Silver Lake: Plant Management Challenges

February 2, 2015

SLIA Annual Meeting

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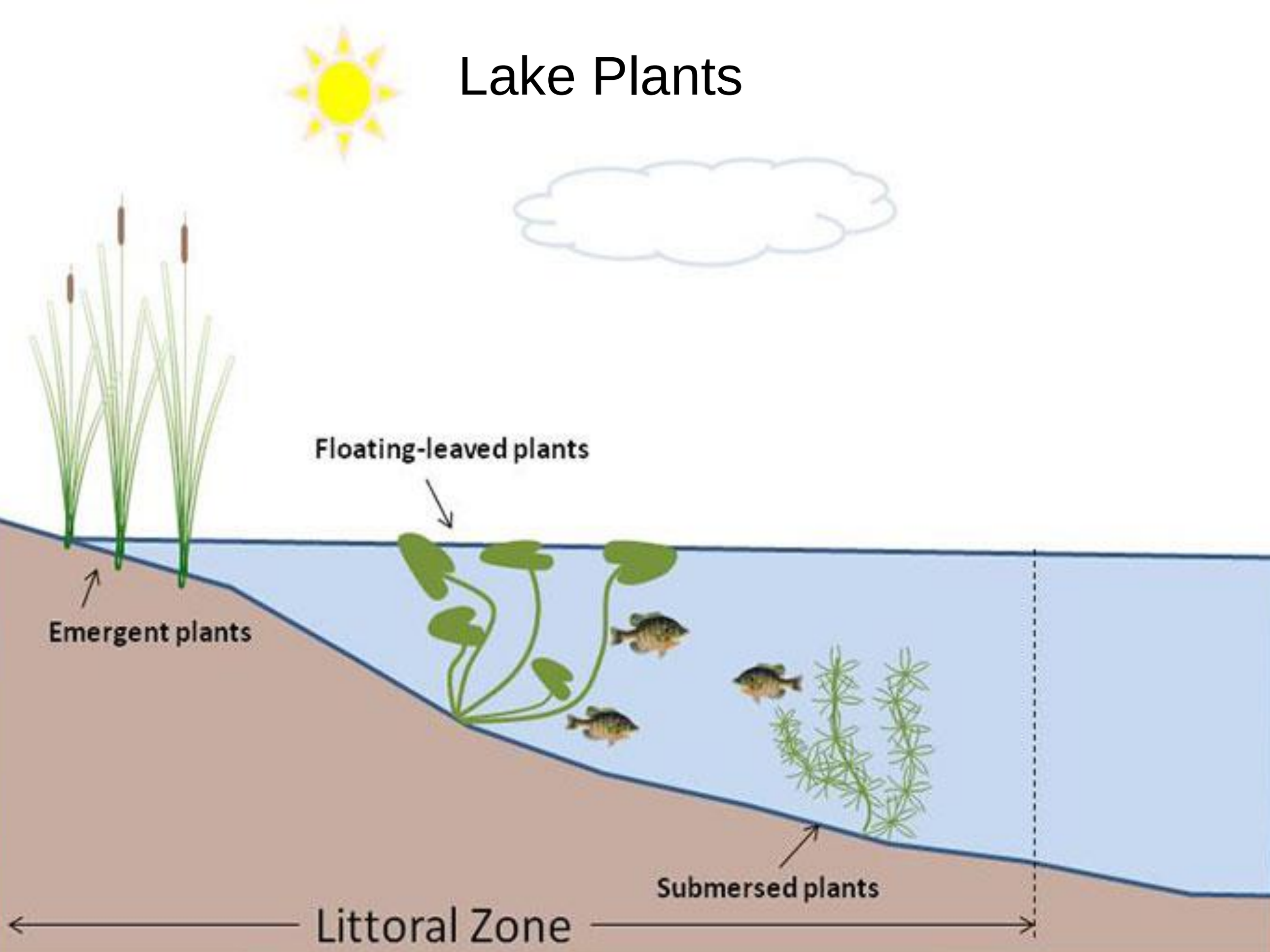
Barr Engineering Company
Representing VBWD

