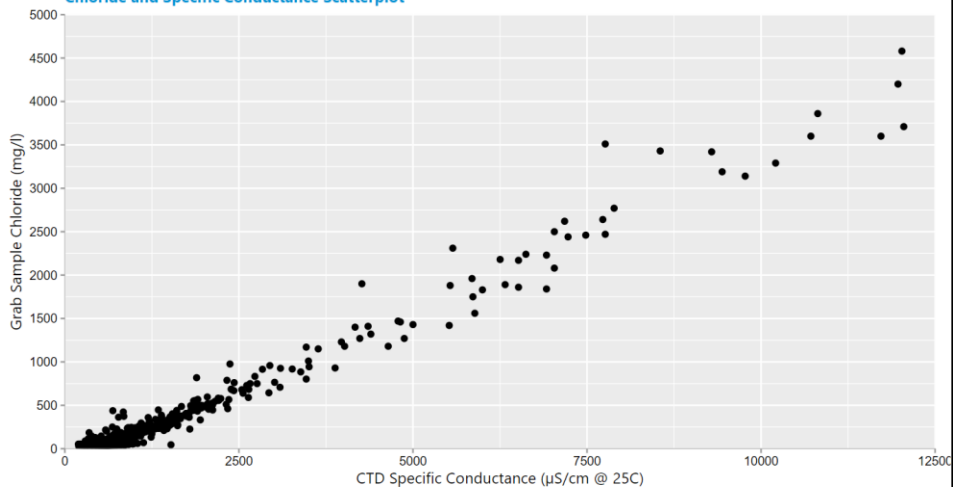


29

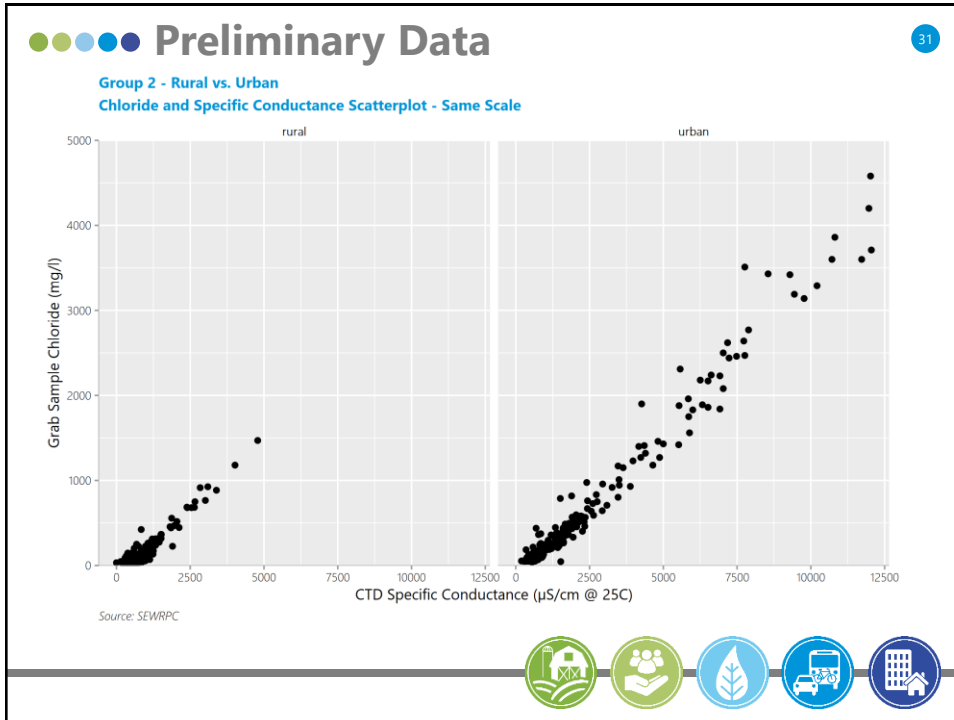
Preliminary Data

30

Group 1 - Entire Region
Chloride and Specific Conductance Scatterplot



30



31

●●●● Chloride Loading – Chloride Sources 32

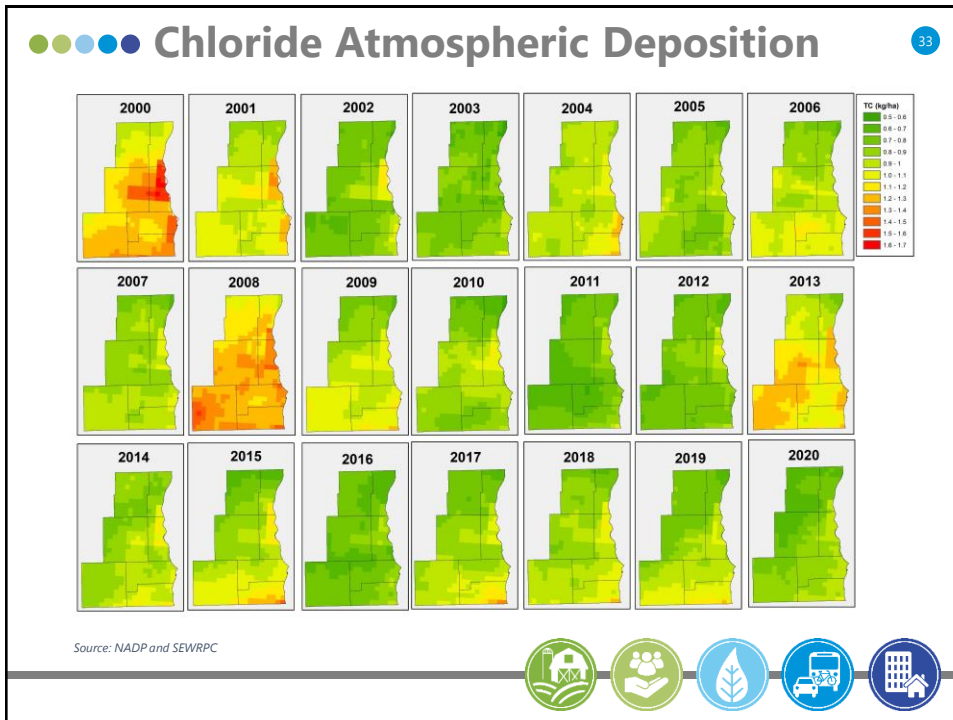
Chloride Source Loading

- Gathering data for each significant source of chloride
- Estimate the monthly chloride load from each source
- Quality and quantity of data varies among both the chloride source and data source

Source: Wikimedia/Michael Dibb

Source: Wikimedia/Charles Passarella

32



33

●●●● Chloride Loading Estimation 34

In-Stream Chloride Loading

- Regression equation(s) will be used to estimate chloride concentration from observed Specific Conductance
- Monthly chloride loads will be estimated for select sites
- Monthly chloride loading estimates require a reliable discharge record
- Computational approach investigation for developing chloride loads
 - Computation Interval
 - Variability in the datasets
 - Missing data
 - Central tendency parameter

34

Planned Study Reports

35

Technical Reports

- TR 61 – Field Monitoring and Data Collection
- TR 62 – Impacts of Chloride on the Environment
- TR 63 – Chloride Conditions and Trends in SE WI
- TR 64 – Regression Analysis of Specific Conductance and Chloride
- TR 65 – Mass Balance Analysis for Chlorides in SE WI
- TR 66 – Chloride Management: State of the Art
- TR 67 – Chloride Management: Legal and Policy Considerations

Planning Report PR 57

- Summarize technical reports
- Potential Future Chloride Conditions
- Alternative Scenarios
- Recommendations to Reduce the Impact of Chloride



35

Working Group Signup

36

Intent is a smaller group of individuals to provide input on a particular topic. Interactions would be less formal than the TAC and could be done via email as Commission staff have questions or need input.

