Tale of Two Cities, Deerwood and Crosby Embarking on Storm Water Management

State of Water Conference

Melissa Barrick, Crow Wing SWCD
Jeff Hrubes, BWSR
Jay Michels, EOR, Inc.

April 13, 2018

Overview

- Clean Water Funding – BWSR (Jeff)
- Prioritization Process for Serpent Lake (Melissa)
- Storm Water Design, ALUM Treatment, and Ordinances (Jay)
- Lessons Learned and Closing Comments (Melissa)

Targeted Watershed Demonstration Program

"Do what we know needs to be done"

Began in FY 2014

Targeted Watershed Demonstration Program

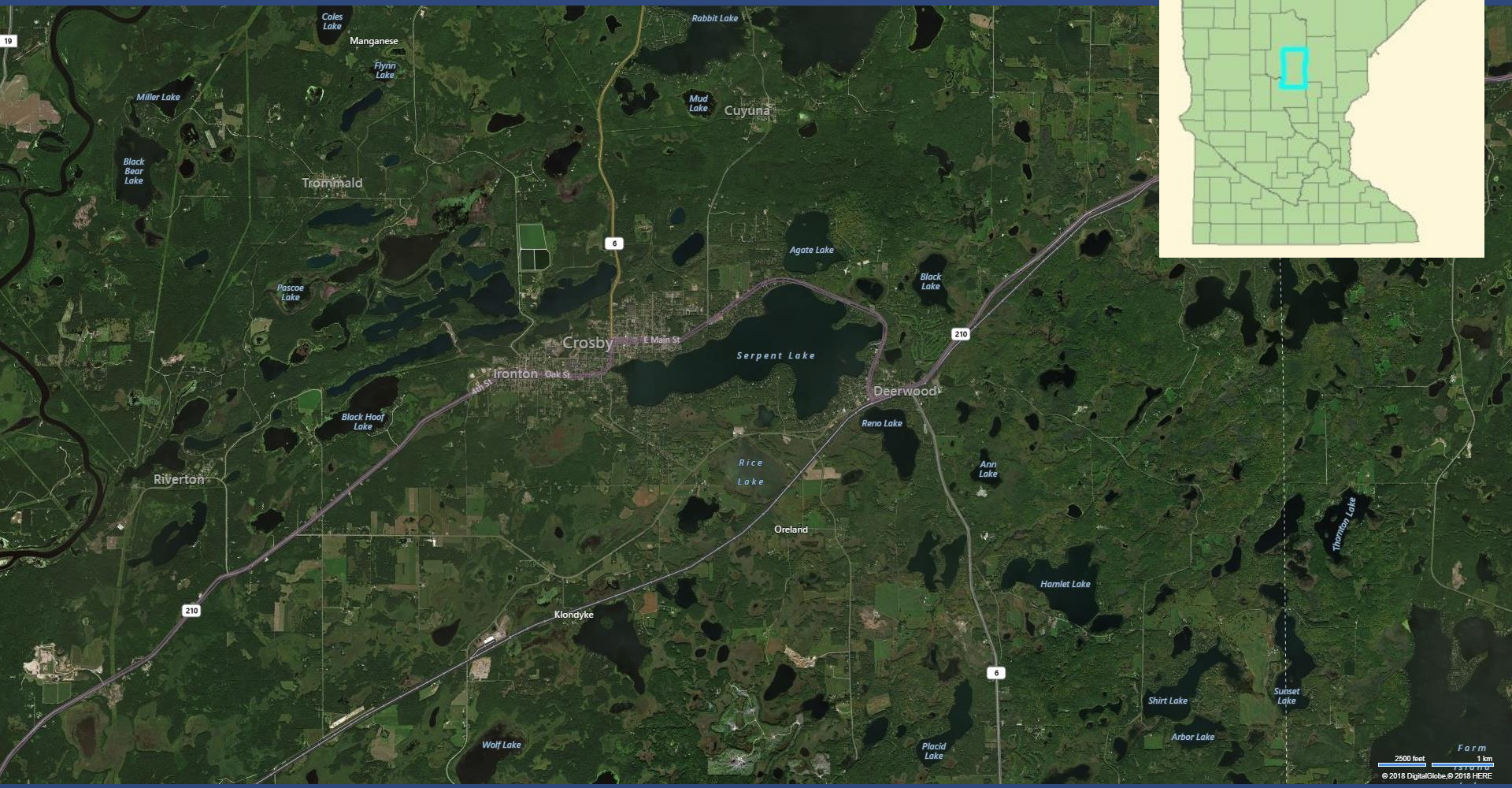
- Data Driven
- Watershed and Water Resource Knowledge
- Specific Actions/Locations Identified
- Quantifiable-models or measurements
- Restoration or Protection
- Substantial Resources

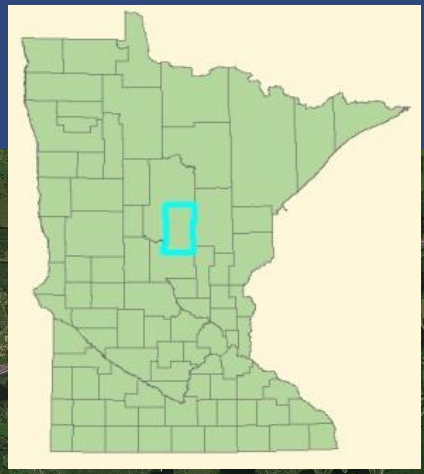
Basis for Comprehensive Watershed Planning (1W1P)

- Prioritizing—Crow Wing County Water Plan
- Targeting—High Impact Locations
- Measurable Results—Volunteer and Public Monitoring