Presentation Summary

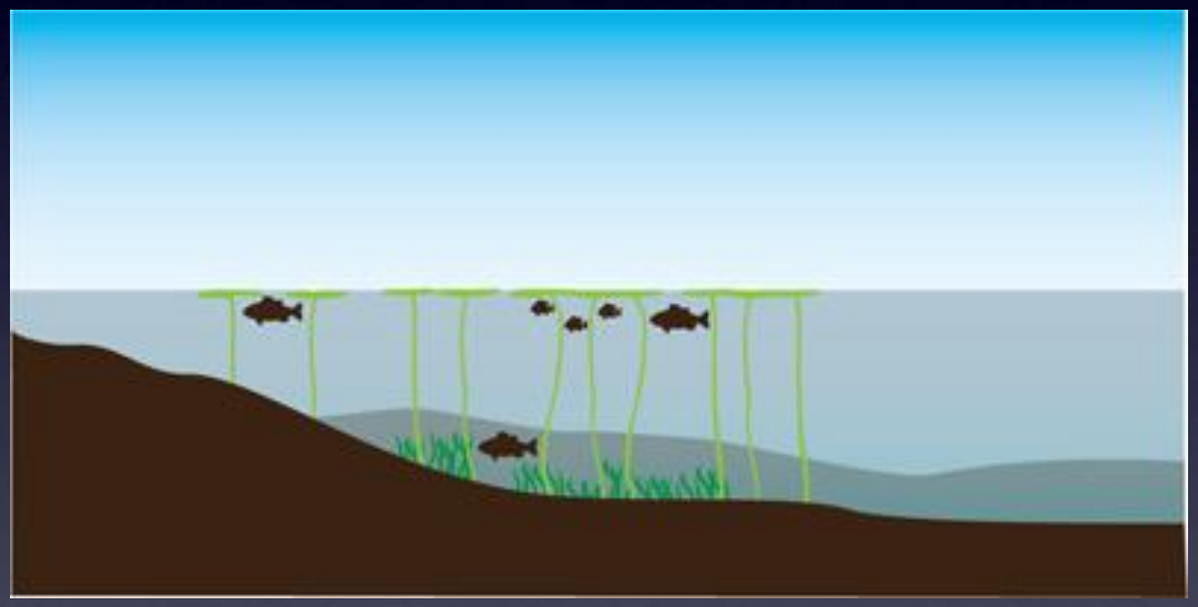
- Lake Plants
- Native Aquatic Plants – The Good
- Invasive Aquatic Plants – The Bad
- Historic and Current Conditions of Silver Lake
- Another Lake's Experience: Kohlman Lake
- VBWD Watershed Restoration and Protection Strategies (WRAPS) Study
- Potential Next Steps for SLIA

Lake Plants


Floating-leaved plants
Emergent plants
Submersed plants
Littoral Zone

Benefits of Native Aquatic Plants

Food



Shade, Shelter and Spawning Sites

Benefits of Native Aquatic Plants

Shelter

Oxygen

Benefits of Native Aquatic Plants

Prevent Erosion

Aesthetics

Invasive Plants

Eurasian Watermilfoil
Long Lake

Curly-leaf Pondweed
Eagle Point Lake

Problems Caused by Invasive Species

- Nuisance to people – anglers, swimmers, boaters
- Reduces predator effectiveness
- Displacement of native species
- Add nutrients which can cause algal blooms

