



Chisago Lakes Lake Improvement District

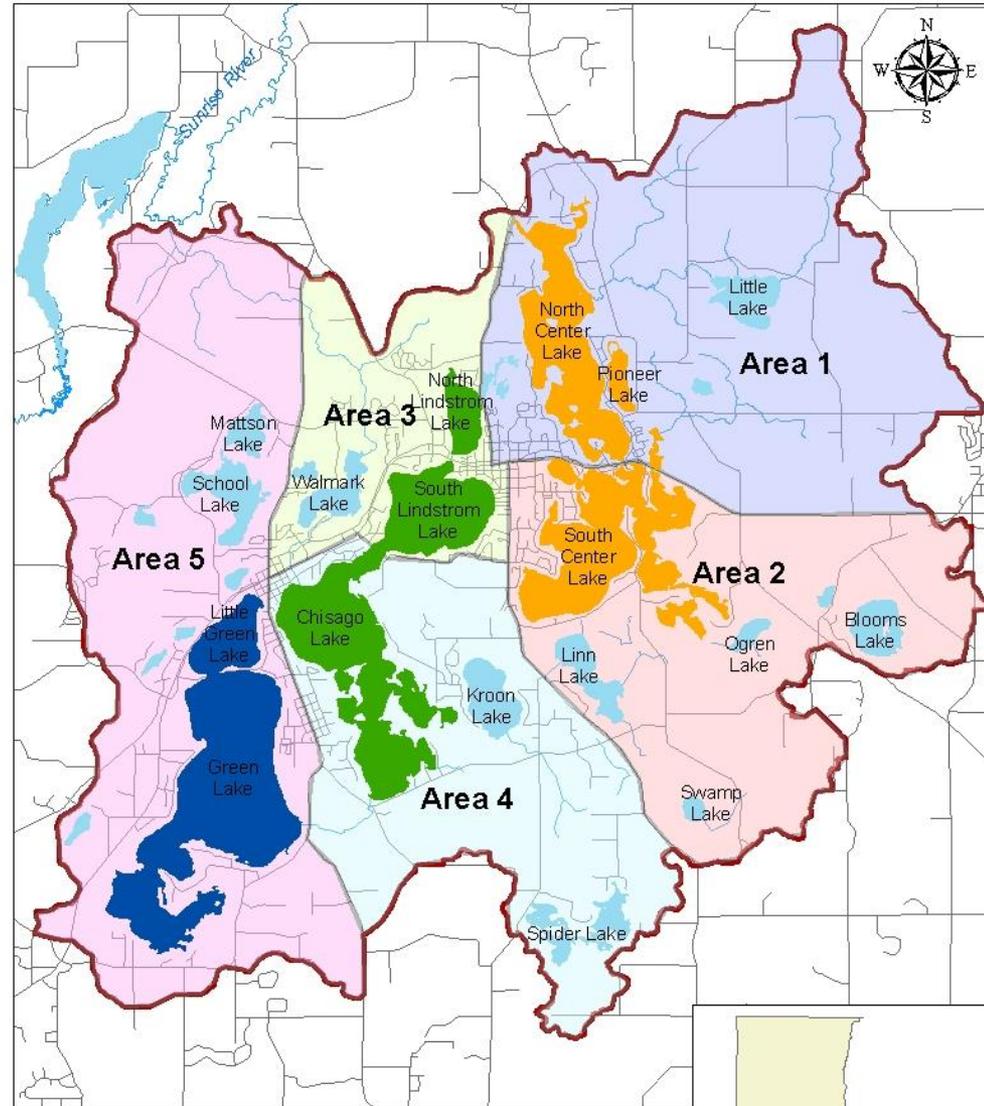
2014 Annual Report



Mission:

**Protect and restore
the surface water resources of
the Chisago Lakes watershed**

Board Member Areas & Lake Associations



**Chisago Lakes Chain
of Lakes Watershed
Board Member Areas**

Chisago SWCD 2013

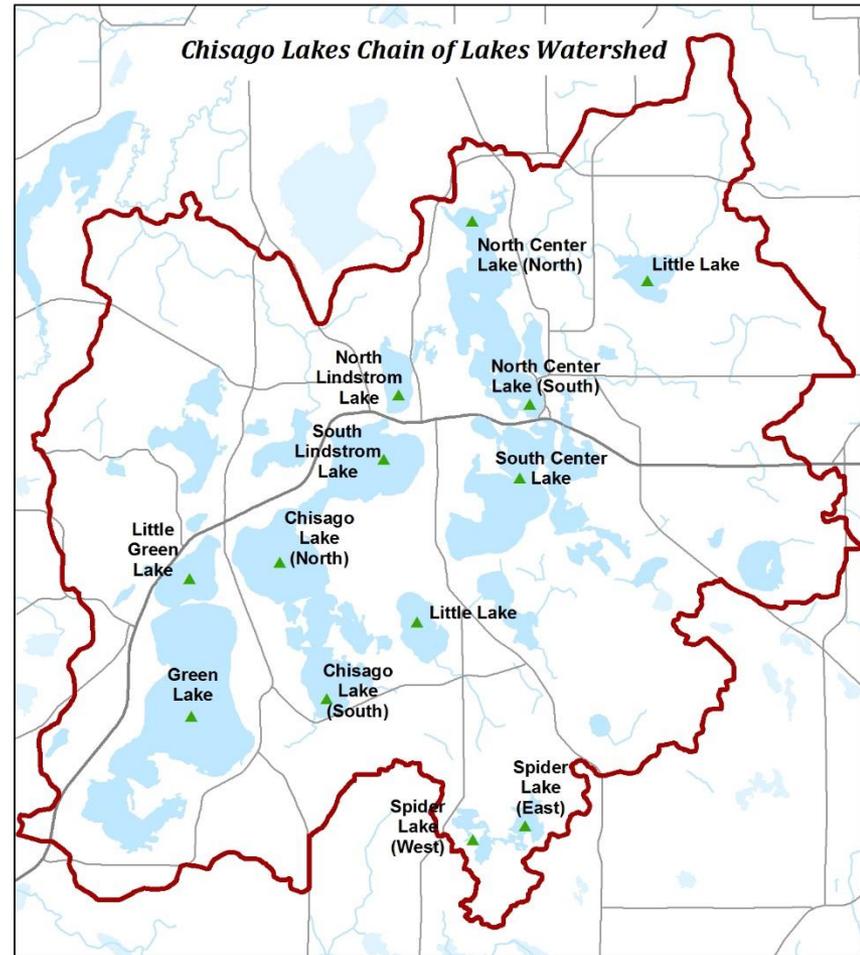
- Chisago Lindstrom Lake Association
- Green Lake Association
- Center Lakes Association



GOAL:
**Preserve, protect and
enhance water quality
within the
Chisago Lakes watershed**

Water Quality Monitoring

- 12 sites
- Once per month
 - May – September
- Chlorophyll
- Color
- Invasive Plants
- Nitrogen
- Phosphorus
- Physical Condition
- Recreational Suitability
- Temperature
- Transparency