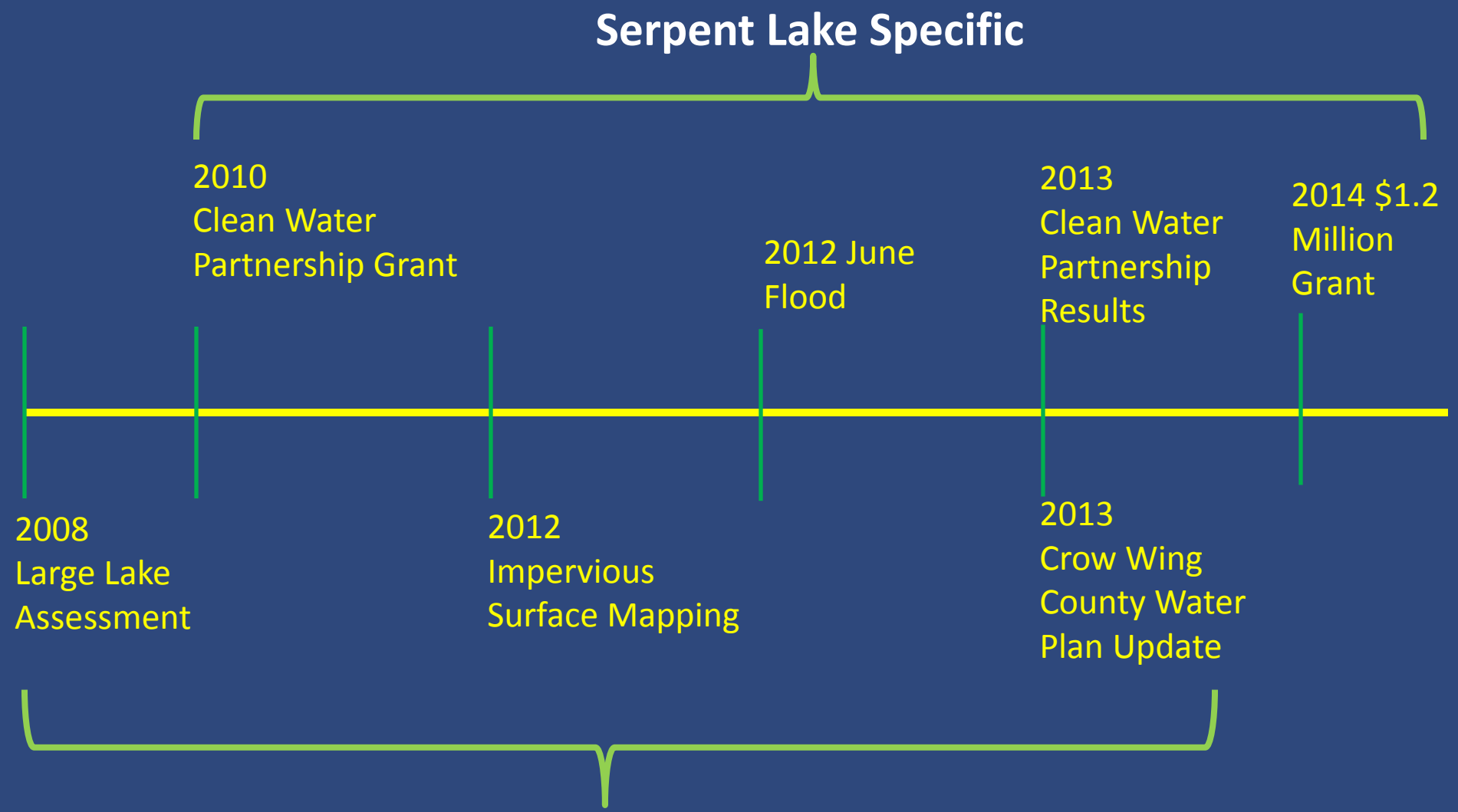

I LOVE IT
WHEN A PLAN COMES TOGETHER
quickmeme.com

Serpent Lake



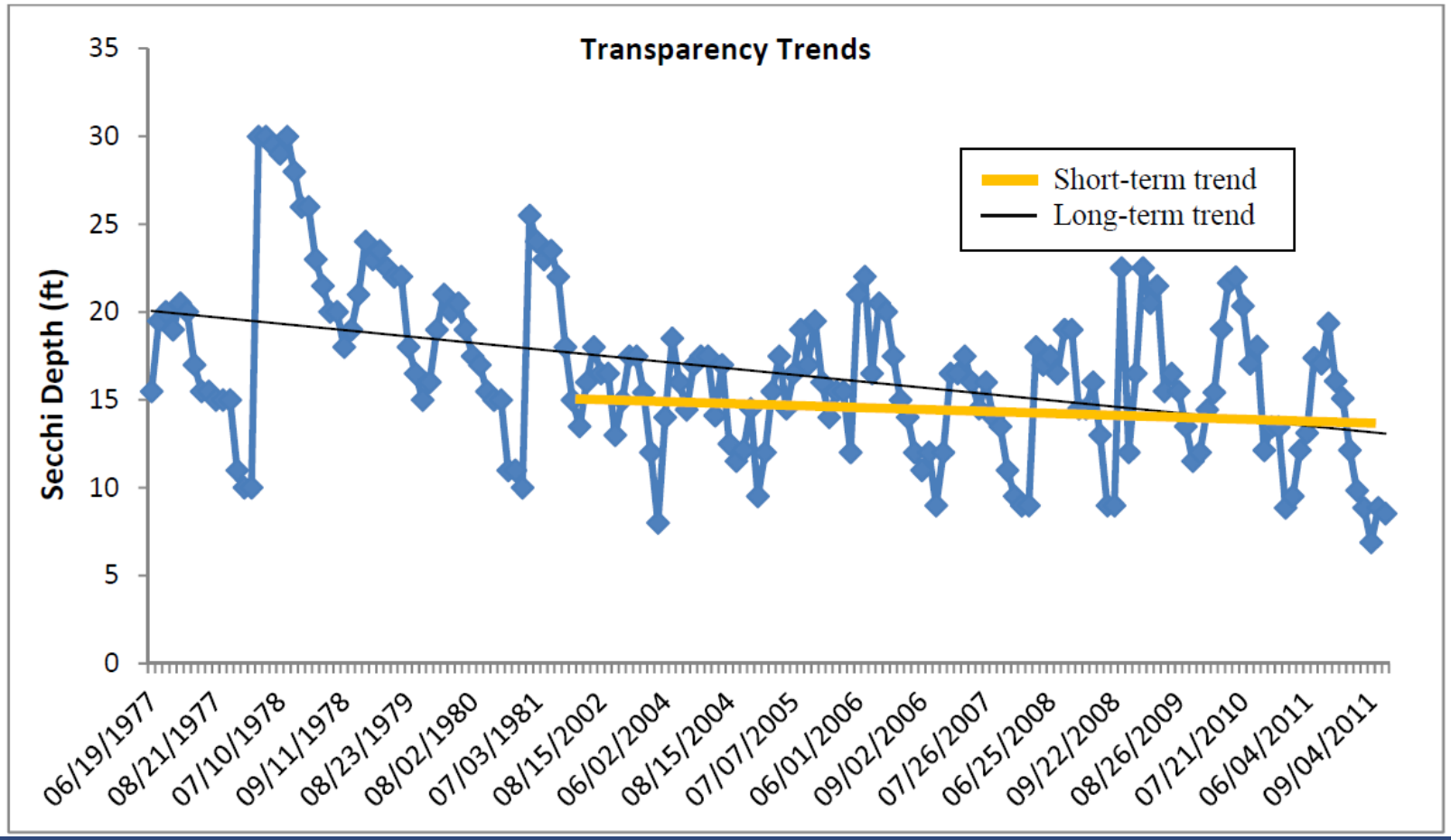


Serpent Lake Prioritization Process



2008 Large Lake Assessment

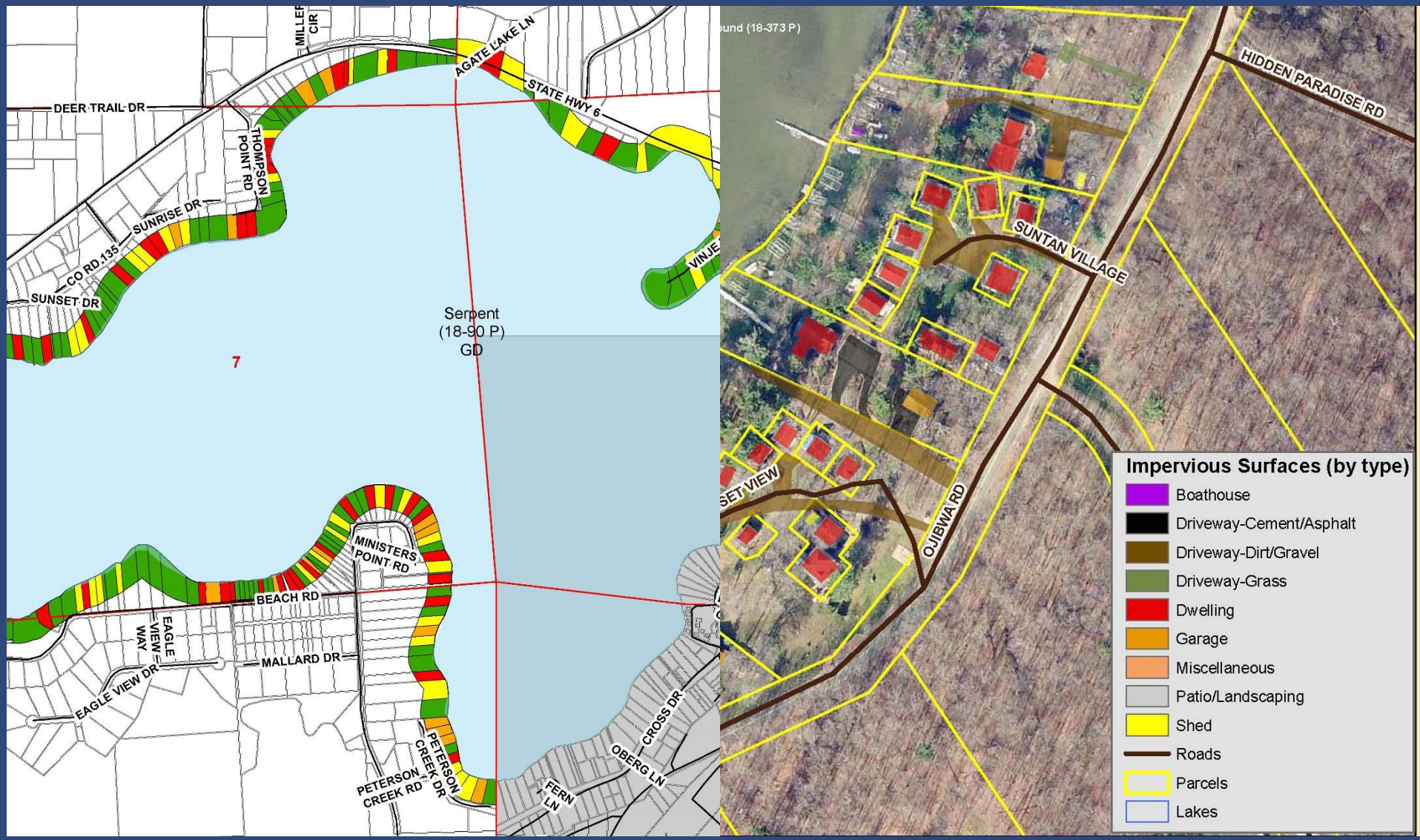
Lake Site	Parameter	Date Range	Trend	Probability
201	Transparency	1977-1981, 2002-2011	Declining	95%
201	Transparency	2002-2011	No Trend	--



