
2010 APWA
Profession Awards
Excellence in Snow and
Ice Control Award:
City of Prior Lake Snow and
Ice Control Program
Developed by the City of Prior Lake

wq-iw11-06u

Smart Snow & Ice Control

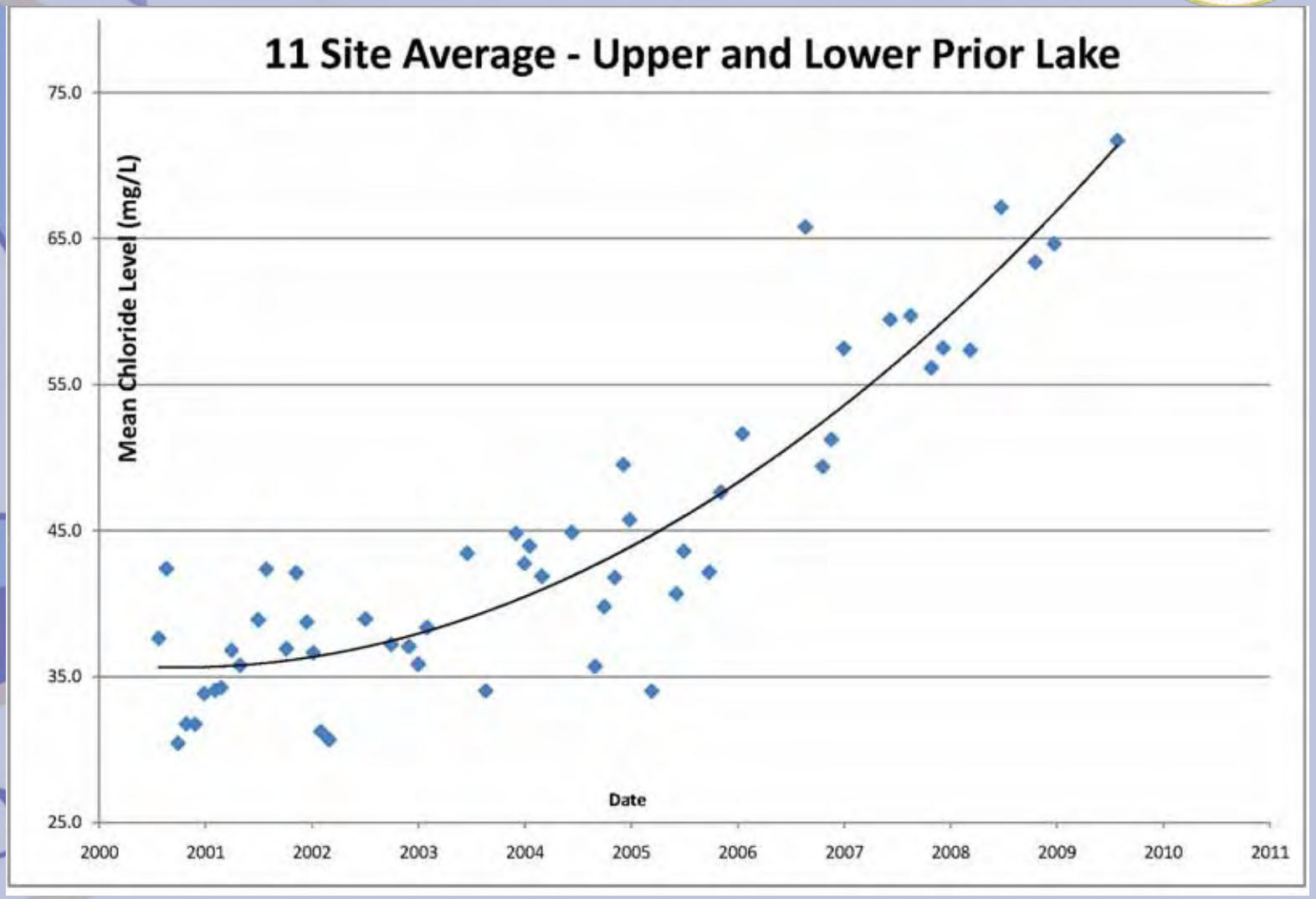
Mission:

Provide a snow and ice control program that balances economic, environmental and safety concerns.

Method:

By applying the appropriate practice only as needed to meet the desired road safety **Level of Service (LOS)** in an efficient targeted manner.

Prior Lake Chloride Trend



Why Do It?

- In 2010 the MPCA more than doubled the number of waters listed as impaired by chloride.
- U of M Study indicates 78% of chlorides generated in Twin Cities Metro Area is being retained.
- You may be required to do it. Shingle Creek and 9 Mile Creek Watersheds have Chloride TMDL's.

- Chlorides have environmental implications
  - At high levels they are toxic to aquatic organisms and wildlife
  - At low levels they affect structure, diversity and productivity of aquatic organisms
  - Reduces soil stability increasing erosion and can decrease soil permeability
- Road Salt Cost increases of 50%+ since 2004
- Shrinking Street Budgets

Why should you care?

- **Better for environment**
  - Reduced salt use = less chlorides going into environment
- **Saves money!!!**
  - Reduced salt use
  - Reduced staff time for sweeping, storm sewer cleaning and snow removal
- **Can be done without reducing roadway safety or level of service**

Program Fundamentals

- Develop policy for safety LOS. Track safety LOS to ensure it is held steady based on winter severity index.
- Track fleet and operation costs and innovate increasingly cost efficient BMPs for the wide variety of storm events.
- Track environmental LOS and attempt to reduce total chloride use.