2014 Water Quality Monitoring Sites

▲ 2014 Lake Monitoring Sites
■ Lakes

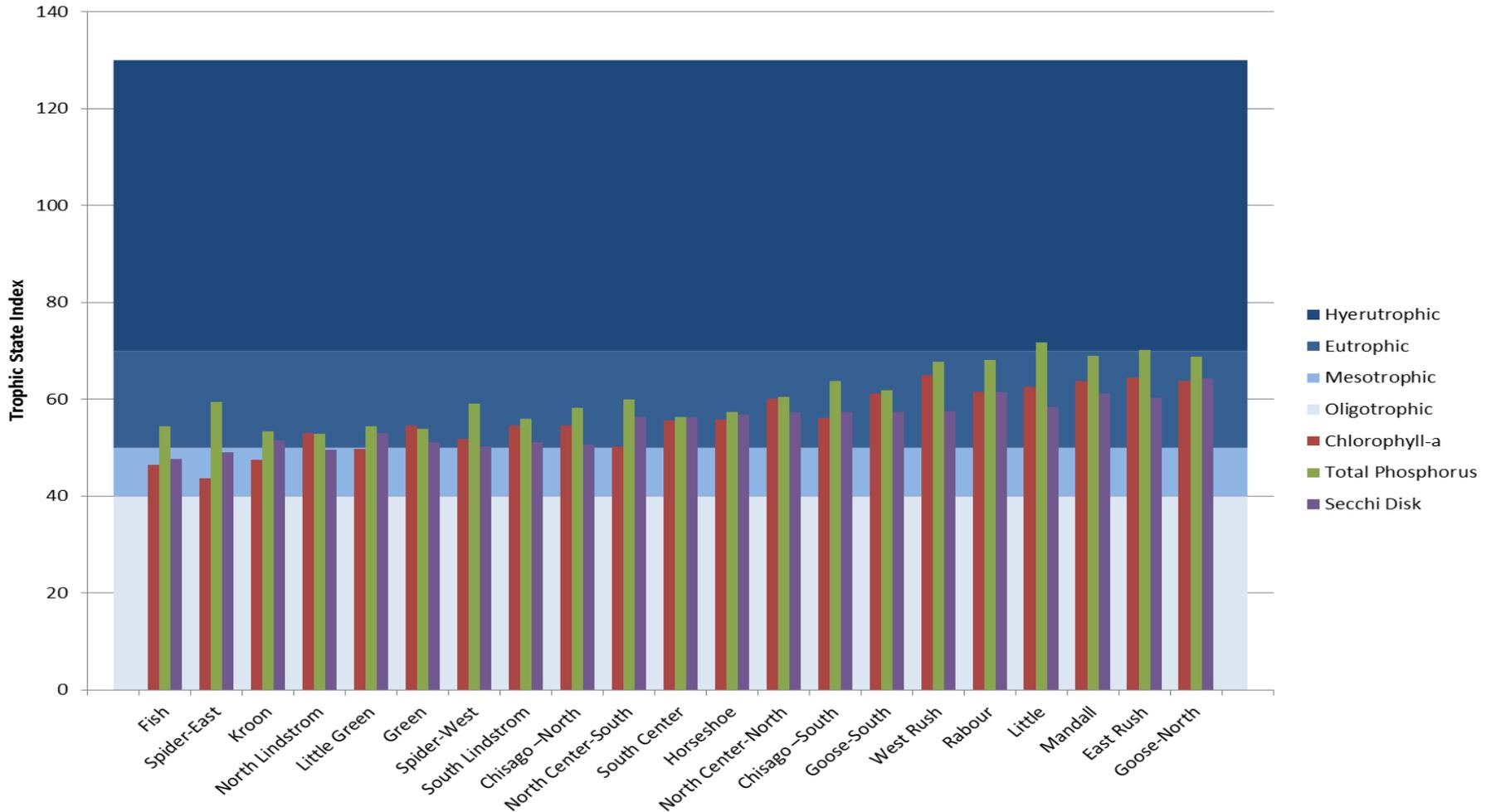


Water Quality Monitoring Summary

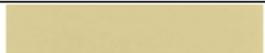
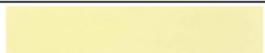
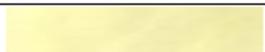
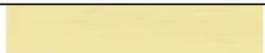
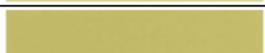
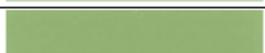
Lake	2011 Grade	2012 Grade	2013 Grade	2014 Grade
Spider (east)	C	C	C	C+
Kroon	B	C	B	B
North Lindstrom	B	C	B	B
Little Green	C	C-D	C	B-
Green	C	B-C	C	C+
Spider (west)		B-C	B	C+
South Lindstrom	B	C	C	C+
Chisago (north)	B	C	C	C+
North Center (south)	C	C	C	C+
South Center	C	C	C	C+
Chisago (south)	C	D	D	C
North Center (north)	C	C	C	C
Little	C-	D	C	D