2010 Clean Water Partnership Grant

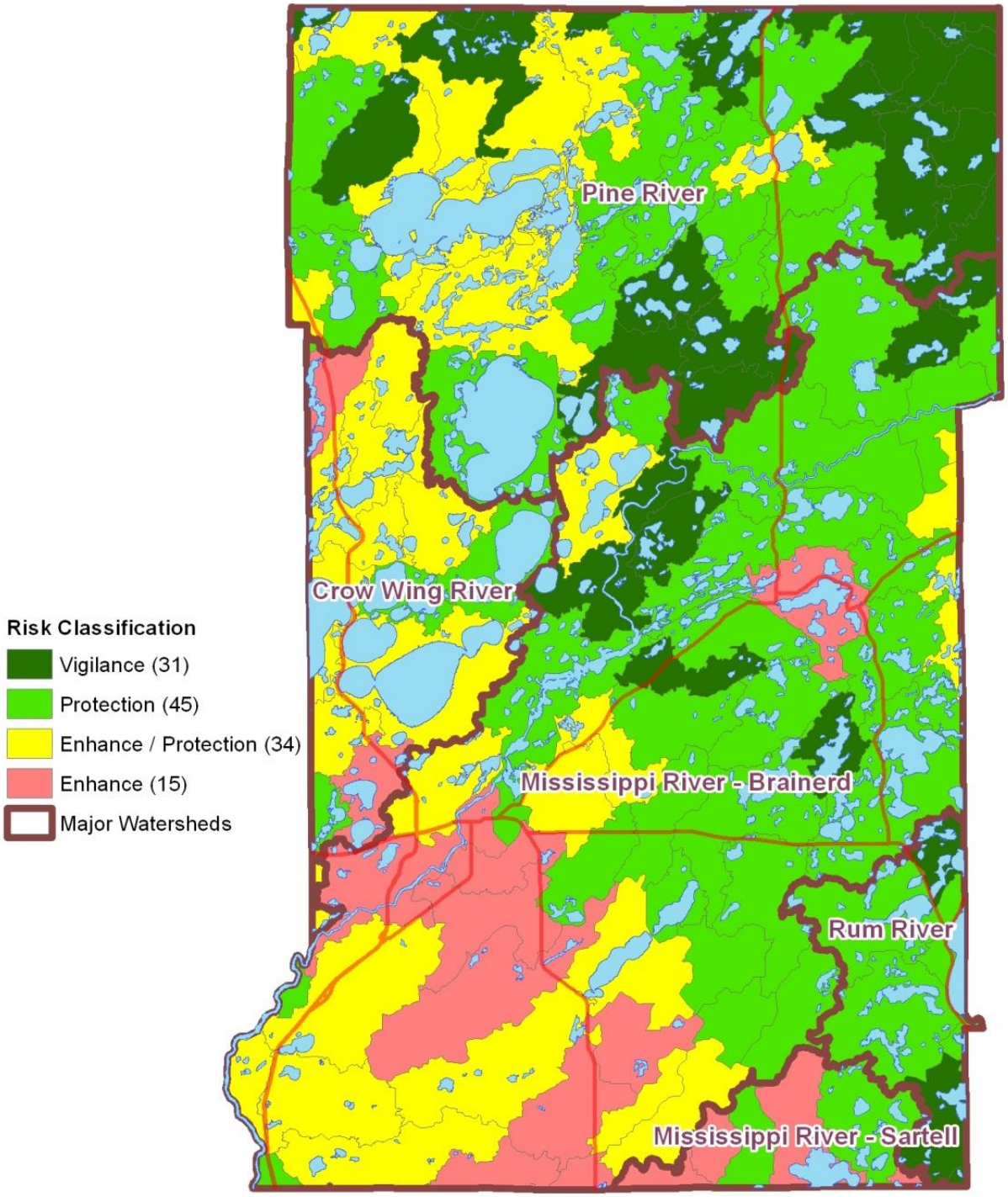
Type of Monitoring	Parameters
Stormwater Samples	TSS, TSVS, SRP, TP
Serpent Lake	SRP, TP, Chl-a, Secchi, DO, Cond, pH, Temp.
Cascade, Unnamed, and Cranberry Lakes	Secchi, TP, Chl-A

2012 Impervious Surface Mapping



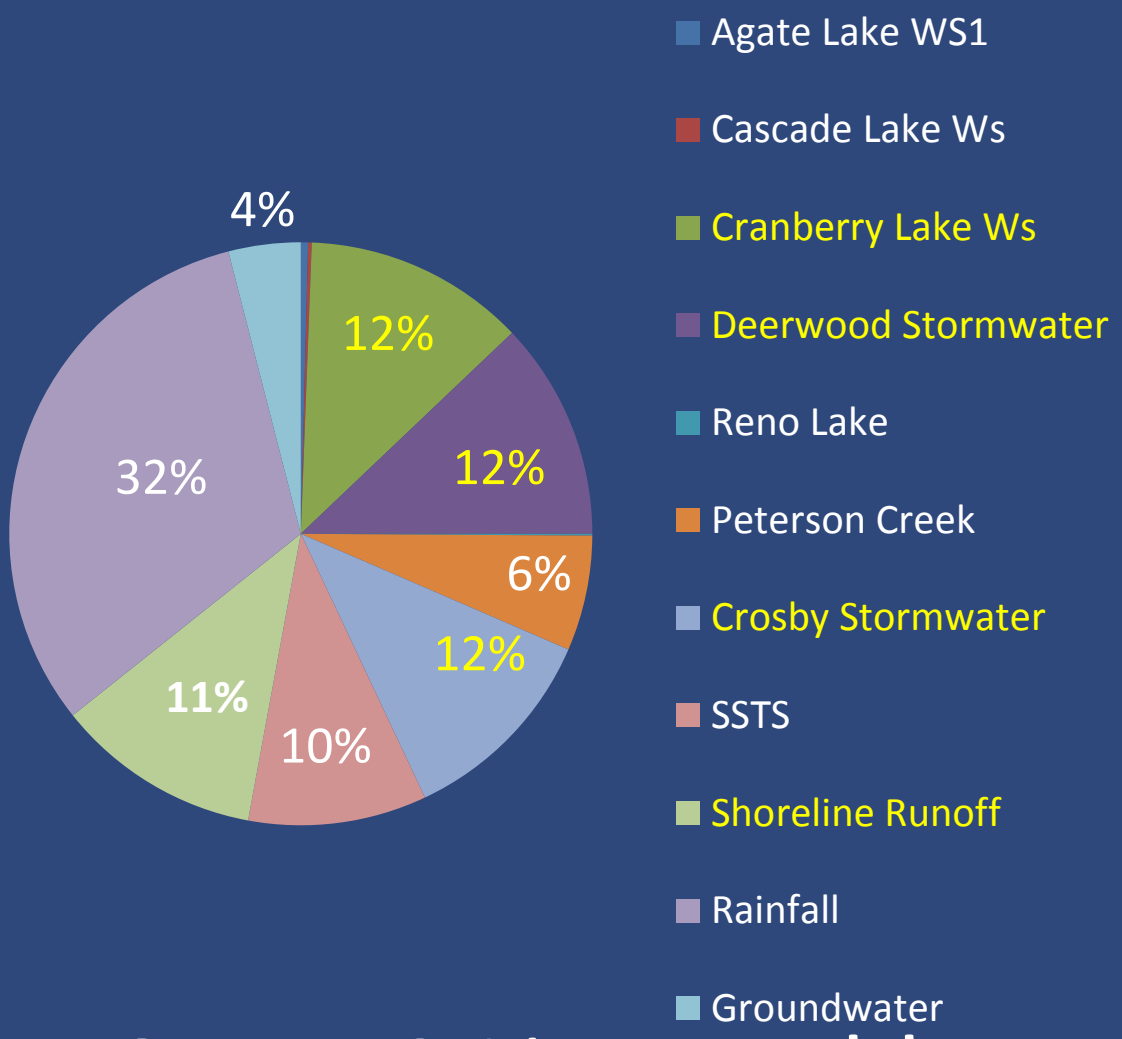
2012 June Flood

2013 CWC Water Plan Update



2013 Clean Water Partnership Results

Subwatershed	Load	
	kg/yr	% total
Agate Lake WS1	0.9	0.4%
Cascade Lake Ws	0.3	0.2%
Cranberry Lake Ws	26.0	12.3%
Deerwood Stormwater	25.6	12.1%
Reno Lake	0.2	0.1%
Peterson Creek	13.6	6.4%
Crosby Stormwater	24.3	11.5%
SSTS	21.0	9.9%
Shoreline Runoff	24.0	11.4%
Rainfall	67.0	31.7%
Outlet - Discharge	44.4	-21.2
Groundwater	8.4	4.0%



= Over 40 % Treatable

Partnership

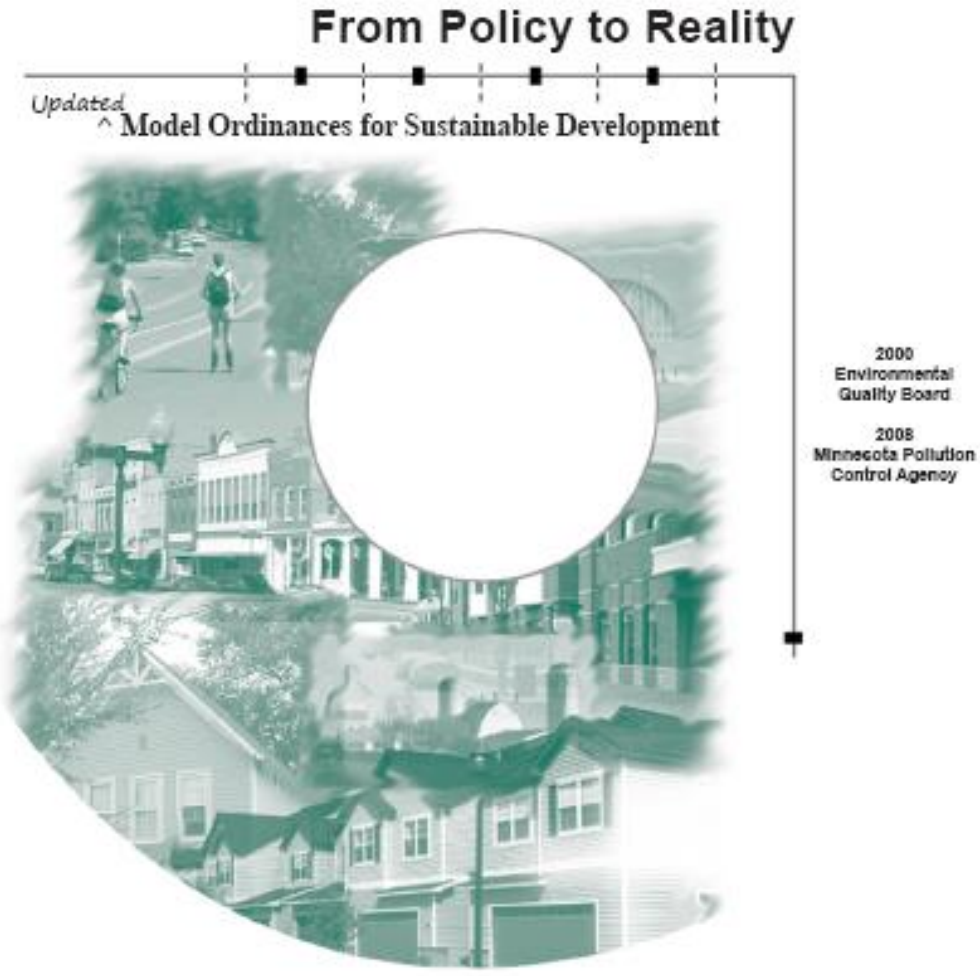
Minnesota Board of Water & Soil Resources