Prior Lake's Story

Starting in 2003 Prior Lake implemented the program which includes:

- Staff education and development
- Anti-icing before events to reduce removal time
- Pre-wetting (no more dry salt) delivers salt more efficiently at lower concentrations
- Upgraded controllers and sanders that allow precise applications (Flexibility!!!)
- Pre-mixed chemical storage that allows on-site storage of 3 ready to use mixes and bulk storage of critical ingredients
- Liquid mixing and transfer equipment

Staff Education

- Critical for success of program is staff buy-in and support. Takes time to modify old habits.
- Start with supervisor training and research other programs. No one size fits all, every community has specific needs or challenges.
- Training; LTAP, CTAP, Manual of Practice for an Effective Anti-icing Program, APWA Anti-icing/RWIS CD, AASHTO Clear Roads CD Series, Attend APWA Snow Conference

Equipment

Since 2003 the City has invested about $250k in the program including a $50k building addition.

The right equipment is key to providing the flexibility to apply the right chemicals, in the appropriate amounts by the most efficient method.

Chemical Storage and Mixing

Depending on conditions Prior Lake keeps pre-mixed chemicals ready for use and bulk materials on hand. Allows City to pre-mix and modify operations on the fly depending on weather conditions. Using best available weather data for preparation and monitoring actual ground temperatures during operations is critical.

- Bulk materials include brine, beet juice, magnesium or calcium chloride and molasses
- Pre-mixes include liquids for anti-icing and pre-wetting above and below 15 degrees F


12/28/2009

Application Equipment

Upgrading of application equipment can be phased in. Prior Lake took 7 years to fully upgrade fleet. With 5100/6100 Controllers and new sanders we can apply pre-wet material at rates down to 85 lbs per lane mile. Liquid application units can also apply at sub 100 lbs per lane mile rates.

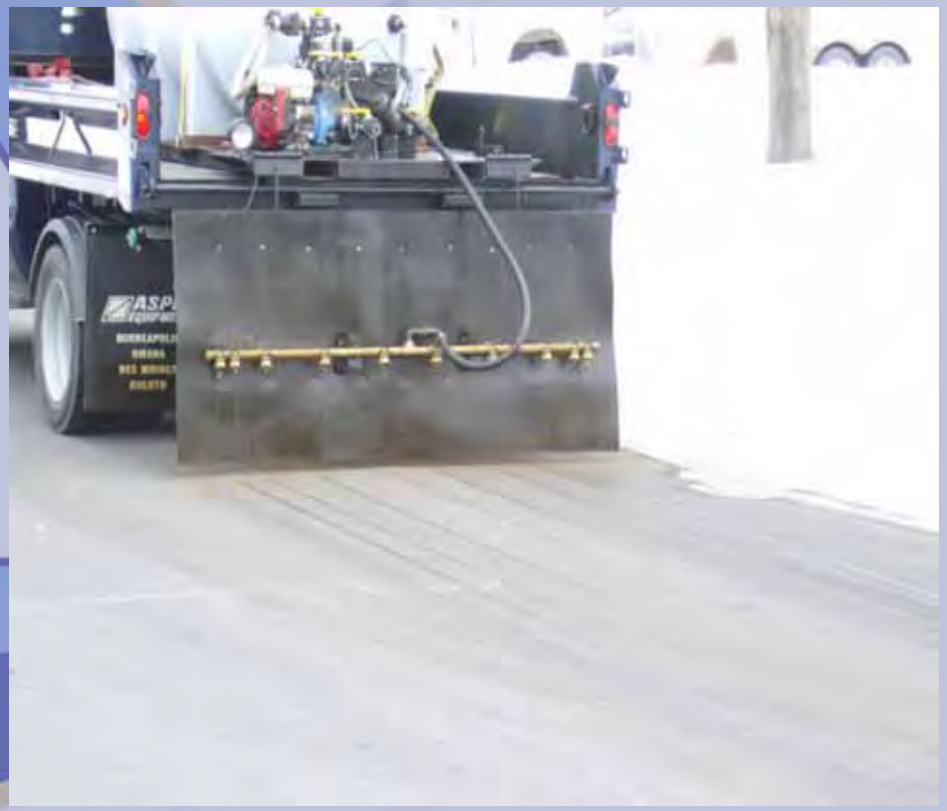
- Controllers
- Salt Sanders
- Evaluate plow configuration to further optimize
- On-board liquid tanks


12/28/2009


12/28/2009


12/03/2009


12/29/2009



Liquid anti-icing operations increase removal efficiency. Applications are effective for 7-14 days depending on mixture used and conditions. Equipment also used on liquid only route with deicing application rates of less than 100 lbs per lane mile.