Water Quality Monitoring Summary

Lake Classification Chart

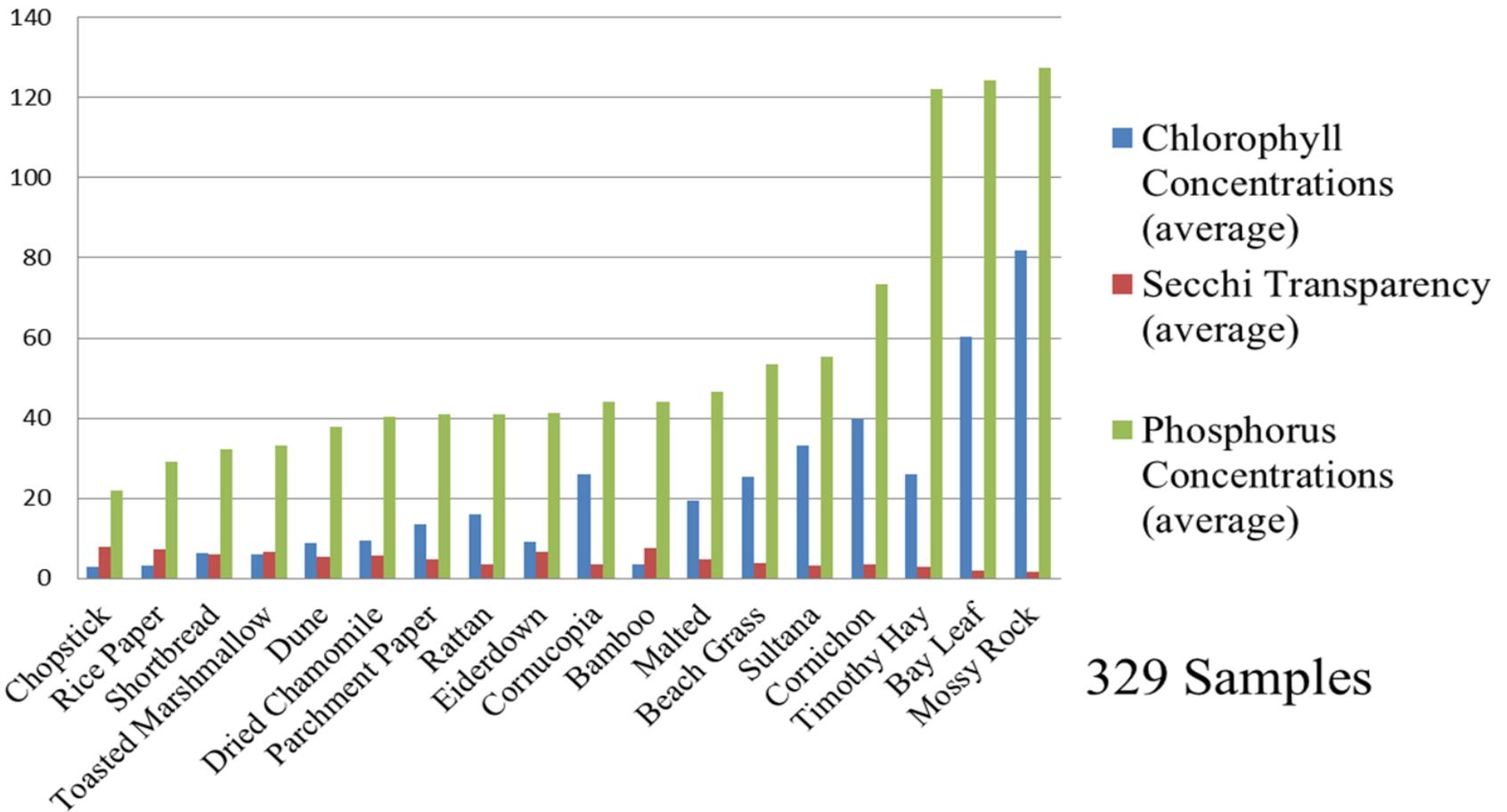


Color of Filtered Lake Water

Color Name		Chlorophyll-a Concentrations (average µg/L)	Secchi Transparency (average M)	Phosphorus Concentrations (average µg/L)	Number of Samples
Chopstick		2.9	7.9	21.8	9
Rice Paper		3.2	7.2	29.2	13
Shortbread		6.5	6.1	32.1	13
Toasted Marshmallow		6	6.8	33.3	25
Dune		8.7	5.5	38	3
Dried Chamomile		9.6	5.7	40.4	26
Parchment Paper		13.5	4.8	40.9	30
Rattan		16	3.7	41	4
Eiderdown		9.1	6.7	41.2	10
Cornucopia		26	3.5	44	1
Bamboo		3.7	7.5	44	3
Malted		19.5	4.9	46.5	4
Beach Grass		25.4	3.9	53.6	84
Sultana		33.3	3.3	55.2	21
Cornichon		39.7	3.4	73.3	66
Timothy Hay		26	3	122	1
Bay Leaf		60.3	1.9	124.3	7
Mossy Rock		81.8	1.6	127.5	9

Color of Filtered Lake Water

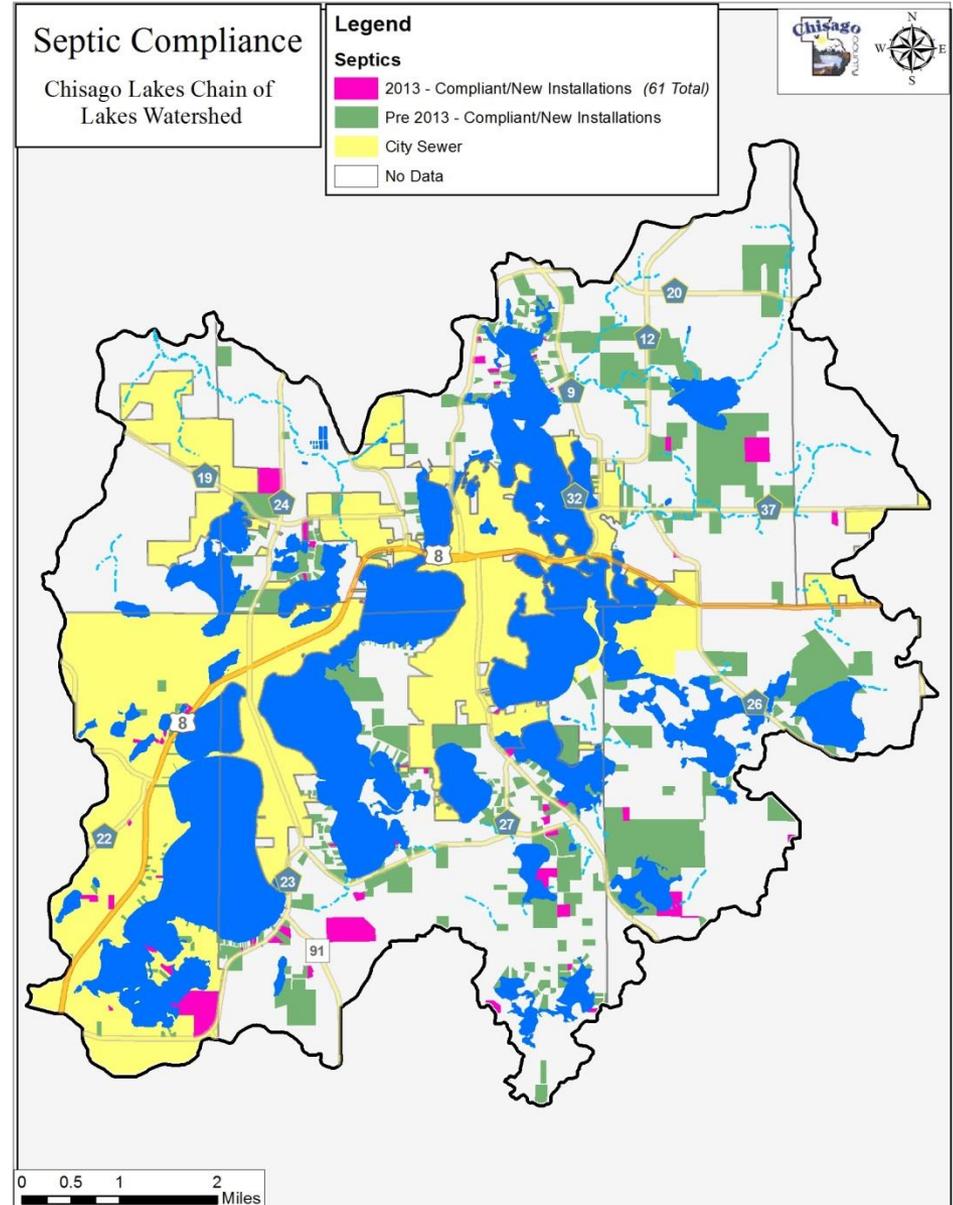
Color of Filtered Water 2011-2014 Summary



329 Samples

Septic System Compliance within Chisago Lakes Watershed

- Septic Systems found to be compliant or new installations
 - 61 in 2013
 - 85 in 2014