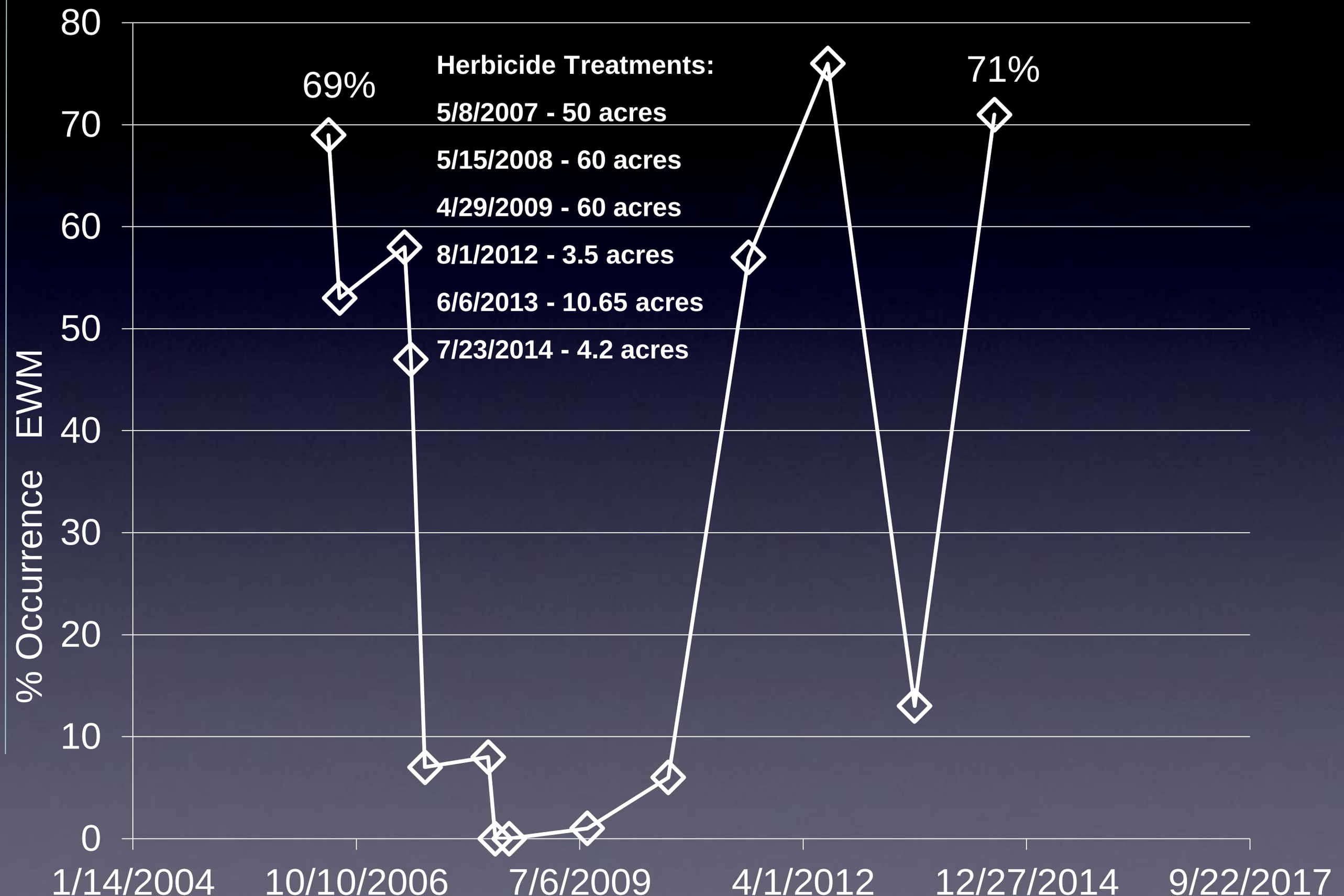
Eurasian Watermilfoil (EWM)
Long Lake

Silver Lake Invasive Aquatic Plants