Efficient truck design and equipment including Elliptical Box, 200 gallons of Liquid Storage, Falls Salt Special Material Applicator, Force America 6100 Controller and bed tarp allows for more efficient with application rates of pre-wet salt as low as 85 lbs per lane mile.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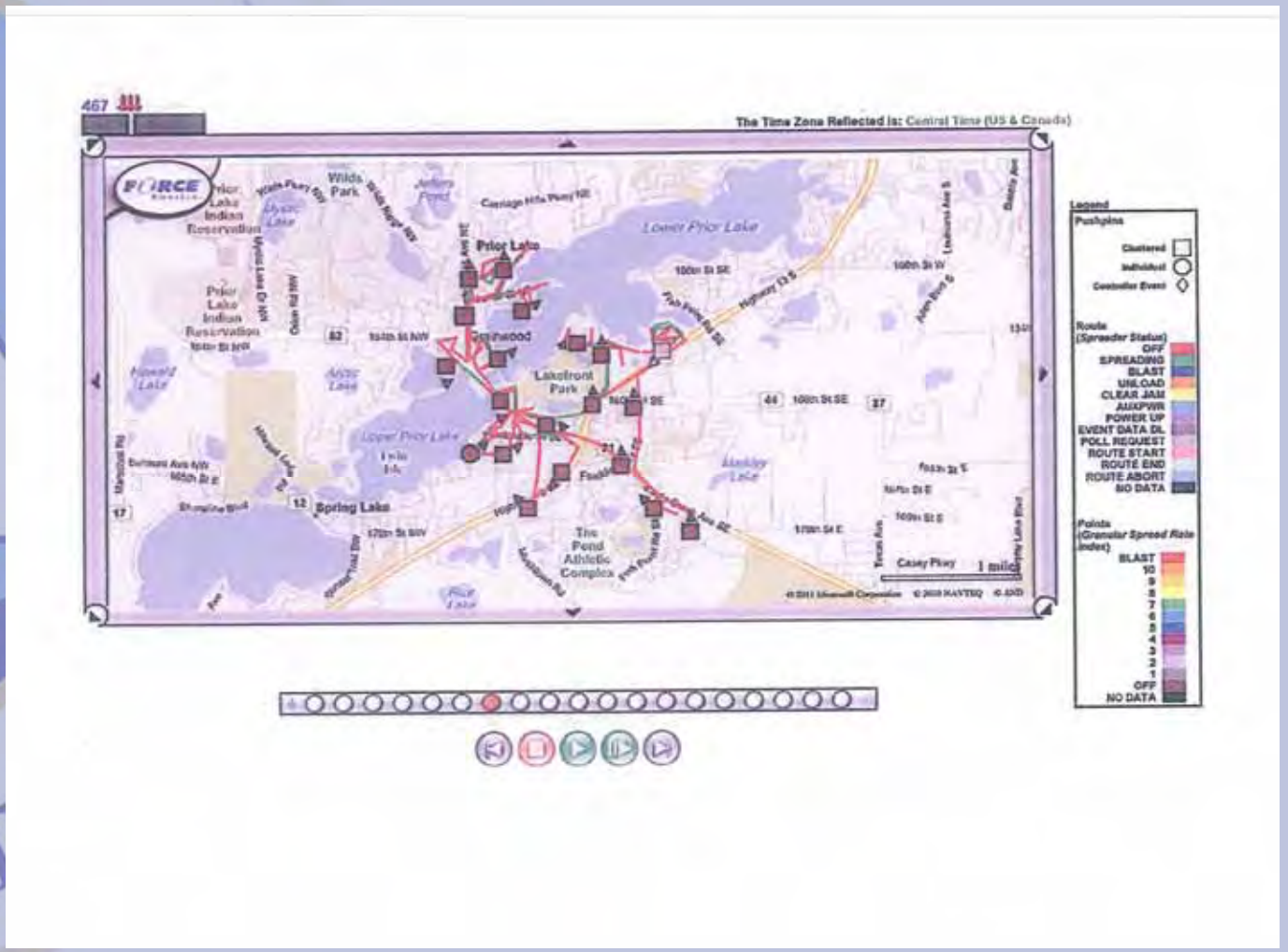
Remote Real Time Monitoring



Results to Date

- Reduction of average application rates from 500 lbs per lane mile of salt in 2005 lane to 200-250 lbs per lane mile pre-wet salt in 2010.
- All liquid route with application rates with equivalent of 100 lbs per lane mile or less.
- Confirmed chloride level reduction in controlled watershed of 20 – 40 mg/l with all liquid program
- Reduced staff time for snow removal and maintenance
- Overall road salt use reduced 42% since 2005 even with an additional 7% increase in mileage maintained.
- Minimum estimated savings per snow removal event $2,000(salt, labor, equipment) .
- Maintained safety and increased level of service.

Future

- No chemical application routes, blade cutting edge technology advances
- Pre-wet application rates sub 100 lbs per lane mile
- Expanded liquid only routes
- High Priority Chloride Reduction Zones

Questions?

Contact Steve Albrecht salbrecht@cityofpriorlake.com

TWIN CITIES METRO AREA CHLORIDE MANAGEMENT PLAN PROJECT

Water & Watersheds Meeting

Feb. 8, 2011

Minnesota Pollution Control Agency
Brooke Asleson & Barb Peichel

Chloride Management Plan Development (Phase 2)

- A combination of all 3 strategies from feasibility study
- Detailed Stakeholder process developed for Phase 2
- 2010 - 2014

Phase 2 – Project Goals

- Develop chloride management plan:
  - satisfy EPA requirements for impaired waters (TMDL)
  - address waters not yet listed
  - develop a protection strategy for waters that are currently meeting the water quality standard
- Develop implementation plan:
  - layout plan for reducing chloride loads to:
    - meet TMDL requirements
    - prevent waters from exceeding standard
    - protect high quality waters
  - identify high priority areas to target implementation activities
- Layout monitoring plan to:
  - track effectiveness of practices
  - determine long-term trends in chloride

Phase 2 - Current Activities

- Project website developed
- Stakeholder groups populated (except Implementation group)
- Project work plan has been developed
- Monitoring started in Nov. 2010
- Draft chloride monitoring guidance has been developed

Phase 2 – Next Steps

- Begin working with consultants to complete work plan tasks
- Review & analyze monitoring data
- Work with Outreach & Education Committee to develop a "toolbox" of broad outreach materials that can be utilized by local partners and road authorities
- Continue to populate stakeholder groups – specifically Implementation teams