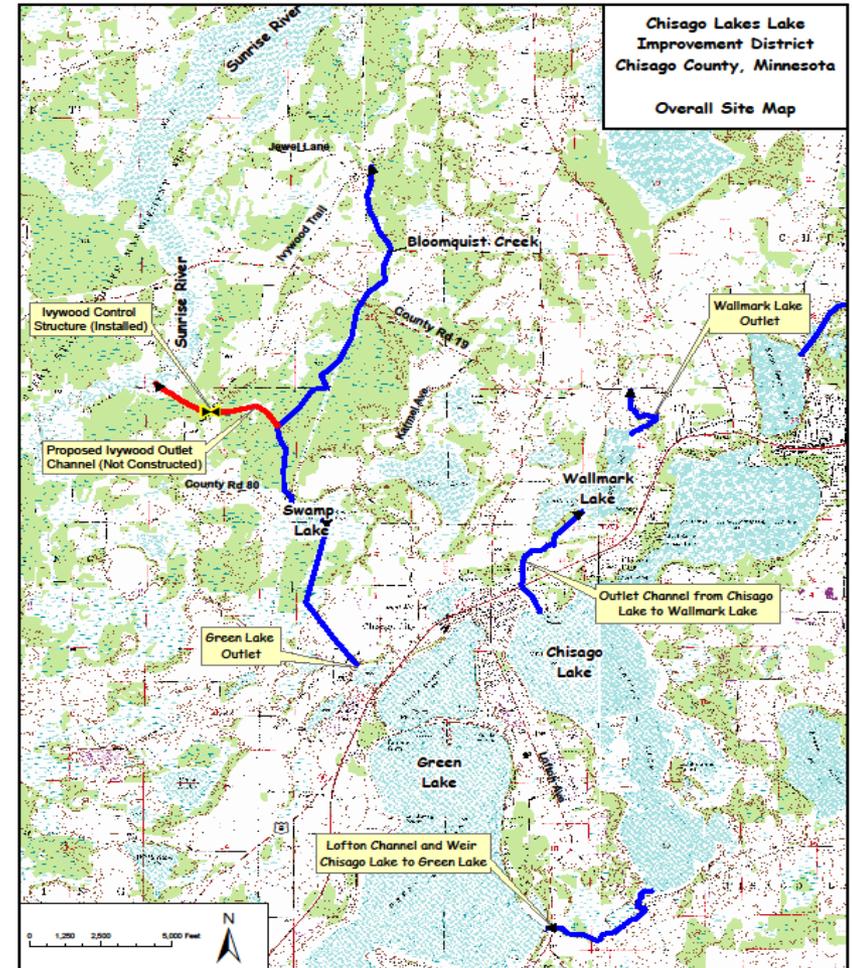




GOAL:
**Maintain the ditch & weir
system to control water levels
during high water events**

Ditch & Weir Maintenance

- Seasonal Inspections
- System well maintained and functioning properly



Ditch & Weir Maintenance



- Lake Ellen Weir
- Weir gates exercised and operational
- Gate opened in 2014 due to high water on Green Lake
- Scheduled for maintenance this spring due to debris build up

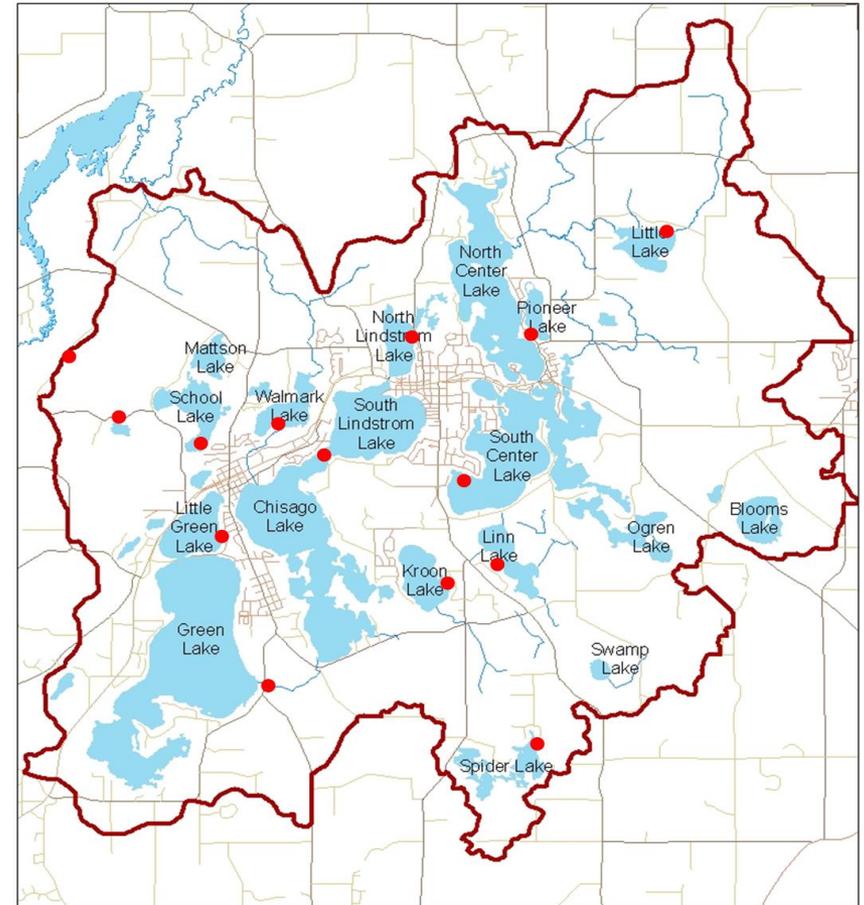
Ditch & Weir Maintenance Aquatic Plant Management



Lake Level Monitoring



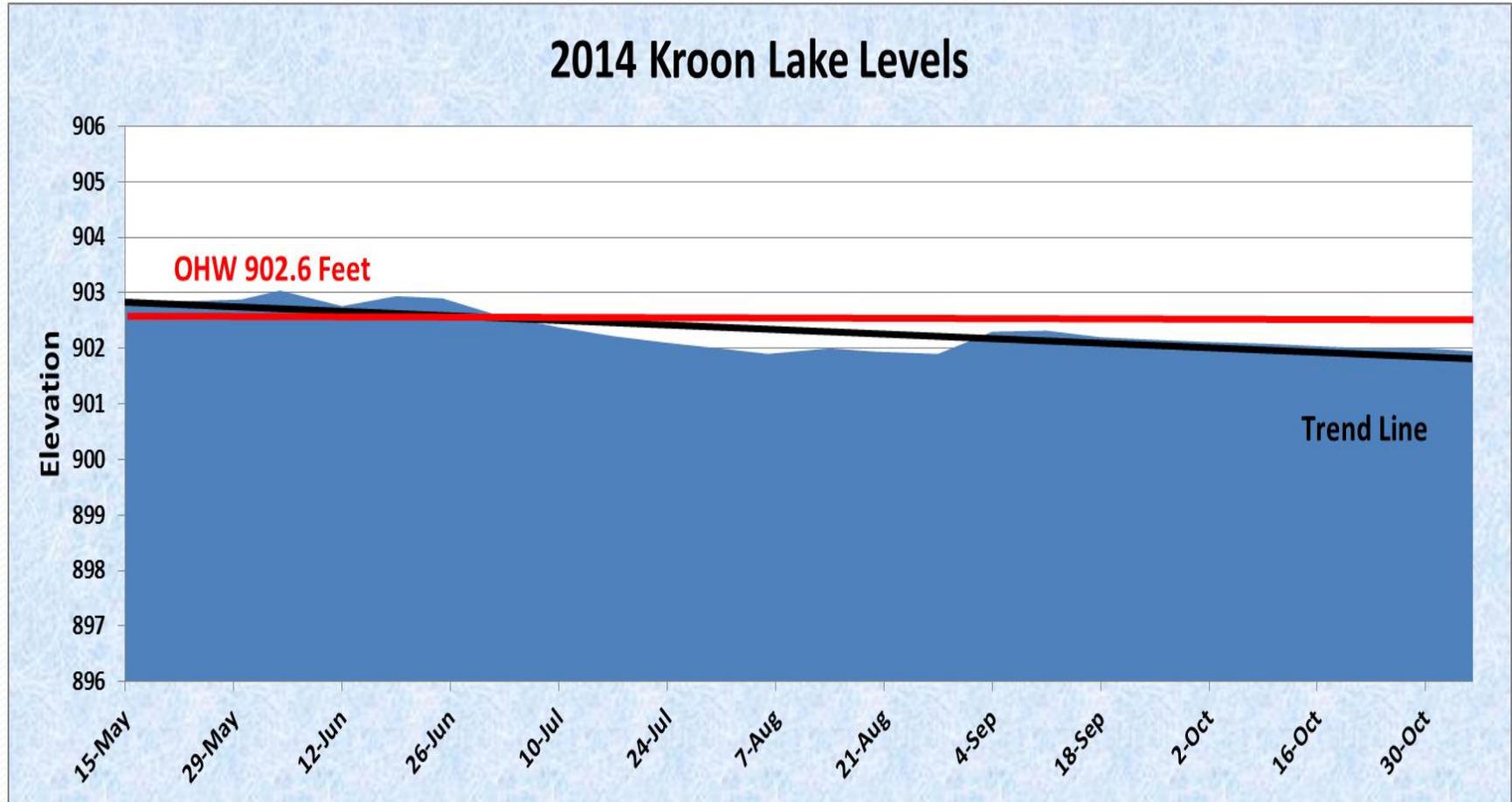
- 14 lake gauges monitored weekly during open water season