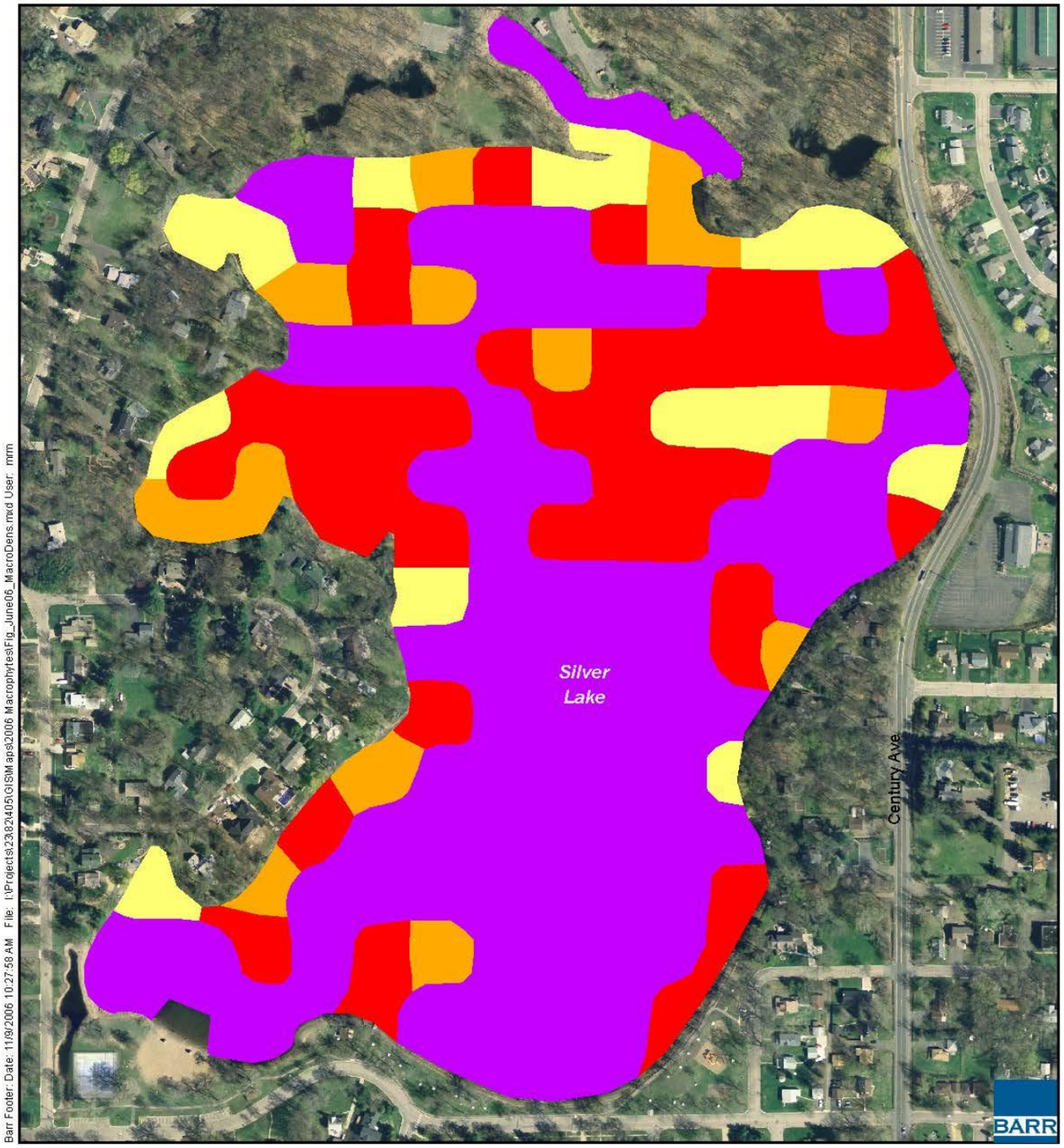
EWM is present (frequency of 71% in 2014);
Treatments 2007, 2008, 2012, 2013 and 2014