Minnesota Pollution Control Agency

Minnesota DEPARTMENT OF NATURAL RESOURCES

2014 $1.2 Million Grant

1.	Cranberry Lake Treatment	In-lake Alum treatment.	50 lb/yr	$90,000
2a.	Deerwood Summer Place	Bioretention and Enhanced Iron Sand Filter	27 lb/yr	$500,000
2b.	City of Crosby	Stormwater Investigation		$15,000
2b.	City of Crosby	Stormwater Projects	40 lb/yr	$400,000
3.	Ordinance Revisions	Work with the City of Deerwood and Crosby and Irondale Township		$90,000
4.	Landowners Stormwater	Install best management practices	21 lb/yr	DNR Grant Funds.
5.	Education and Outreach	Utilize Media Resources and Existing Partnerships		



Funded by a Minnesota Pollution Control Agency Sustainable Communities Grant

Minimal Impact Design Standards (MIDS)

In 2009, the Minnesota Legislature allocated funds to "develop performance standards, design standards or other tools to enable and promote the implementation of low impact development and other stormwater management techniques." (Minnesota Statutes 2009, section 115.03, subdivision 5c).

Minimal Impact Design Standards (MIDS)

The development of **Minimal Impact Design Standards is based on low impact development (LID) — an approach to stormwater management that mimics a site's natural hydrology as the landscape is developed.** Using the low impact development approach, stormwater is managed on site and the rate and volume of predevelopment stormwater reaching receiving waters is unchanged. The calculation of predevelopment hydrology is based on native soil and vegetation. (Minnesota Statutes, section 115.03, subdivision 5c).

Minimal Impact Design Standards (MIDS)

Minimal Impact Design Standards (MIDS) represents the next generation of stormwater management and contains three main elements that address the following challenges:

- A higher clean water **performance goal** for new development and redevelopment to provide enhanced protection for Minnesota's water resources.
- New **modeling methods and credit calculations** that will standardize the use of a range of innovative structural and nonstructural stormwater techniques.
- A **credits system and ordinance package** that will allow for increased flexibility and a streamlined approach to regulatory programs for developers and communities.

MIDS: Performance Goals

New development

Redevelopment

Linear Projects

Flexible Treatment options – when a site just cannot meet the goal.

MIDS: Performance Goals

Flexible Treatment Options - Sequence & Design Guidance Flow-Chart

Site Restrictions

- **Insufficient ROW**
- **Incompatible zoning or land use requirements**
  - **Ultra-urban site - >50 units/acre**
- **In DWSMA or wellhead protection area**
- **Incompatible existing or proposed structures or infrastructure**
- **Karst**
- **Shallow groundwater or bedrock**
- **Contaminated soils or hotspots**
- **Very low or high infiltrating soils**
- **Adverse surface water hydrologic impacts – starving a wetland**

MIDS: Performance Goals

Flexible Treatment Options - Sequence & Design Guidance Flow-Chart

Option #1 = Applicant attempts to comply with the following conditions:

- **Achieve at least 0.55" volume reduction goal, and**
- ***Remove 75%* of the annual TP load, and**
- **Options considered and presented shall examine the merits of relocating project elements to address varying soil conditions and other constraints across the site**

Option #2 = Applicant attempts to comply with the following conditions:

- **Achieve volume reduction to the maximum extent practicable (as determined by the Local Authority), and**
- ***Remove 60%* of the annual TP load, and**
- **Options considered and presented shall examine the merits of relocating project elements to address varying soil conditions and other constraints across the site.**

MIDS: Performance Goals

Flexible Treatment Options - Sequence & Design Guidance Flow-Chart

Option #3 = Off-site mitigation (including banking or cash or treatment on another project, as determined by the local authority) equivalent to the volume reduction performance goal can be used to protect the receiving water body. Off-site compliance and banking credits shall be achieved through a method that protects the receiving water.

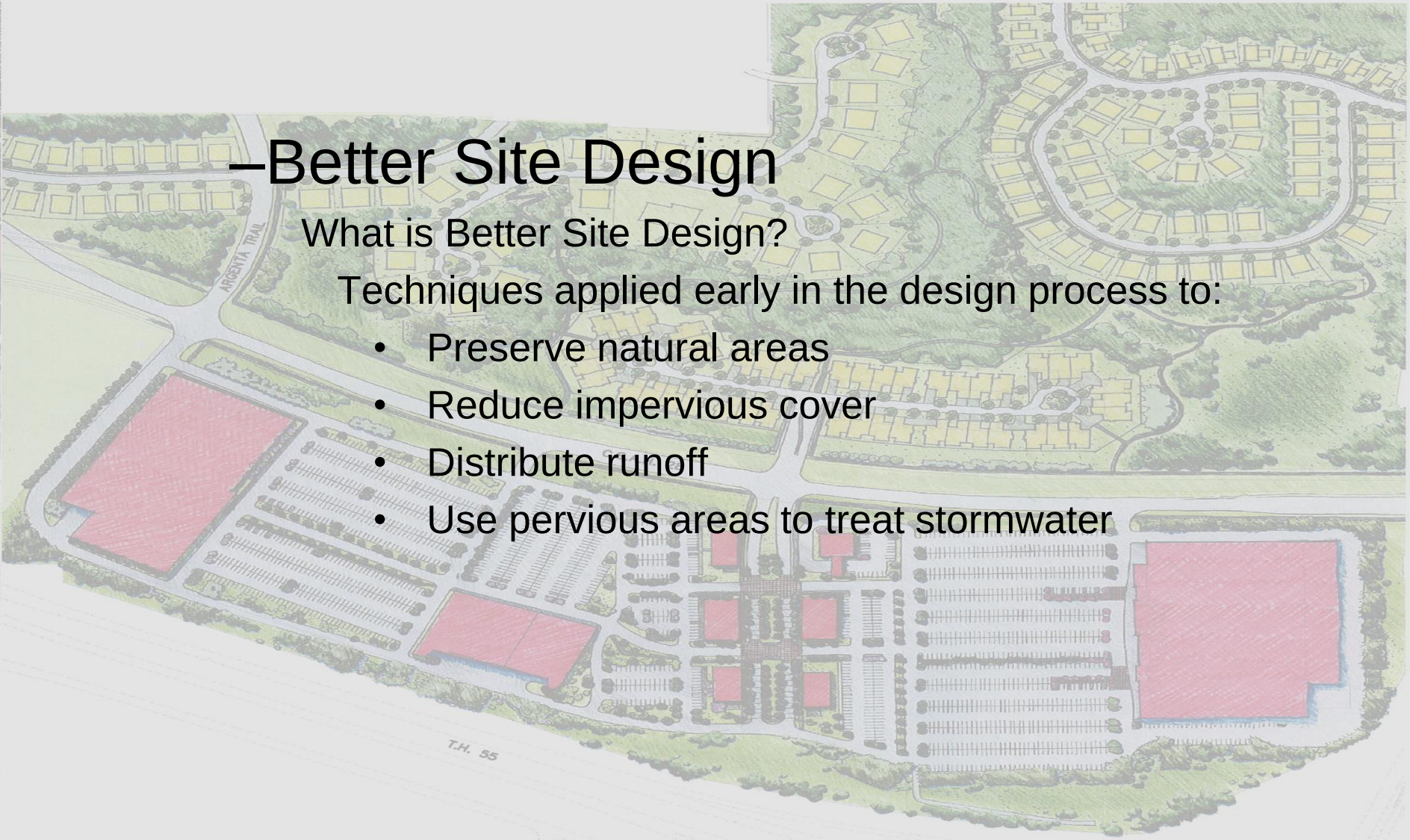
MIDS: Community Assistance Package

Minimal Impact Design Standards
for enhancing stormwater management in Minnesota

Community Assistance Package

April 2014

MIDS: Stormwater & Erosion Ordinance



–Better Site Design

What is Better Site Design?