Data Analysis

- Regression analysis – best fit and how to group the datasets
- Mass balance analysis – assumptions for various sources of chloride
- Trends analysis – historical data help

State-of-the-Art

- Winter snow removal and deicing
- Water softening
- Agricultural fertilizing and feedlots

Please note your Working Group interest in the GoTo Chat or in an email to Laura after the meeting.



36


Next Steps 37

- Continue research and report writing
- Continue regression analysis
- Continue loading analysis
- Continue state-of-the-art information gathering

Anticipate the next TAC meeting to be spring 2023 and include review of draft chapters from TR 61 (field monitoring) and TR 62 (impacts of chloride)


Meeting agendas, presentations, and minutes along with draft text will all be posted on the project website


www.sewrpc.org/chloridestudy





37


Project Funding Provided By 38















38

Commission Staff Contributors 39

- **Laura Herrick – Chief Env. Engineer**
 - Mike Hahn - retired
 - Joe Boxhorn
 - Ron Printz - retired
 - Karin Hollister
 - Aaron Owens
 - Megan Beauchaine
 - Nicklaus Neureuther
 - Alexis McAdams
 - Julia Orłowski
 - Zijia Li
 - James Mahoney
 - Kathy Sobottke
 - Kim Walsh - intern
 - Santos Quispe - intern
- **Tom Slawski – Chief Biologist**
 - Dale Buser
 - Justin Poinsette
 - Zofia Noe
 - Mike Borst
 - Emma Weiss-Burns - intern
- **GIS Staff**
 - Rob Merry
 - Mike Gosetti
 - Tim Gorsegner
 - Patti Bouchard
- **Support Staff**
 - Megan Deau
 - Alexa Carzoli



39

Thank You

Laura Herrick | Chief Environmental Engineer
lherrick@sewrpc.org | 262.953.3224

Tom Slawski | Chief Specialist-Biologist
tslawski@sewrpc.org | 262.953.3263

www.sewrpc.org/chloridestudy

SEWRPC.org  /SEWRPC  @SEW_RPC

40