Curly-leaf Pondweed (CLP) is present (frequency of 44% in August 2014)
Treatments 2007, 2008, 2009, 2013

2006-2014 Eurasian Watermilfoil Frequency of Occurrence in Silver Lake (Within Maximum Rooted Vegetation Range)



2006 Silver Lake: Aquatic plants found throughout lake



Barr Footer: Date: 11/9/2006 10:27:58 AM File: I:\Projects\23\82405\GIS\MApS\2006 MacrophytesFig_June06_MacroDens.mxd User: mrm

Legend

Macrophyte Density (Single Rake Toss)

- 1 or 10% - 29% = 7.6 acres
- 2 or 30% - 54% = 6.7 acres
- 3 or 55% - 69% = 20.5 acres
- 4 or 70% - 100% = 40.5 acres

N

1:4,000

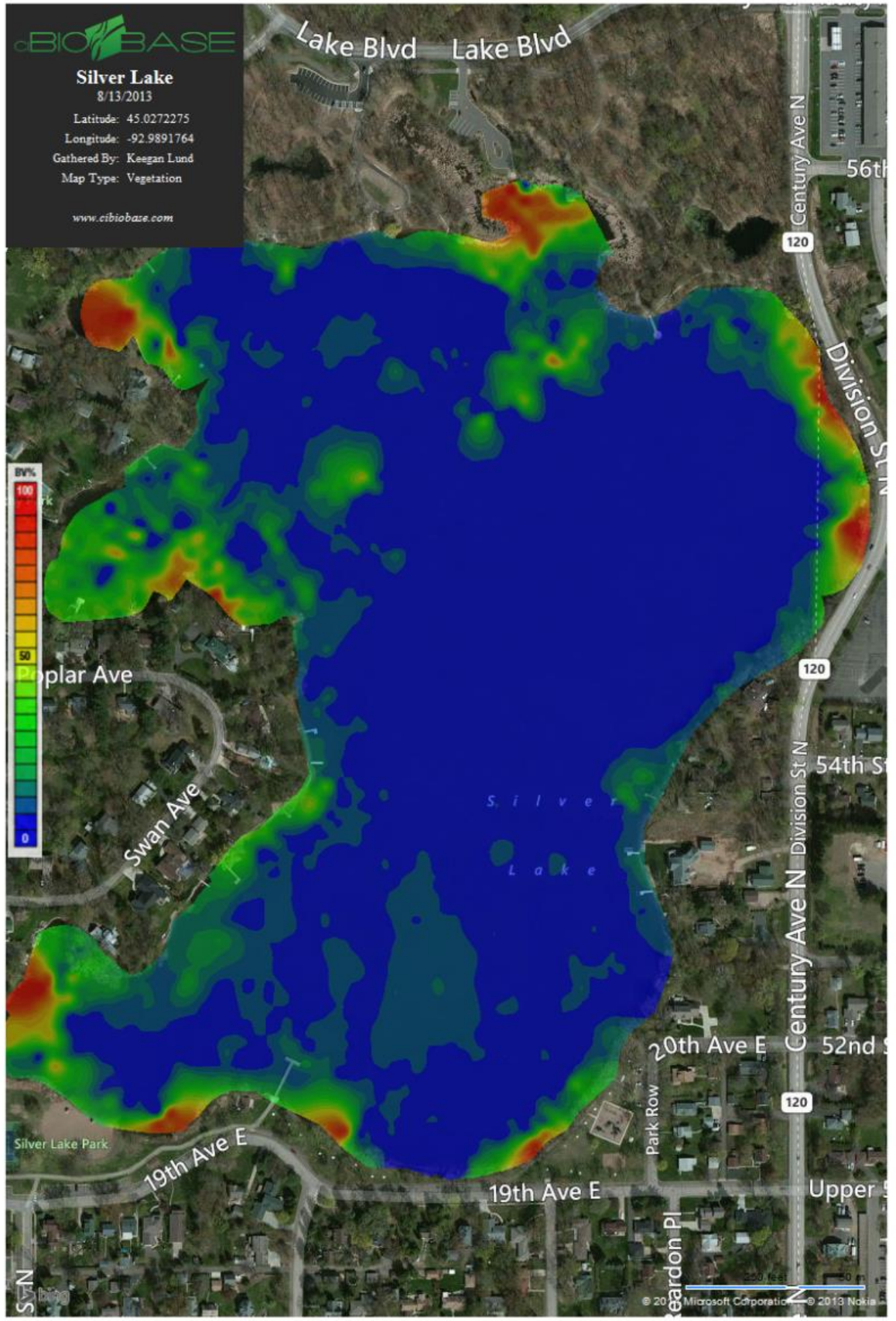
Meters: 100 0 100

Feet: 200 0 200 400

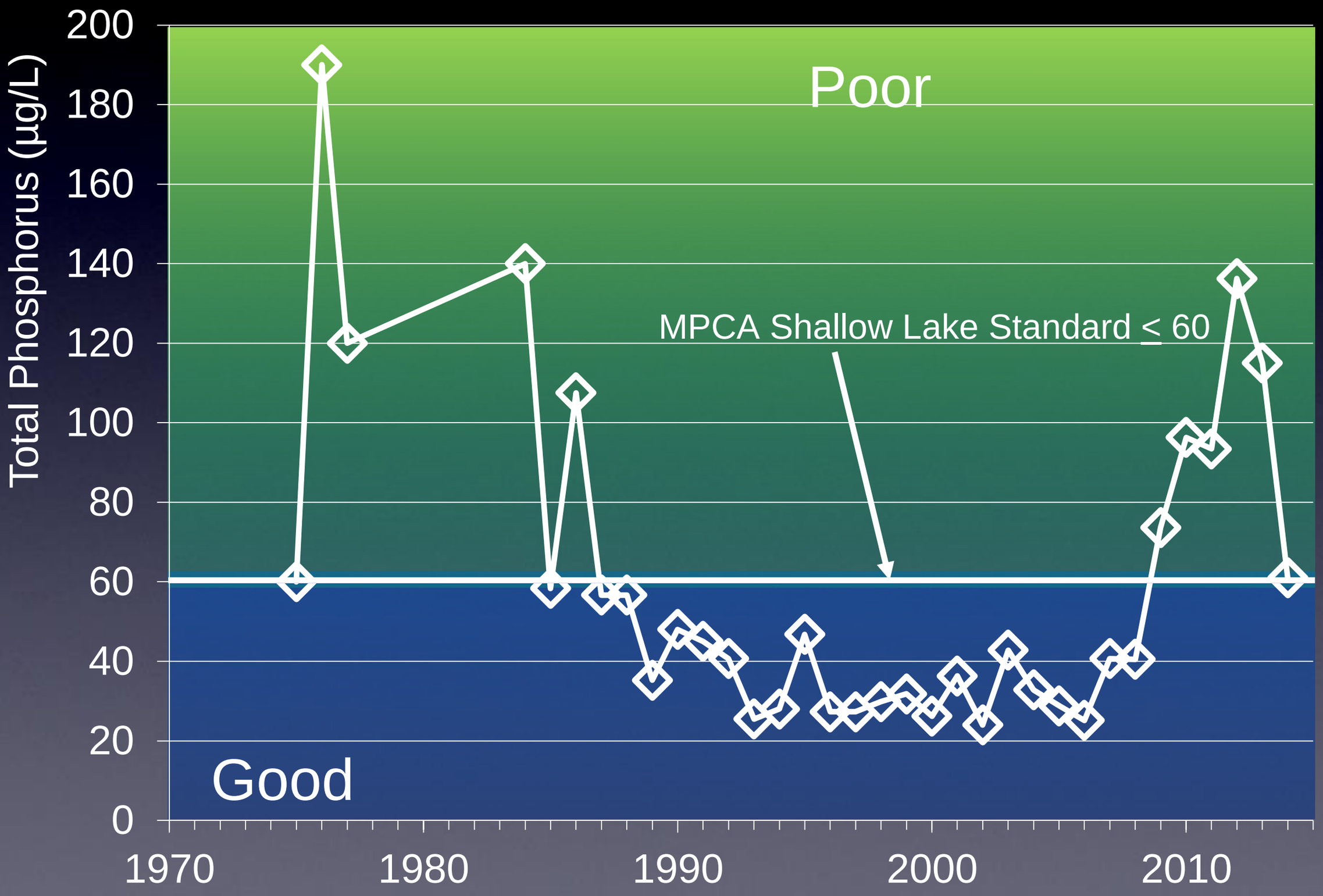
DRAFT Figure 1

MACROPHYTE DENSITY AREAS