Chisago Lakes Chain of Lakes Watershed

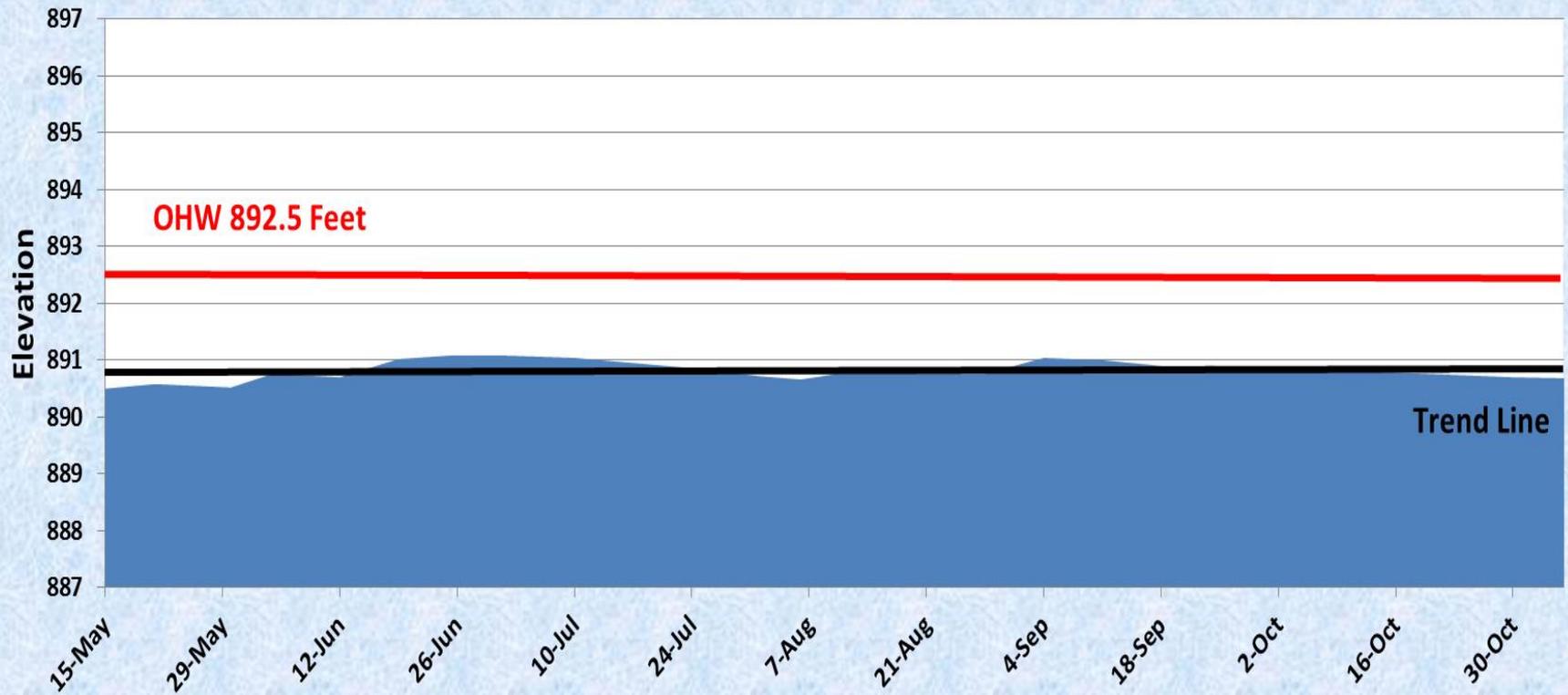
● Lake Level Gauge sites

Lake Level Monitoring

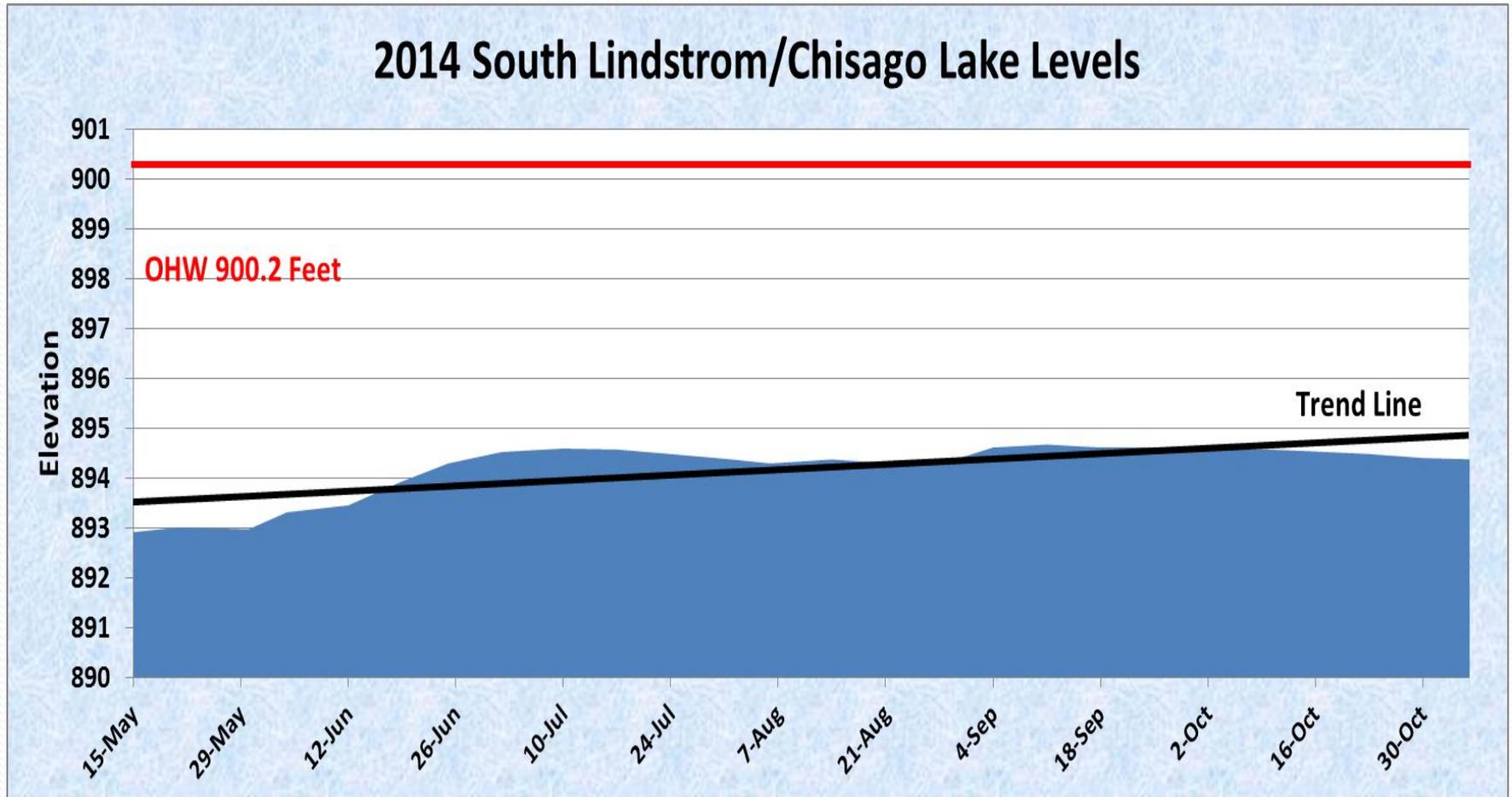


Lake Level Monitoring

2014 Little Green/Green/Ellen Lake Levels



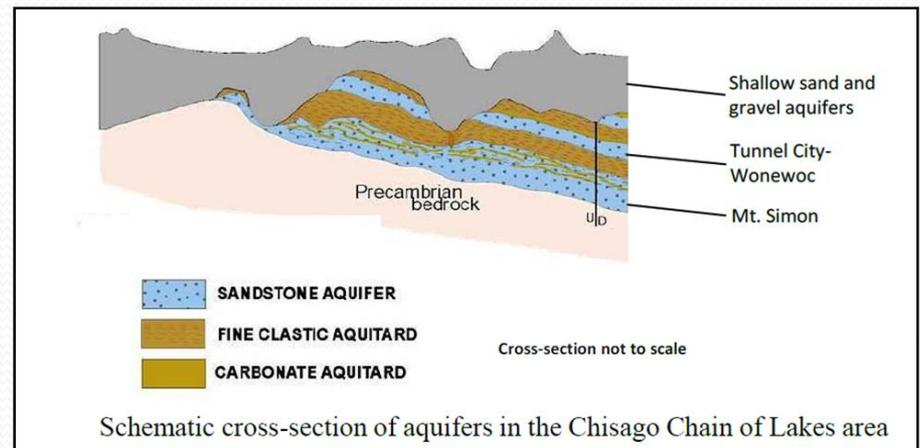
Lake Level Monitoring



Groundwater Observation Wells



- Assess groundwater resources
- Determine long term trends
- Interpret impacts of pumping and climate
- Plan for water conservation
- Evaluate water conflicts

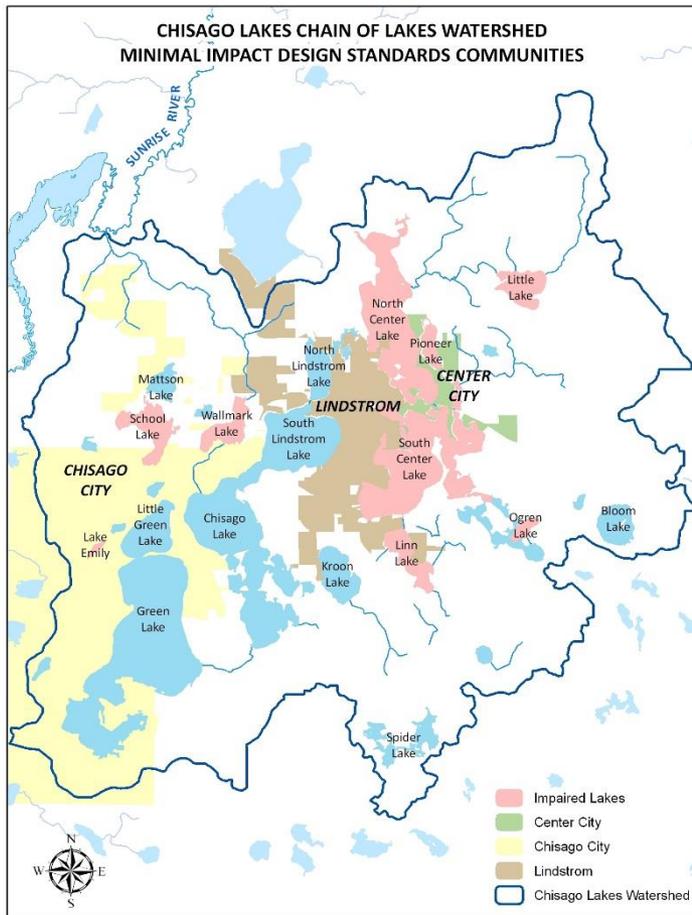


GOAL:

Encourage environmentally sound land use practices for urban and agricultural areas to protect water quality within the Chisago Lakes watershed

- **Establish a matching fund**

Minimal Impact Design Standards Pilot Project



- Next generation stormwater management
- Pilot Communities
 - Center City
 - Chisago City
 - Lindstrom
- 2015 anticipate uniform ordinance adoption

Watershed Best Management Practices Implementation

- Total Maximum Daily Load Study
- Watershed Restoration and Protection Plan
- Urban & Rural Stormwater Retrofit Assessments
- **Thousands** of projects identified
- **Very successful** in obtaining state funding



Rural Subwatershed Assessment

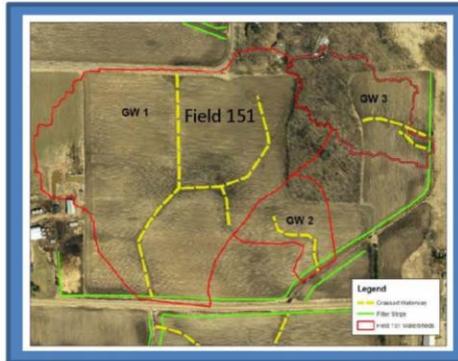
Example Project Profile

Project Description

This is a large agricultural field of about 46 acres. It is planted in a corn-soybean rotation. There is a large concentrated flow path running through the field and a drainage ditch runs alongside the field. The concentrated flow area drains to the ditch, which flows through more agricultural fields, pastures, and empties into Rush Lake.