Project Information

http://www.pca.state.mn.us/water/tmdl/project-chloride-metro

TMDL Special Projects

IN THIS SECTION

- Twin Cities Metropolitan Area Chloride Project
- Environmental concerns about chloride
- Meetings and events: Metro Area Chloride Project
- Phase 1 Summary: Metro Area Chloride Project
- Phase 2 Overview: Metro Area Chloride Project
- Metropolitan Area Chloride Project

RELATED TOPICS

- Lake Superior Basin
- Lower Mississippi River Basin
- Minnesota River Basin
- Missouri and Des Moines River Basins
- Rainy River Basin
- Red River Basin

Twin Cities Metropolitan Area Chloride Project

Winters in Minnesota bring about the season of slippery roads and the application of de-icing materials to keep our roads free from ice. Road salt is the most commonly used de-icer, which contains chloride. The chloride in road salt enters our surface waters, groundwater and soils after a snowmelt.

This page will inform you on the MPCA's activities, efforts, status, and impacts of chloride in our waters.

Why is chloride an environmental concern?

Chloride is a conservative ion (meaning it moves with water without being broken down or lost). Once the chloride is introduced to water, the only known available technology for its removal is reverse osmosis. This means that chloride will continue to accumulate in the environment. Learn more about chloride environmental concerns.

Project History

The MPCA is leading a project that will allow us to address the water quality problems caused by chloride in the TCMA in a proactive and efficient way. In the first phase of this project the MPCA hired a consultant to conduct a feasibility study to obtain a better understanding of the extent, magnitude, and causes of chloride contamination to surface waters in the seven county TCMA, and to explore options and strategies for addressing chloride impairments and other impacts to water resources. The project included:

- extensive data collection and analysis,
- a literature review,
- a telephone survey, and
- analysis of potential strategies for further research, public education, and potential regulation.

ON THIS PAGE

- Project History
- Current Activities
- What's Next
- Documents
- Other Projects
- Check It Out
- Meetings
- Links
- Contacts

SEE ALSO

- South Fork Crow River Lakes - Excess Nutrients: TMDL Project
- Underway TMDL: North Fork Crow River, Rice Lake - Excess Nutrients
- Bluff Creek - Turbidity and Fish Biota: TMDL Project
- Redwood River - Fecal Coliform: TMDL Project

RECENT New

- Phase 2 Overview: Metro Area Chloride Project
- Phase 1 Summary: Metro Area Chloride Project
- Meetings and events: Metro Area Chloride Project

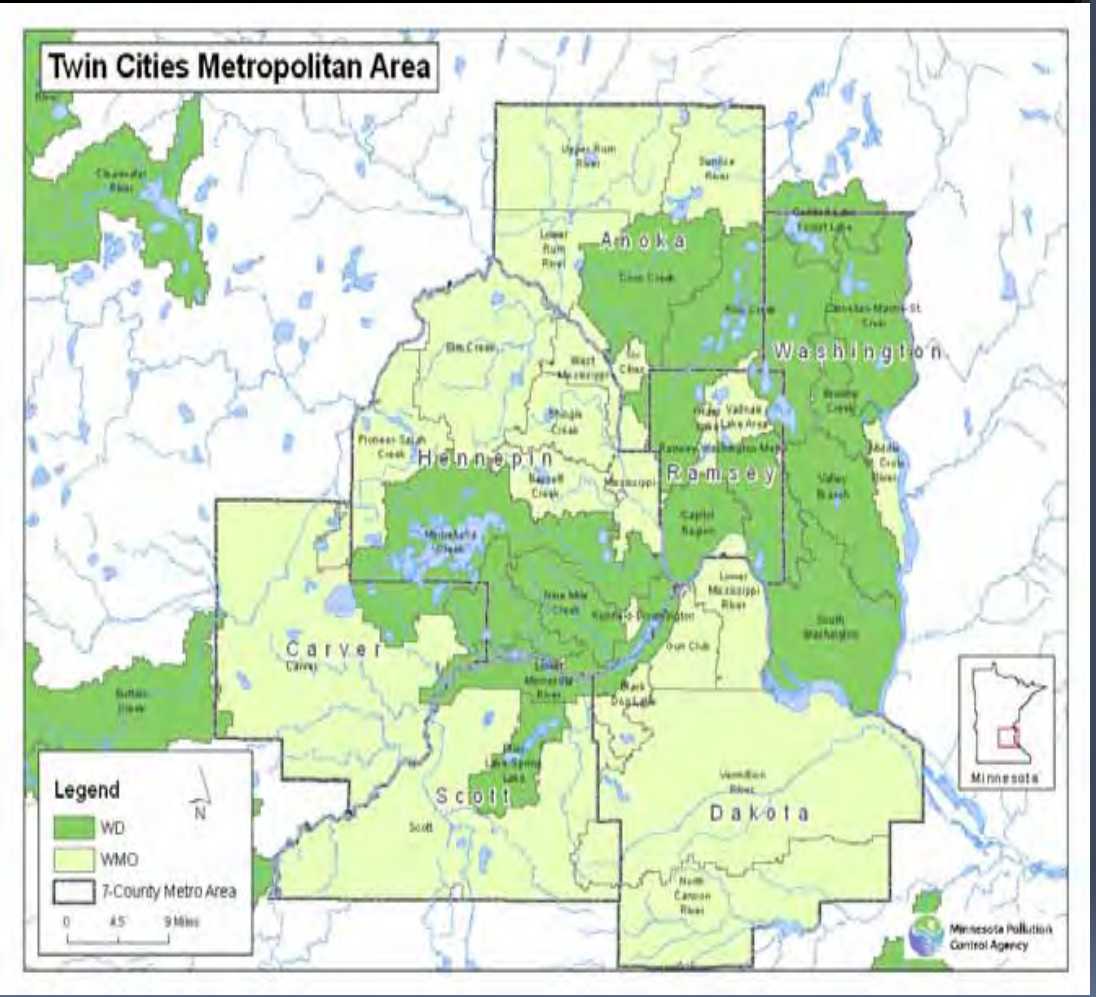
Twin Cities Metro Area (TCMA) Lake Chloride Monitoring