Silver Lake - June 7, 2006
Valley Branch Watershed District
North St. Paul, MN

2013 Silver Lake: Areas in blue represent no aquatic vegetation



1975-2014 Silver Lake Total Phosphorus
Summer 0-2 Meter Averages



1975-2014 Silver Lake Chlorophyll *a* Summer 0-2 Meter Averages

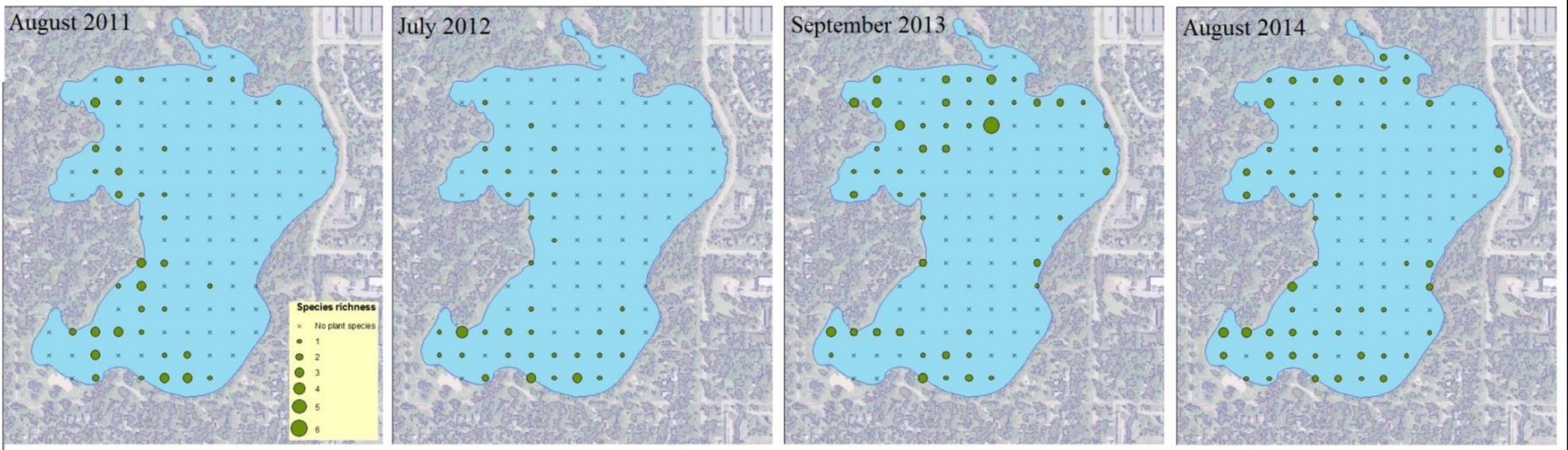
1975-2014 Silver Lake Secchi Disc Transparency Summer Averages