BMP Recommendation

The concentrated flow areas should be converted to a grassed waterway. A 50-foot filter strip should be installed along the drainage ditch.



Catchment Summary	
Field Acres	45.6
Current Cover	Corn/Beans
# of Landowners	1
Removed TP (Lb/yr)	197
Removed TSS (Ton/yr)	182
Estimated Cost	\$23,911
Cost/Lb TP	\$121
Model Inputs	
Soil Type	346;292;75
Slopes >6%	No

- Rural North/South Center Lake Watersheds
- Identify potential Best Management Practices
 - Water & Sediment Control Basins
 - Rock-lined Channels
 - Grassed Waterways
 - Filter Strips

Practice	Removed TP (Lb/yr)	Removed TSS (Ton/yr)	Watershed Size (Acres)	Average Watershed Slope	Distance to Surface Water (Feet)	Length (Feet)	Estimated Cost	Cost/Lb TP
GW 1	109	109	35.8	1.1	0'	2,525'	\$12,411	\$114
GW 2	27	27	4.3	2	0'	500'	\$3,805	\$141
GW 3	19	19	7.4	1.9	0'	576'	\$4,128	\$217
Practice	Removed TP (Lb/yr)	Removed TSS (Ton/yr)	Existing Filter Strip (Feet)			Area (Acres)	Estimated Cost	Cost/Lb TP
Filter Strip	42	27	<5'			3.7	\$3,567	\$85

2014 Stormwater Best Management Practices

- 295th Street Neighborhood Retrofit
 - Rain Gardens
 - Lindstrom



2014 Stormwater Best Management Practices

- Furgala/Labernik Rain Gardens
 - Water Quality Project
 - Center City



2014 Stormwater Best Management Practices

- Lake Avenue Dead End Street Project
 - Vegetated Swale with Rock Check Dams
 - Chisago City



2014 Stormwater Best Management Practices

- Lorens Park
 - Vegetated Swale and Rain Garden
 - Center City



2014 Stormwater Best Management Practices

- Pleasant Hill Park
 - Filtration Basin
 - Lindstrom



2014 Stormwater Best Management Practices

- Pumphouse Park/Elm Street Project
 - Curb Cut Rain Gardens
 - Lindstrom



2014 Stormwater Best Management Practices

- South Center Lake Boat Launch
 - Pretreatment and Vegetated Swale
 - Lindstrom



2014 Stormwater Best Management Practices

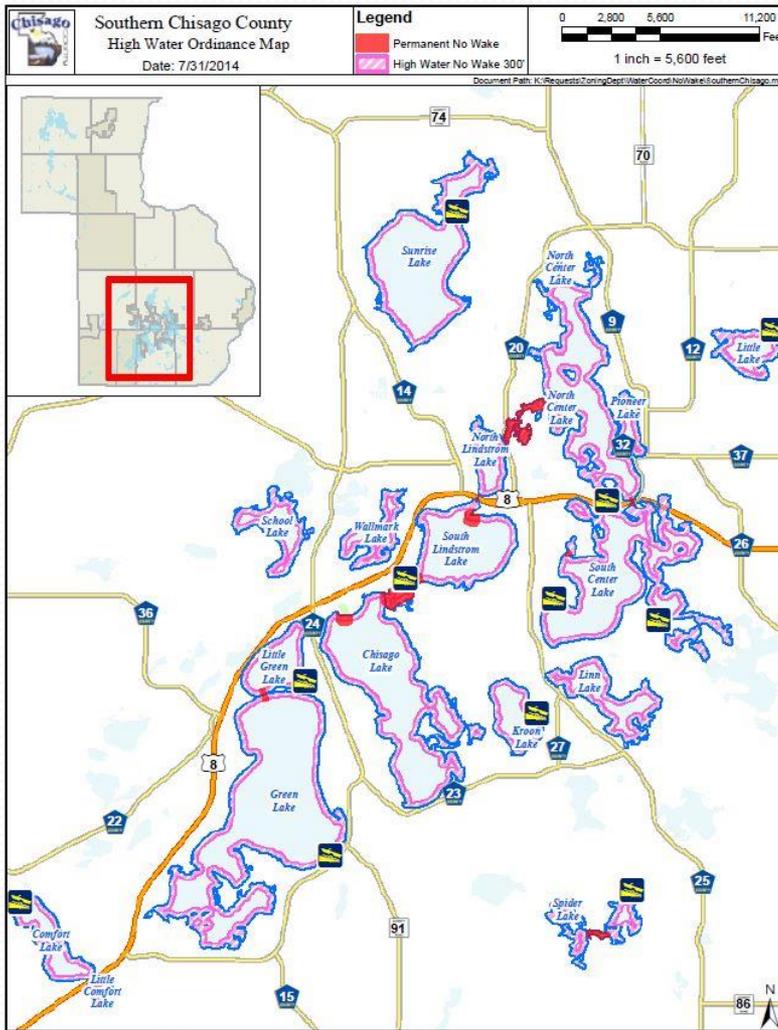
- Surfland Neighborhood
 - Raingardens
 - Chisago City





GOAL:
**Support safe and balanced
recreational use
of surface water**

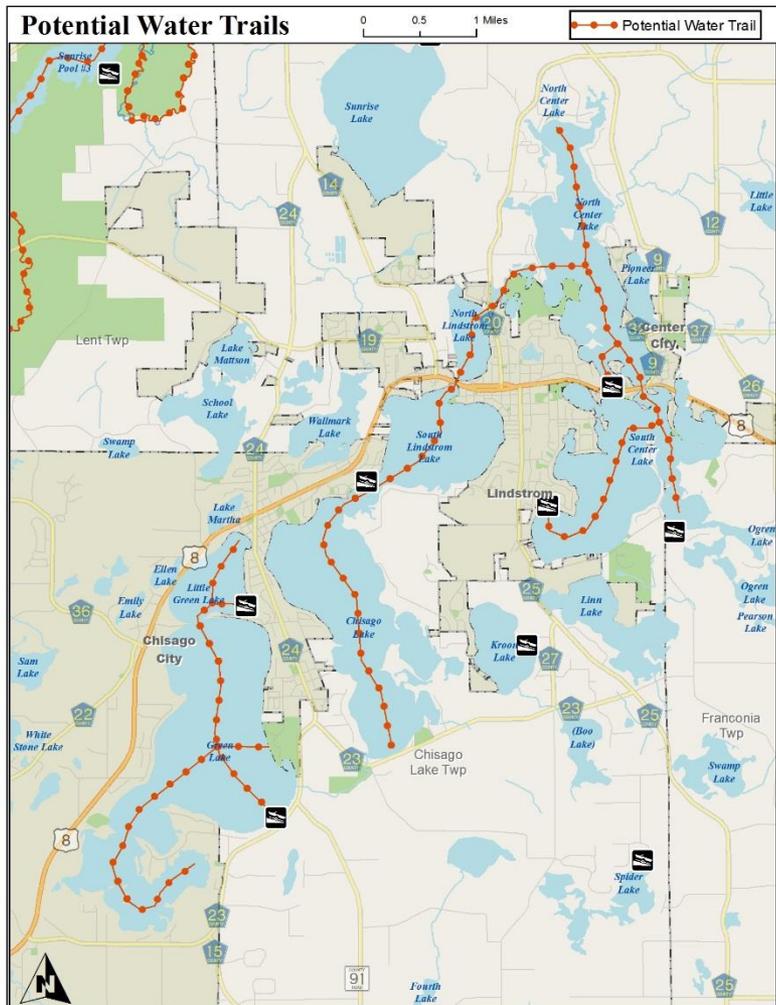
Slow No-Wake Ordinance



- Temporary restrictions
 - High water conditions
- Permanent restrictions
 - Channels
- Bull Lake non-motorized