Key findings from Phase 1 (Feasibility Study)

- The majority of data values greater than 230 mg/L occur during the winter (Nov. - March), with only 20% of data collected in winter
- Chloride levels were typically higher in deeper portions of the lake
- Highest chloride concentrations were found in lakes in the more developed core of the TCMA
- Primary source of chloride is road salt for winter maintenance

Phase 2 – TCMA Chloride Management Plan project

- Summer 2010
- Involves the development of a Chloride Management Plan for the TCMA
- Requires additional monitoring data



Purpose of Monitoring

- Collect data for TCMA Chloride project to:
  - Determine status of waters
  - Calculate chloride loadings for TMDL
  - Calculate chloride loadings for protection plan
- Long-term Trends/Effectiveness data:
  - Develop baseline chloride levels
  - Track long-term trends
- Confirm findings of feasibility study
- Develop new monitoring guidelines for chloride in Metropolitan areas

Overall Project Monitoring Plan

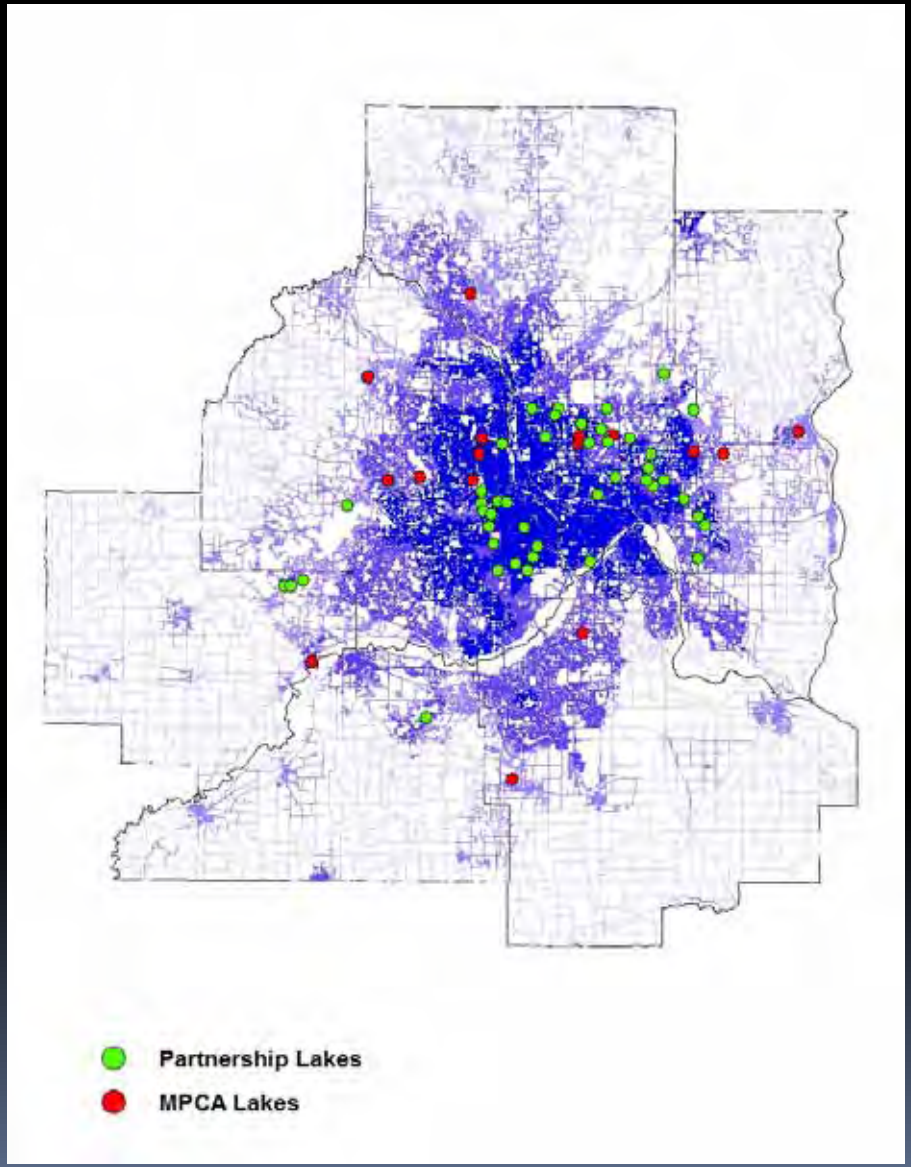
- Includes Lakes, Streams & Stormsewers
- Involves coordinating with several local partners
- Monitoring TAC formed for project
  - Local partners
  - MPCA , DNR, USGS
- Developed monitoring guidance for project
  - Draft Lake Chloride Monitoring guidance
  - Draft Stream & Stormsewer Chloride Monitoring guidance

Chloride Lake Monitoring

- Current lake assessments focus on data collected primarily during spring/summer months
- While there is existing chloride data a majority of it was taken in the typical monitoring season
- Seek to establish a foundation of chloride data collected during the winter in addition to late fall and early spring
- While seeking assistance from local partners additional data was found and added
- No existing guidance regarding this type of surface water monitoring so a draft Standard Operating Procedure was written