Techniques applied early in the design process to:

- Preserve natural areas
- Reduce impervious cover
- Distribute runoff
- Use pervious areas to treat stormwater

Clean Water Ordinances

Clean Water Ordinances

- **Hosted 3 Workshops (avg. 15 city officials)**
- **Hosted 1 public meeting**
- **Both cities adopted the ordinance 1 + year**

Deerwood, MN

Summer Place Stormwater Plan

A BIOFILTRATION SWALE

B BIOFILTRATION BASIN

C IRON ENHANCED SAND FILTER BASIN

EXISTING TREES

PROPOSED TREES

PROPOSED SHRUBS

N

SCALE IN FEET

0 30' 60' 120'

SUMMER PLACE
STORMWATER IMPROVEMENTS

Landscape Rendering

BEFORE

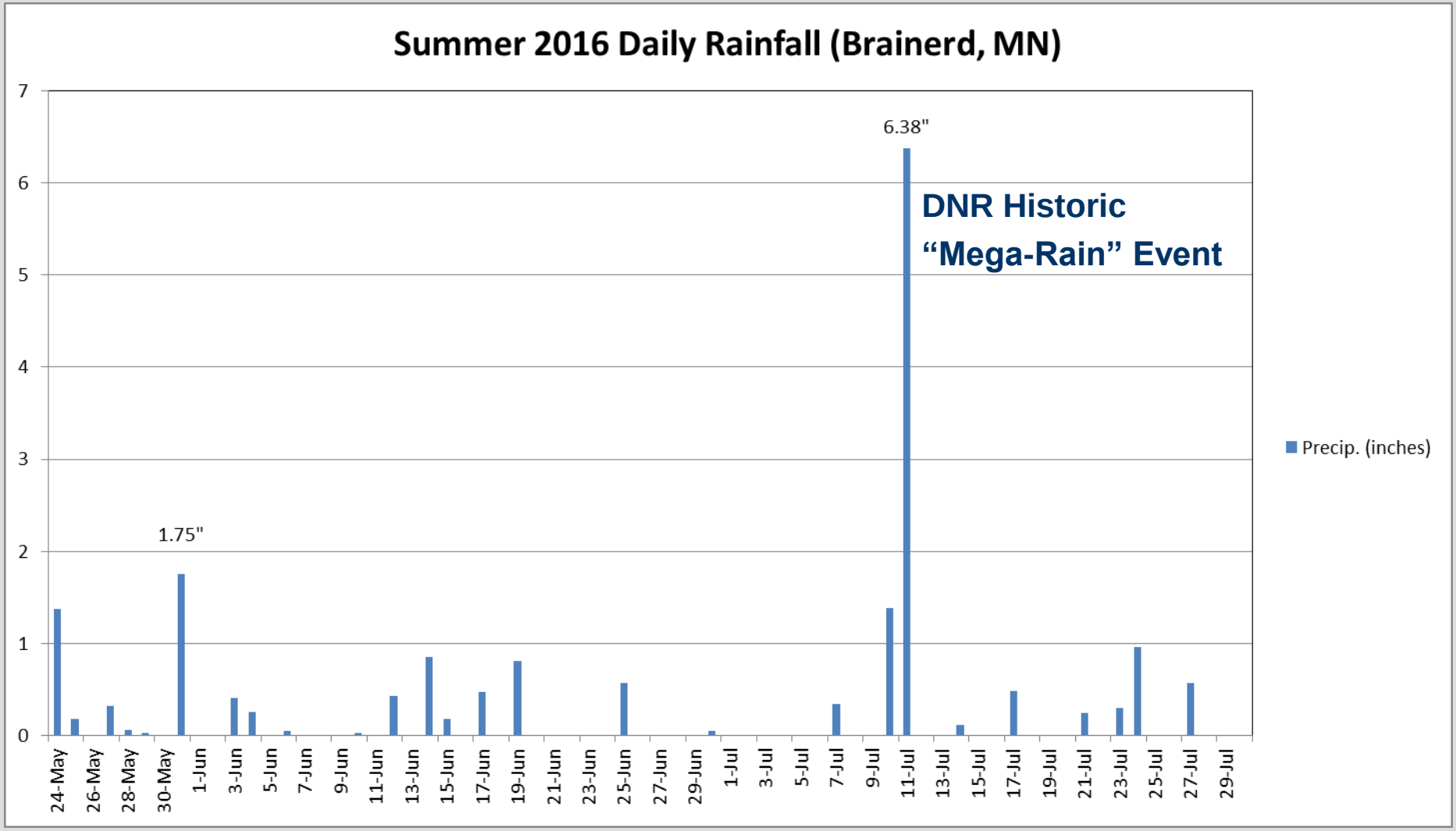
AFTER

Fall 2015: Construction Begins

- Trees cleared and grubbed
- Site is rough-graded and basins are formed
- Site stabilized for winter

May 22, 2016
Placing sand in IESF

A Very Rainy Summer



May 31, 2017: Staking Tree Locations (the rain begins – 1.75”)

June 8, 2016 – Swale stabilized with turf sod and straw logs

June 20, 2016 – after continuous rain June 12-19th

June 25, 2016 – another .57” of rain

June 27, 2016 – the aftermath







July 11, 2016 – the "Mega-Rain" Event (almost 8" of rain in 24 hours)

June 15, 2016: Adding Hard Armor

June 25, 2016: Finally Getting Stabilized

June 22, 2017: A New Season (IESF)

June 22, 2017: Infiltration Basin

July 18, 2017

July 18, 2017

Cranberry Lake Alum Treatment

Cranberry Lake Alum Treatment

Cranberry Lake Alum Treatment

Cranberry Lake Alum Treatment

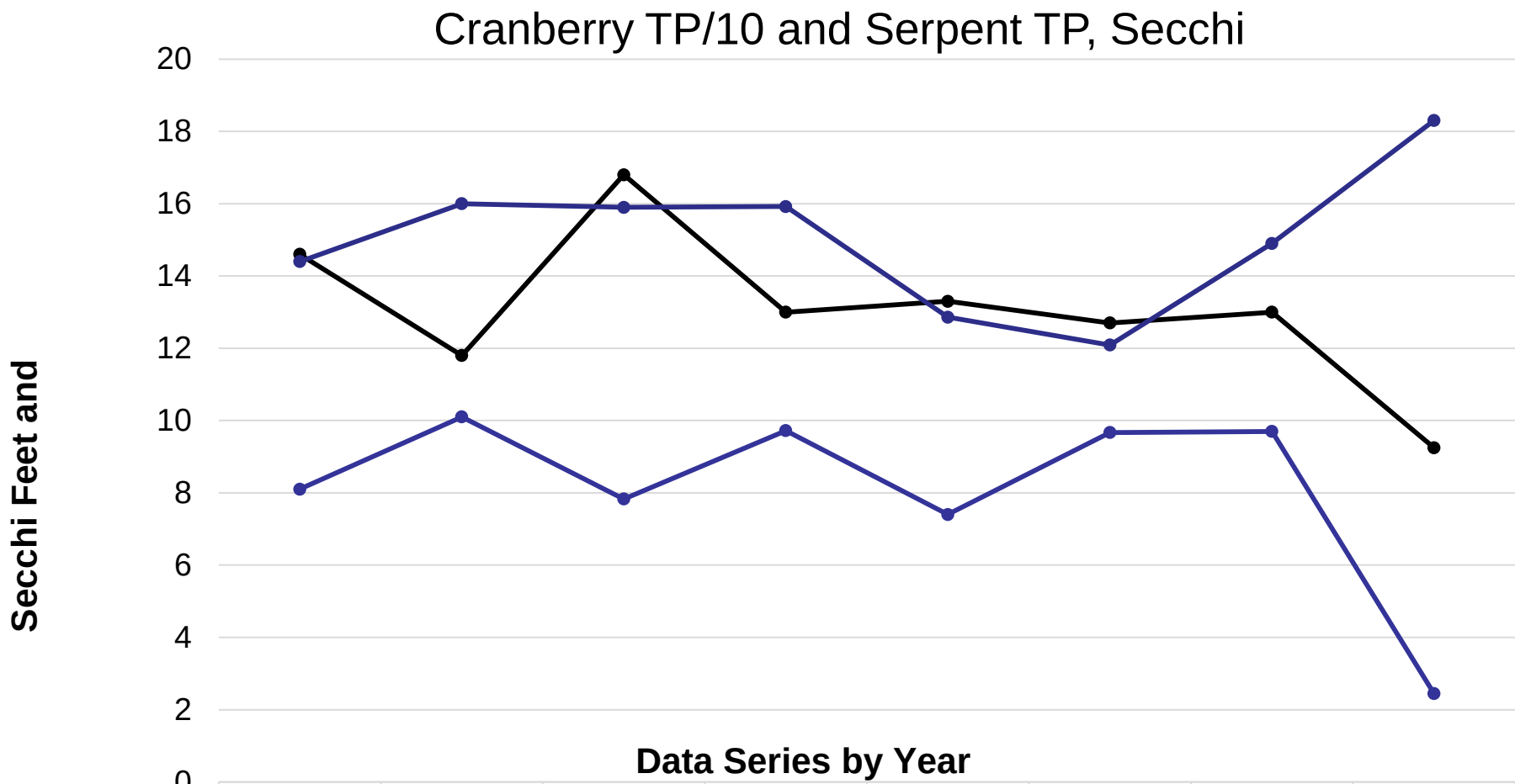
Results:

Before: 155 Total Phosphorus

After: 39 Total Phosphorus

TSI	Chl-a(ug/L)	SD (ft)	TP (ug/L)	Attributes	Fisheries & Recreation
<30	<0.95	>26.2	<6	**Oligotrophy:** Clear water, oxygen throughout the year at the bottom of the lake, very deep cold water.	Trout fisheries dominate
30-40	0.95-2.6	13.1-26.2	6-12	Bottom of shallower lakes may become anoxic (no oxygen).	Trout fisheries in deep lakes only. Walleye, Tullibee present.
40-50	2.6-7.3	6.6-13.1	12-24	**Mesotrophy:** Water moderately clear most of the summer. May be "greener" in late summer.	No oxygen at the bottom of the lake results in loss of trout. Walleye may predominate.
50-60	7.3-20	3.3-6.6	24-48	**Eutrophy:** Algae and aquatic plant problems possible. "Green" water most of the year.	Warm-water fisheries only. Bass may dominate.
60-70	20-56	1.6-3.3	48-96	Blue-green algae dominate, algal scums and aquatic plant problems.	Dense algae and aquatic plants. Low water clarity may discourage swimming and boating.
70-80	56-155	0.8-1.6	96-192	**Hypereutrophy:** (light limited productivity). Dense algae and macrophytes.	Water is not suitable for recreation.
>80	>155	<0.8	192-384	Algal scums, few aquatic plants	Rough fish (carp) dominate; summer fish kills p