Water Trail Systems

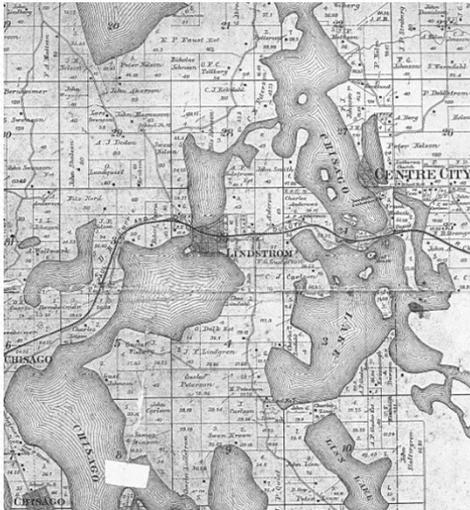


- Facilitate outdoor water based recreation
- Water Trails promote
 - Partnerships
 - Stewardship of natural resources
 - Conservation of aquatic ecosystems
 - Connection of people to places
 - Wellness and wellbeing



GOAL:
**Restore, improve, and
maintain navigation channels
between the lakes**

North Center/North Lindstrom Channel



- Feasibility Assessment Completed
 - Water Quality
 - Water Levels
 - Wetland Impacts
 - Channel design options & estimated cost
- Channel Recommendations
 - No removable weir
 - No lowering of North Center Lake
 - Further action on widening the channel dependent on bridge design options



GOAL:
**Protect, encourage,
and restore native shoreline
to improve fish and
wildlife habitat**

Urban and Shoreland Best Management Practices

- Stabilize erosion
- Reduce pollution
- Shoreland restoration
- Rain gardens
- Filter strips



Fish Kill Disposal



- 2013-2014 Winter Fish Kill
 - Low oxygen levels
 - Long winter
 - Thick ice
 - Heavy snow cover
 - Low water levels
- 30,000 pounds of dead fish collected – mostly carp
- Phosphorus removed
 - 71,250 pounds of algae





GOAL:
**Promote environmental
education, awareness and
stewardship within the
Chisago Lakes watershed**

Children's Water Festival

12 Years Strong ~ Thank You for Your Efforts!



Public Outreach and Awareness

- Partnership with Lake Associations
- Community Events
 - Home & Business Expo
 - Harmony in the Park Water Festival
 - Karl Oskar Days
 - Ki Chi Saga Days



Hook, Line & Sinker

- Recycling stations at 8 boat landings & Household Hazardous Waste Facility
- Fishing line - 500 years to decompose
- Lead sinkers toxic or fatal to waterfowl
- Fishing line recycled free by Berkley, made into fish habitat, tackle boxes, & spool for fishing line
- Fish hooks & lead sinkers recycled

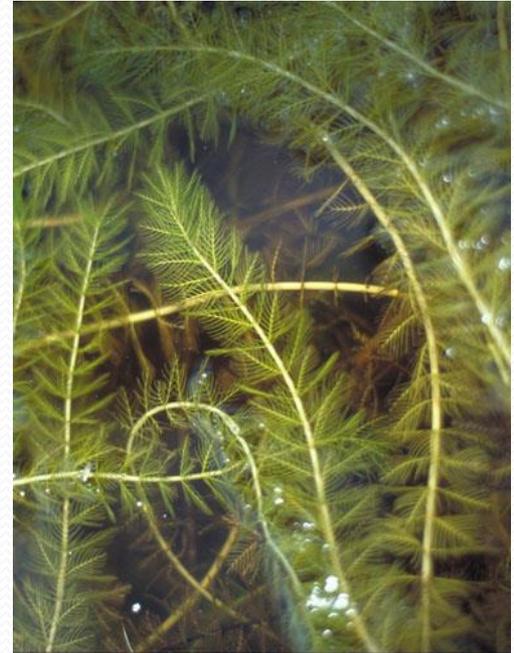




GOAL:
**Promote the reduction
of non-native aquatic
invasive species**

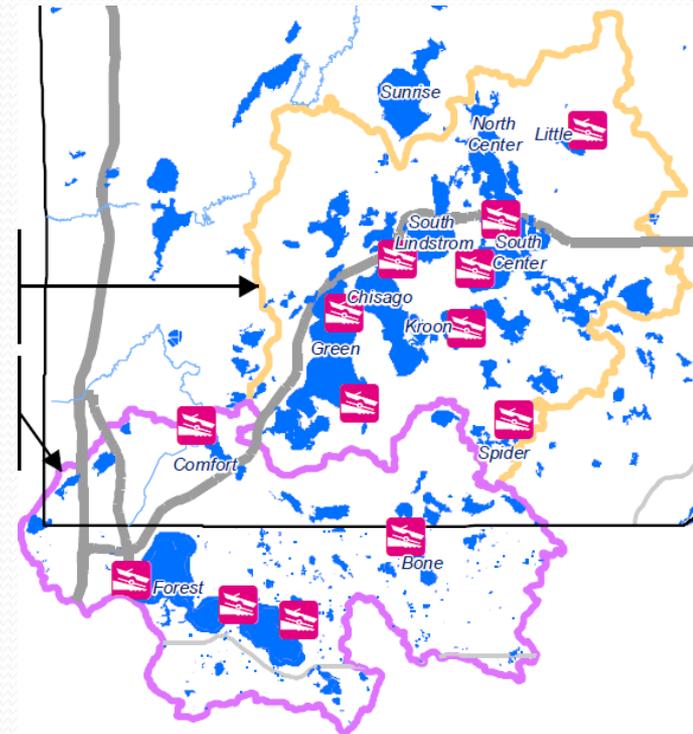
Aquatic Invasive Species Treatment

- Eurasian Water Milfoil
- Curlyleaf Pondweed
- Improve navigation
- Partnership
 - Lake Associations
 - Lake Improvement District
 - Department of Natural Resources



Watercraft Inspection Partnership

- Lake Improvement District
- Comfort Lake Forest Lake Watershed District
- Department of Natural Resources
- 13 Public accesses
- 4 Inspectors
- 3,036 Inspection hours



Carp Management



- Aquatic Invasive Species
 - Stir up bottom sediment
 - Release phosphorus into water column
 - Increase algae growth
 - Disrupt aquatic vegetation
- Temporary carp barrier installed
- 2015 Proposal
 - Intensive tracking and management
 - Green, Little Green, Lake Ellen
 - Harvest
 - Chisago, North & South Center, Linn



~ **Thank you**
for supporting the
**Chisago Lakes Lake
Improvement District**

**We look forward to
working with you
in 2015!**