TCMA Lake Selection

- Sought to represent deep and shallow lakes however deep, potentially meromictic, lakes received priority
- Lakes within watersheds containing a high road density
- Lake/Watershed Ratio
- Lakes with no input vs. lakes receiving watershed contribution
- Lakes analyzed within the initial feasibility report (existing data > std.)
- 74 lakes being monitored for this project



Road densities calculated by Thomas Pearson, MPCA

Determining Priority Lakes

- Highest priorities for lake selection were road density and lake morphometric characteristics
- In particular, lakes with the high potential to become meromictic were sought
- Lakes that do not undergo stratification or mixing of the upper epilimnion with the bottom hypolimnion
- Osgood index was used to assist with the determination of potential meromictic lakes
  - Ratio of the mean depth to the square root of the surface area of the lake

Partners Include....

- Capitol Region Watershed District
- City of Prior Lake
- Metropolitan Council of Environmental Services
- Minnehaha Creek Watershed District
- Minneapolis Parks and Recreation Board
- Mississippi WMO
- Ramsey County Environmental Services
- Ramsey-Washington Metro Watershed District
- Rice Creek Watershed District
- Three Rivers Park District

Lake Monitoring – schedule

- Fall - November
- Winter – January/February
- Spring (Ice-out) - April
- Planning for sample event ~ 2 – 3 weeks after Ice-out - May
- Summer – June through August (most local partners are collecting monthly chloride samples throughout the growing season)

Lake Monitoring

- Samples collected from the deepest point of each lake
- Additional samples collected near input locations during spring sampling events
- Surface sample collected through a 2 meter integrated sampler
- Depth sample collected ~ 1 meter from the lake bottom through a Kemmerer Depth Sampler
- Vertical profile collected along with water chemistry samples

Parameters

- Water chemistry samples collected from the surface and ~ 1 meter from the lake bottom
- Parameters include Chloride, Sulfate, Hardness, Magnesium as CaCO3, Calcium as CaCO3, and Alkalinity
- Vertical profile data also collected for the purpose of determining a relationship between high specific conductance and elevated chloride levels
- Secchi transparency, water temperature, dissolved oxygen, pH, ORP data also collected