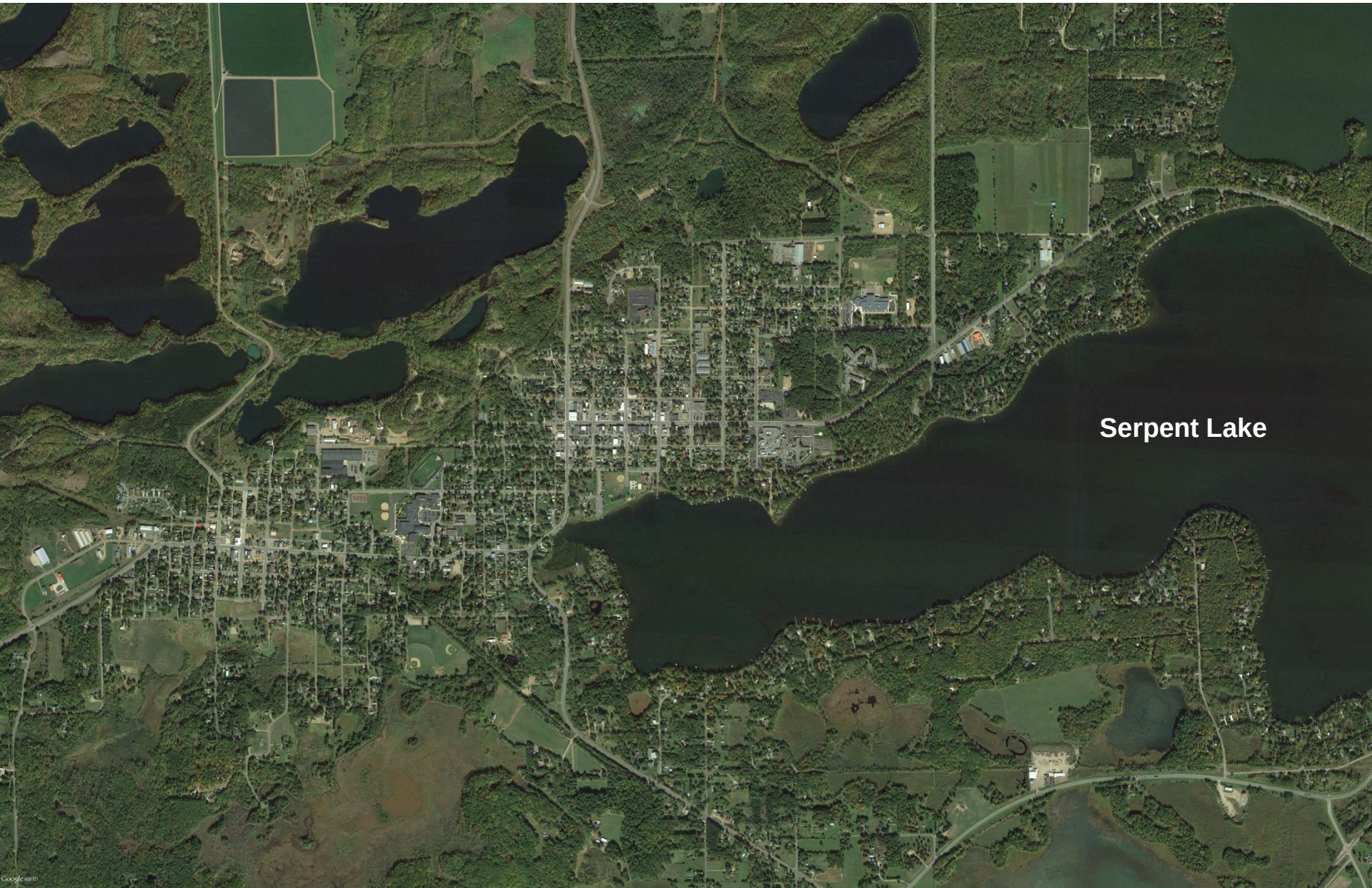
Water Quality Results



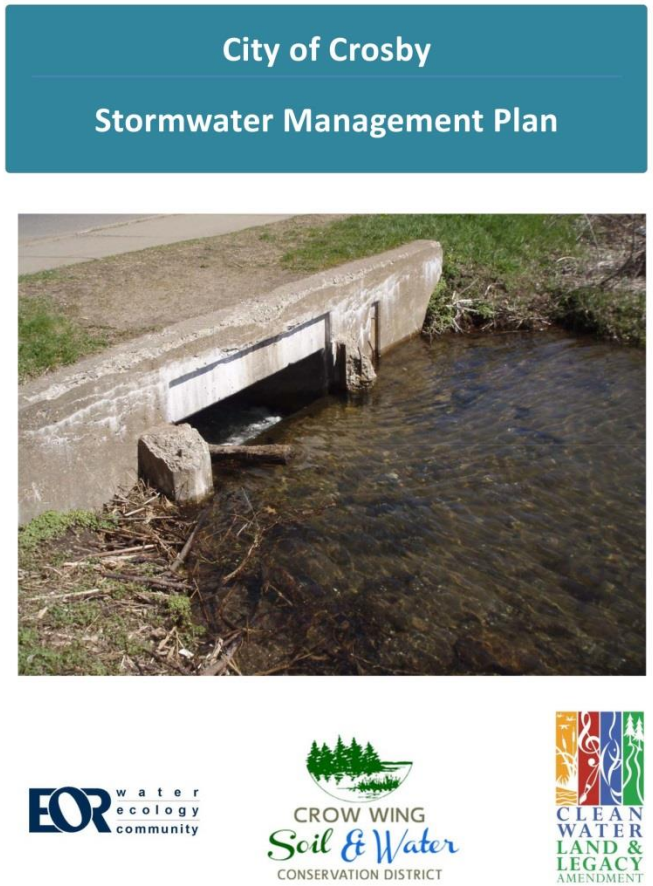
Data Series by Year

	2004	2005	2006	2010	2011	2012	2016	2017
Cranberry TP/10	8.1	10.1	7.83	9.72	7.4	9.67	9.7	2.45
Serpent TP	14.6	11.8	16.8	13	13.3	12.7	13	9.25
"Serpent Secchi'	14.4	16	15.9	15.92	12.86	12.09	14.9	18.3