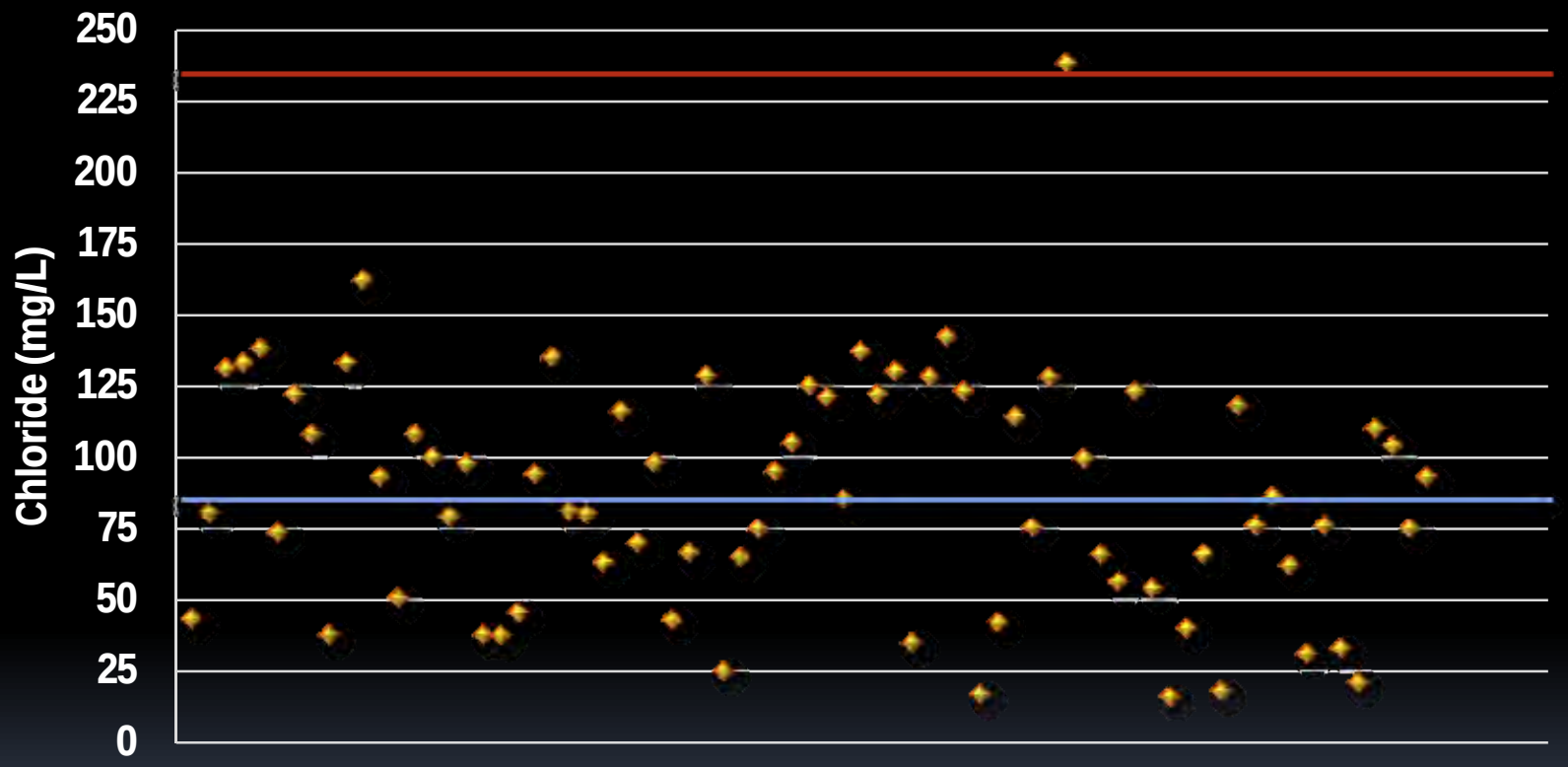
Jan./Feb. Lake Monitoring

- Drilling two holes in the ice
- Collecting profile data from one and water chemistry from the second
- Using techniques similar to summer monitoring (triple rinse, profile reading every meter, etc.)

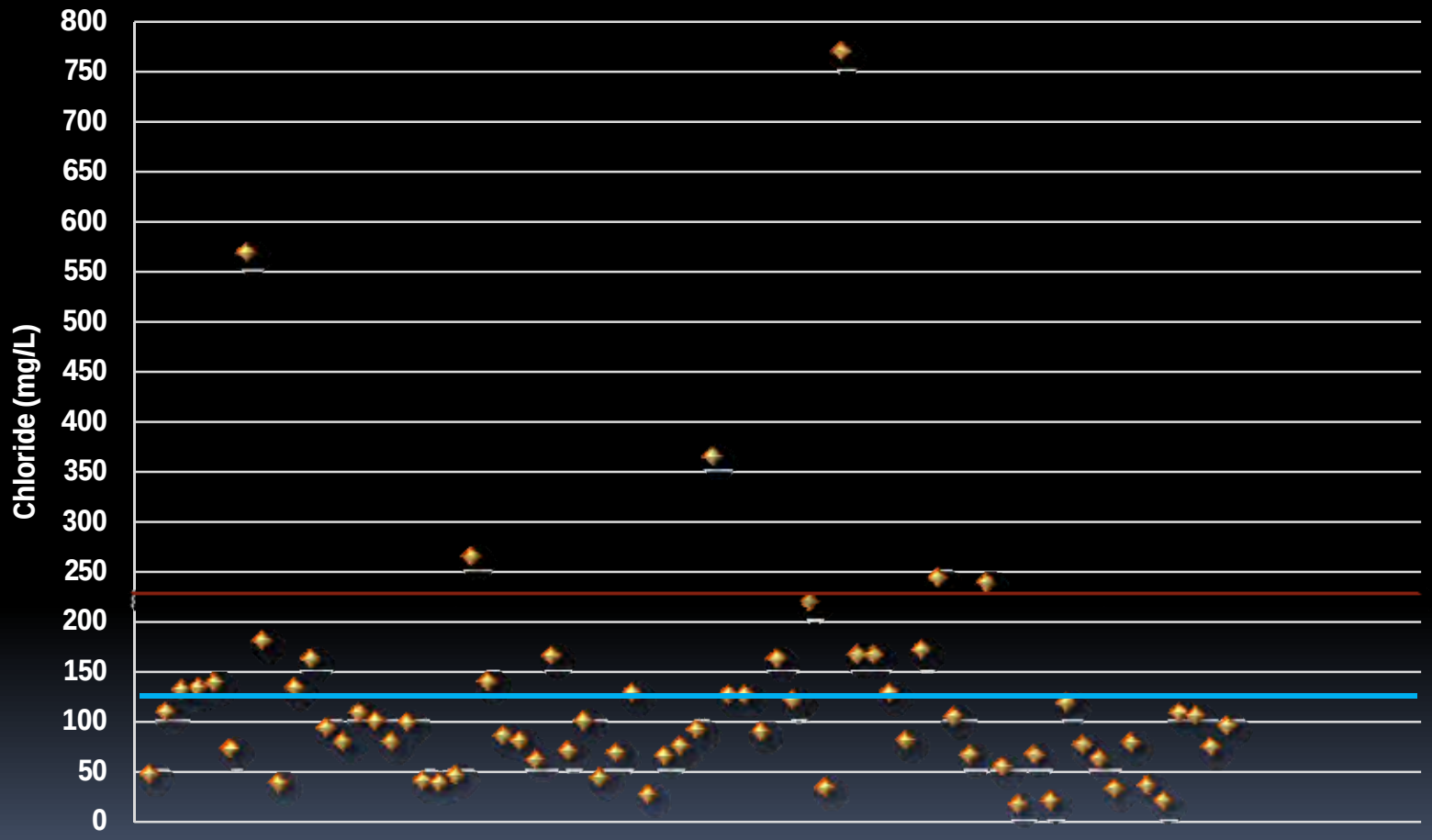
Preliminary Data Results

- Fall surface chloride results had a lower average (86.8 mg/L) than depth samples (120.3 mg/L)
- There was a correlation between high specific conductance and high chloride results however more data is required
- Higher conductivity during winter sampling particularly in deeper waters
- Awaiting winter chemistry data for comparison

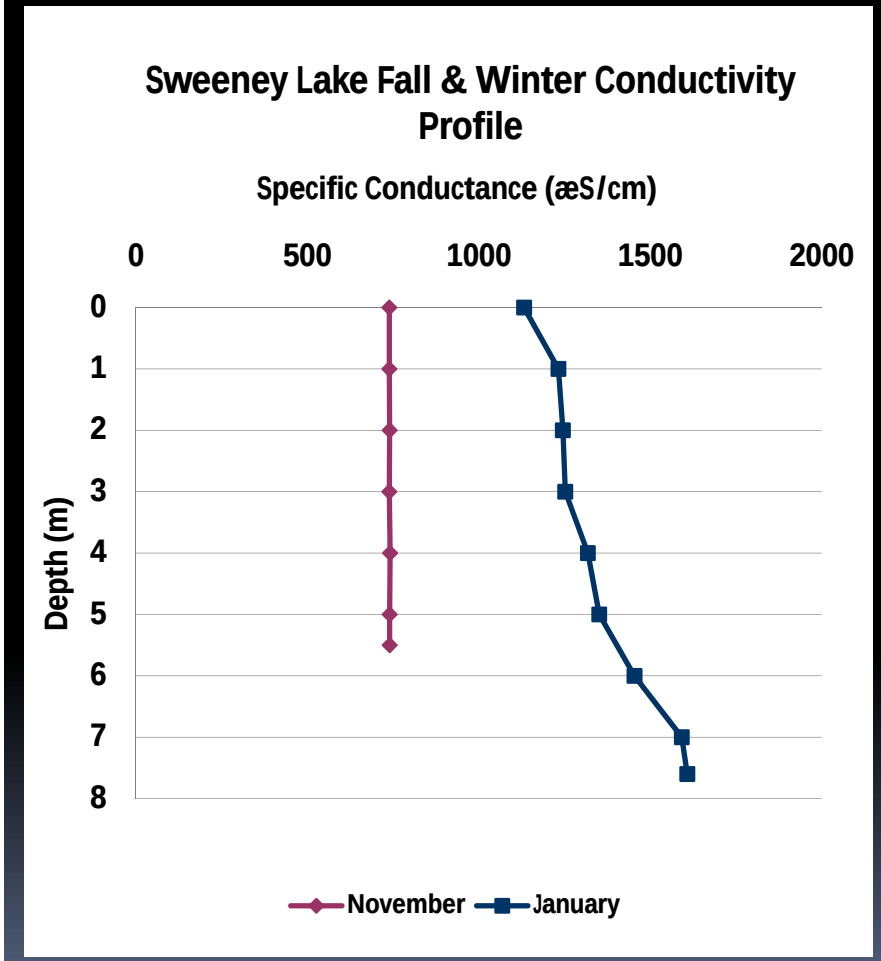
Surface Chloride Results

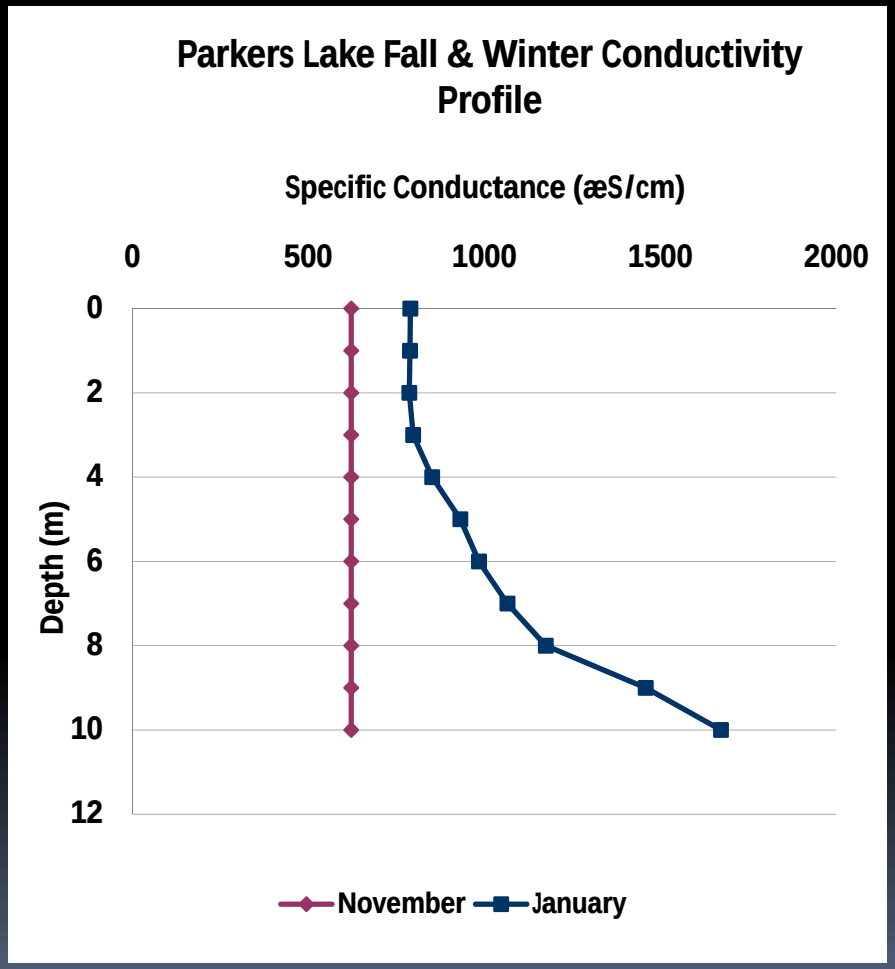


Depth Chloride Results



Seasonal Specific Conductivity Profile Differences





Future Monitoring Plans

- Will continue existing monitoring plan for next 3 years
- Plan to roll out draft monitoring guidance to local partners summer 2011 – which will include list of high priority waters in TCMA
- Expect local partners will start their own chloride monitoring programs
- After 3 years will recommend continued trend/effectiveness monitoring plan for the TCMA