Crosby, MN

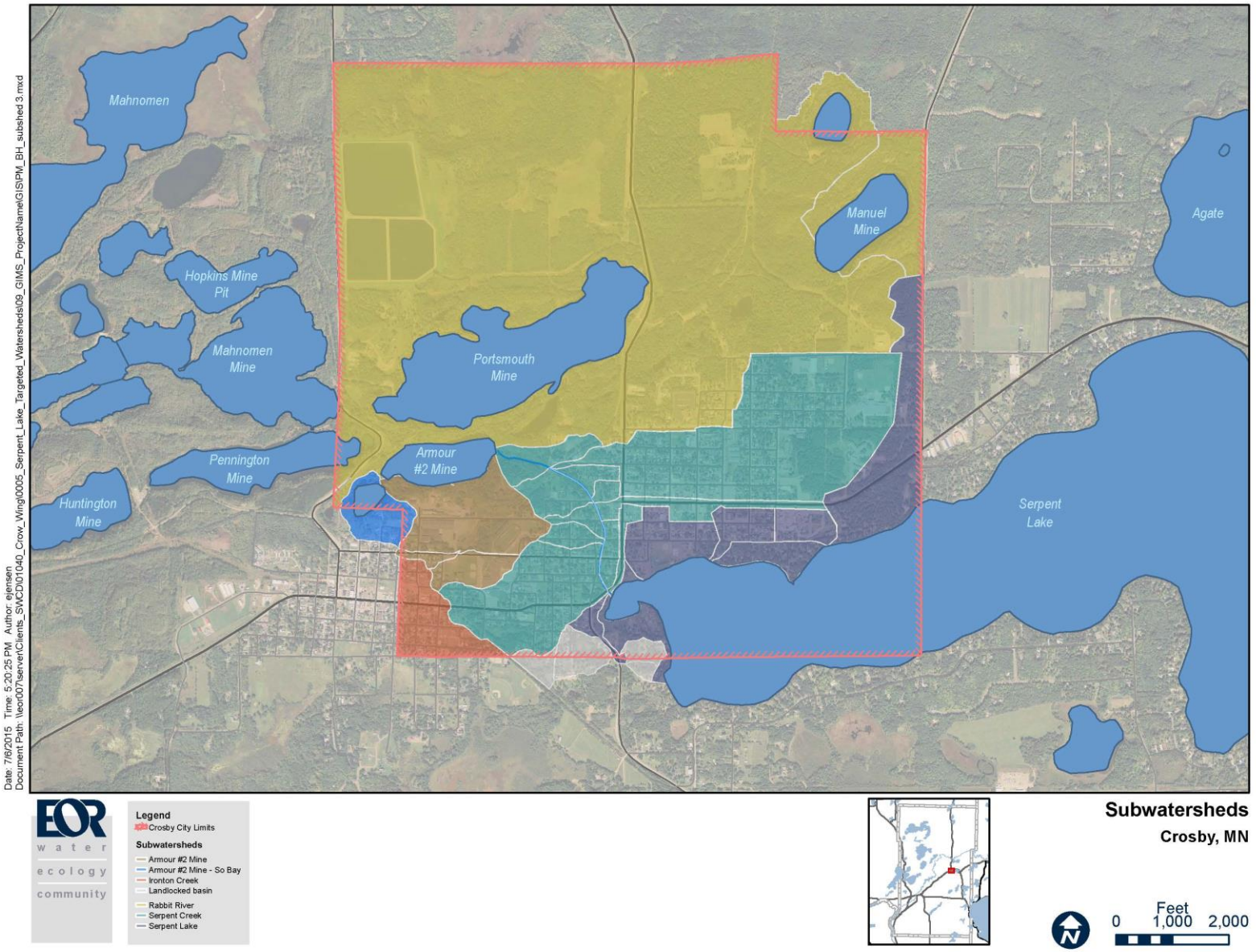


Crosby Stormwater Management Plan

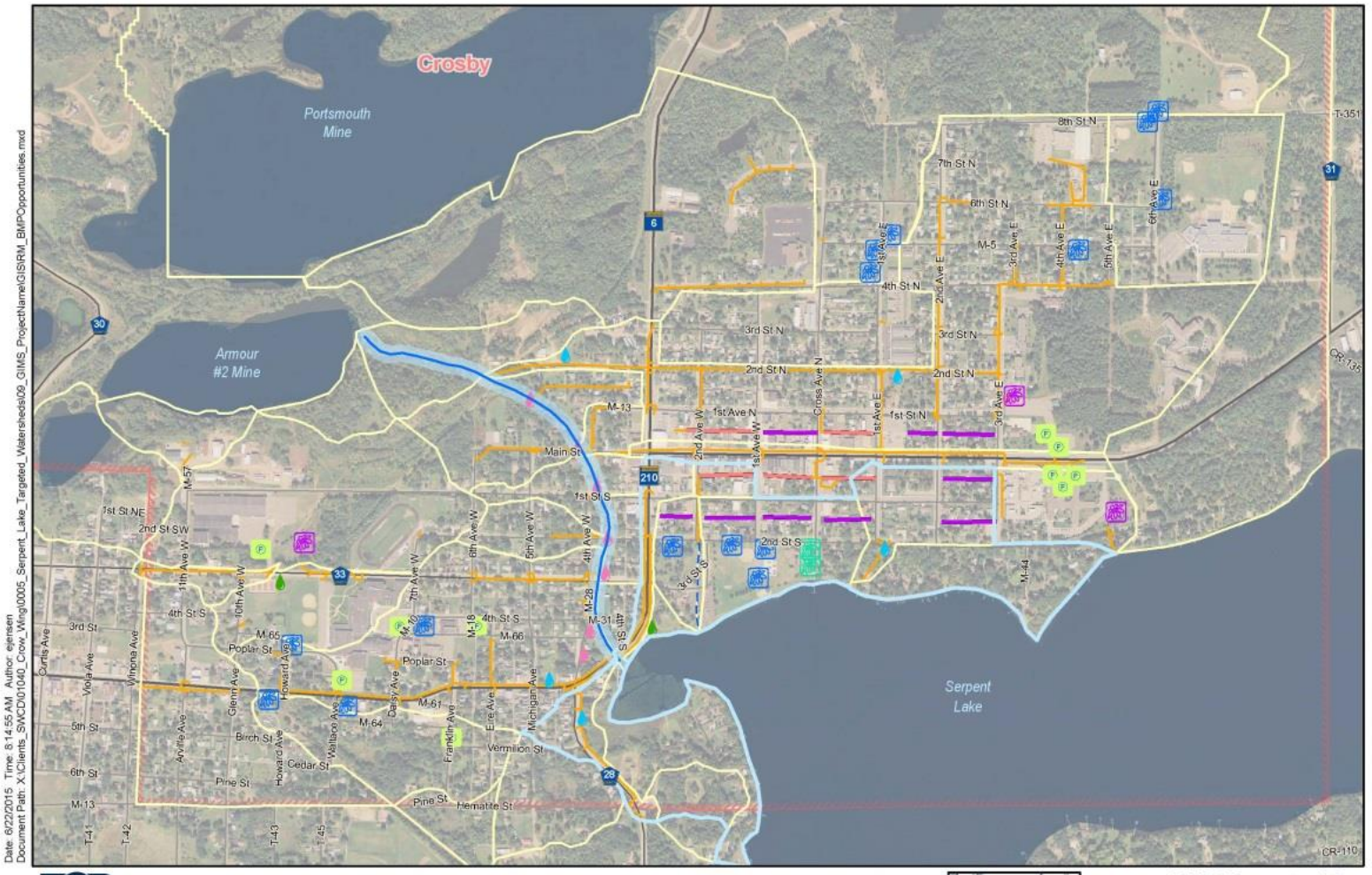


- Fall 2015
- Crow Wing SWCD works with EOR to develop a stormwater management plan for the City of Crosby
- EOR analyzes Crosby subwatersheds and identifies sites for possible BMPs

Analysis of Subwatersheds



Identification of Possible BMPs



Focus on Memorial Park

Focus on Memorial Park

CROSBY MEMORIAL PARK STORMWATER IMPROVEMENTS - CONCEPT PLAN | APRIL 2016

BMP Visioning- Spring 2016

BEFORE: boulevard by baseball diamond at Memorial Park

CONCEPT: roadside rain garden and permeable paver parking strip

BMP Visioning- Spring 2016

BEFORE: boulevard by baseball diamond at Memorial Park

CONCEPT: roadside rain garden with curb cuts from street

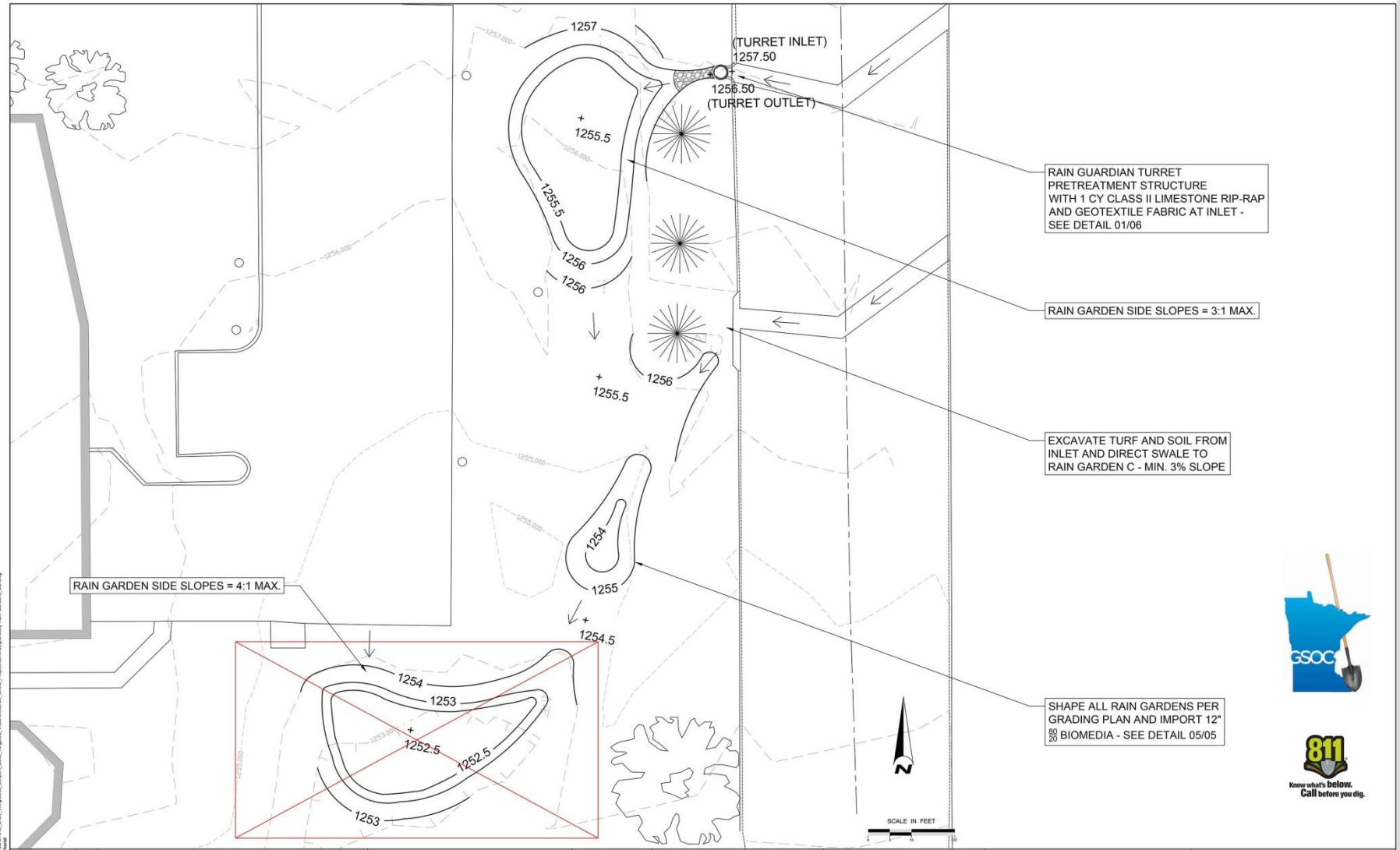
BMP Visioning- Spring 2016

BEFORE: Memorial Park north of skating area

CONCEPT: rain garden with curb inlet and limestone wall

Existing Rain Gardens - Before

Rain Garden Improvements – Fall 2016



NO	DATE	BY	REVISION
6			
5			
4			
3			
2	09/01/16	BH	100% CD SET
1	08/15/16	BH	90% REVIEW PLAN SET

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL LANDSCAPE ARCHITECT UNDER THE LAWS OF THE STATE OF MINNESOTA.

BRITTA M. HANSEN
DATE: 09/01/2016 LICENSE # 53307

SUBMISSION DATE: 09/01/2016
DESIGN BY BMH DRAWN BY BMH
EOR PROJECT NO. 01040-0005

Emmons & Olivier Resources, Inc.
651 Hale Avenue North
Oakdale, MN 55128
Tele: 651.770.8448
www.eorinc.com

CROW WING SWCD
322 LAUREL STREET
BRAINERD, MN 56401

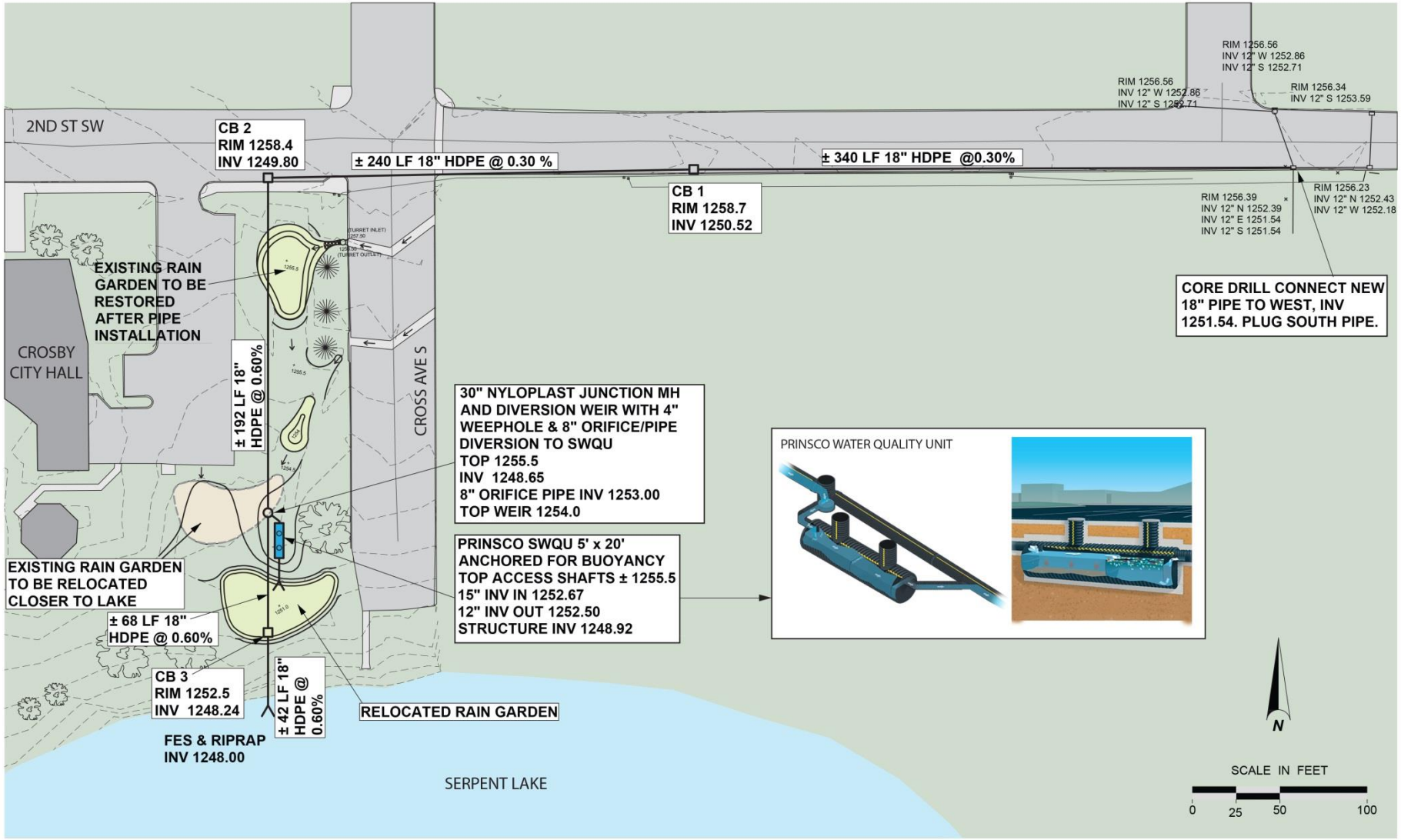
CROSBY RAIN GARDENS
CROSBY, CROW WING COUNTY, MINNESOTA
STATE PROJECT NO. CITY PROJECT NO.

GRADING PLAN
SHEET 03 OF 06 SHEETS

Existing Rain Gardens – Post Renovation

Rain Guardian Turret

“Ferrari” Plan – Spring 2017



FERRARI PIPE REROUTE CONCEPT PLAN

MARCH 2017

Construction Begins – Fall 2017

Dewatering

Early Snow – November 1, 2017

To be continued…

Spring 2018

People 1st and Storm Water 2nd

MPCA 2016 Project of the Year

City of Deerwood and Summer Place Association

Bob Albrecht's Legacy Lives on

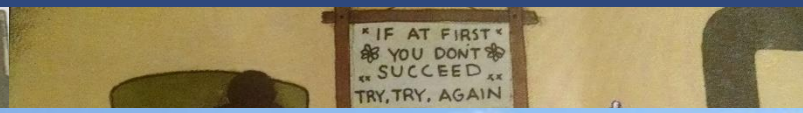
Robert Albrecht- "Do the right thing because it is right thing to do"

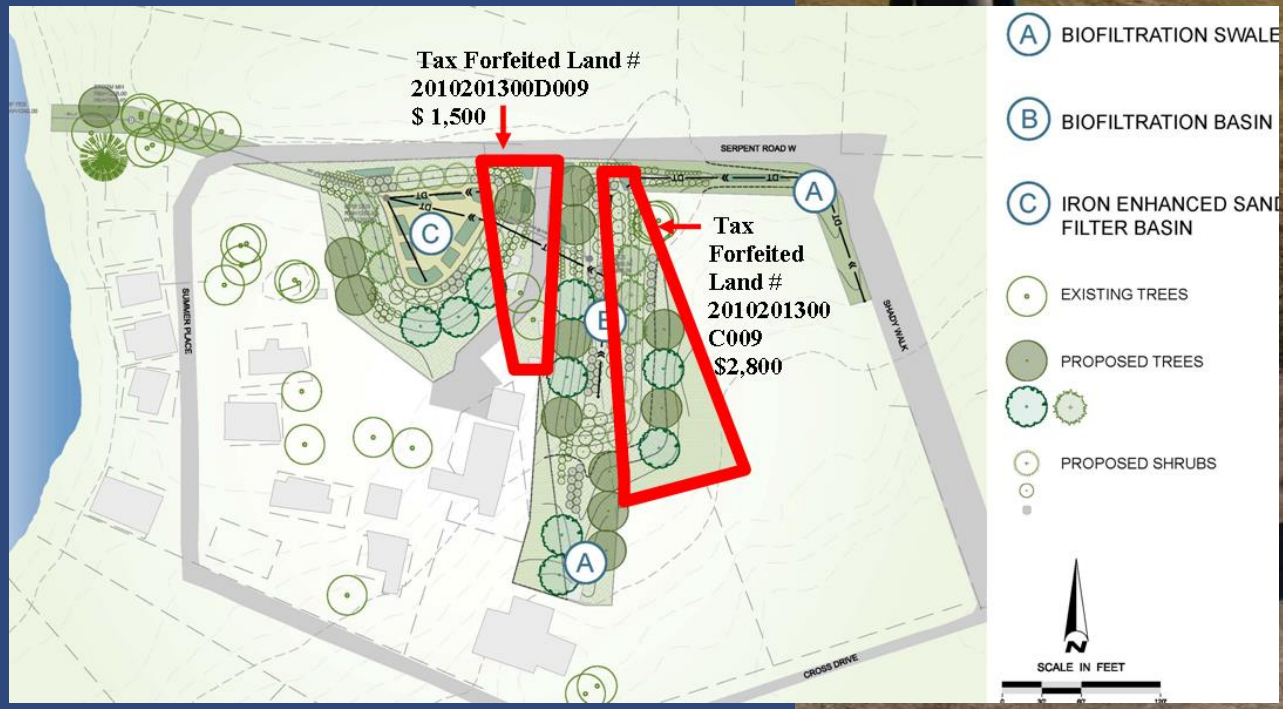
Trees are Important

Over Communicate and Deal with Conflict

LGUs Do Care About WQ

Try and Try Again





“Just as ripples spread out when a single pebble is dropped into water, the actions of individuals can have far-reaching effects.” Dalai Lama

“An ounce of prevention is worth a pound of cure”-Benjamin Franklin

Thank You !!!!

- Serpent Lake Association
- Hallet Charitable Trust
- Darkhouse Association
- City of Crosby
- City of Deerwood
- Irondale Township
- Summer Place Association
- Crow Wing SWCD Board and Staff
- Britta Hansen, EOR
- Robert Albrecht Mem