Silver Lake Plant Statistics

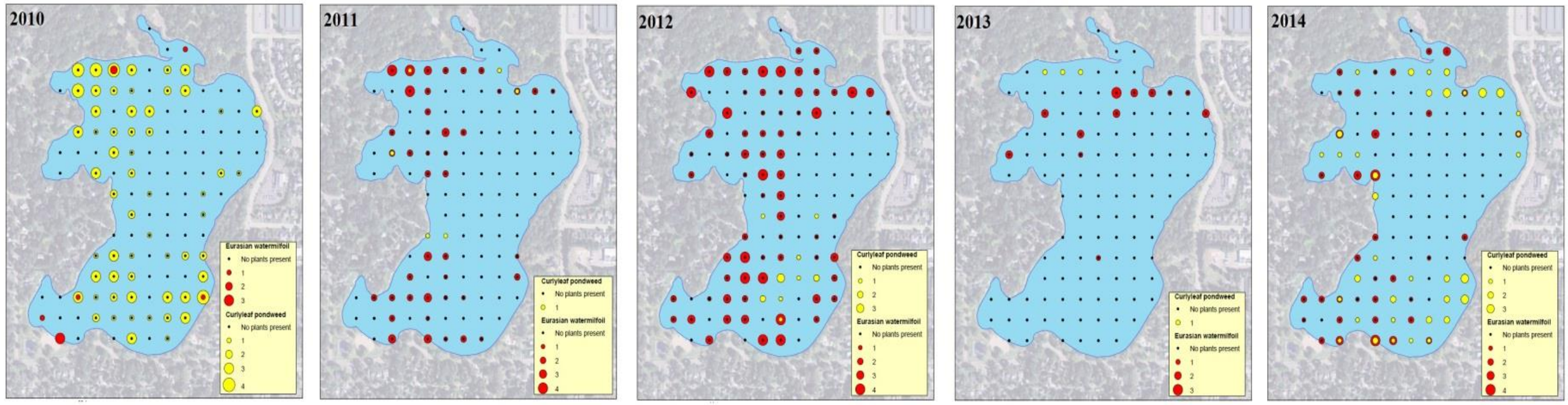
Year	Herbicide Treatment	Max Depth of Submerged Plants (ft)	% of Points with Submerged Plants	% of Points with Native Submerged Plants	Average # of Native Submerged Taxa Per Point
2006	No	19-20	98-100	97-99	2.1-2.4
2007	Yes-Full	17-20	96-97	85-95	1.7-1.8
2008	Yes-Full	7-20	95	27	0.4-1.5
2009	Yes-Partial	7-11	N/A	52	0.4-1.0
2010	No	11	86	63	0.9
2011	No	12	70	45	0.8
2012	Yes-Partial	13	91	36	0.5
2013	Yes-Partial	12	55	51	0.9
2014	Yes-Partial	10	83	66	1.0

Silver Lake Plant Statistics

Mean number of native submersed plant species 2011-2014, Silver Lake (DOW# 62000100)



Invasive species abundance and distribution 2010-2014, Silver Lake (DOW# 62000100)



Silver Lake

Frequency of Occurrence of EWM (% of Sample Points Shallower than Maximum Depth of Plant Growth)

70
60
50
40
30
20
10
0

Whole Lake Herbicide Treatment

Partial Lake Herbicide Treatment

Partial Lake Herbicide Treatment

6/12/2001
8/16/2001
6/26/2002
8/26/2002
6/6/2003
8/25/2003
8/24/2004
6/13/2006
9/9/2006
4/22/2008
6/12/2008
8/18/2008
4/18/2009
6/8/2009
8/11/2009
3/31/2010
6/15/2010
8/25/2010
4/25/2011
6/7/2011
8/25/2011
3/21/2012
6/21/2012
8/28/2012
5/24/2013
6/27/2013
9/4/2013

Kohlman Lake

Whole Lake Herbicide Treatment

Whole Lake Herbicide Treatment

Partial Lake Herbicide Treatment

Partial Lake Herbicide Treatment

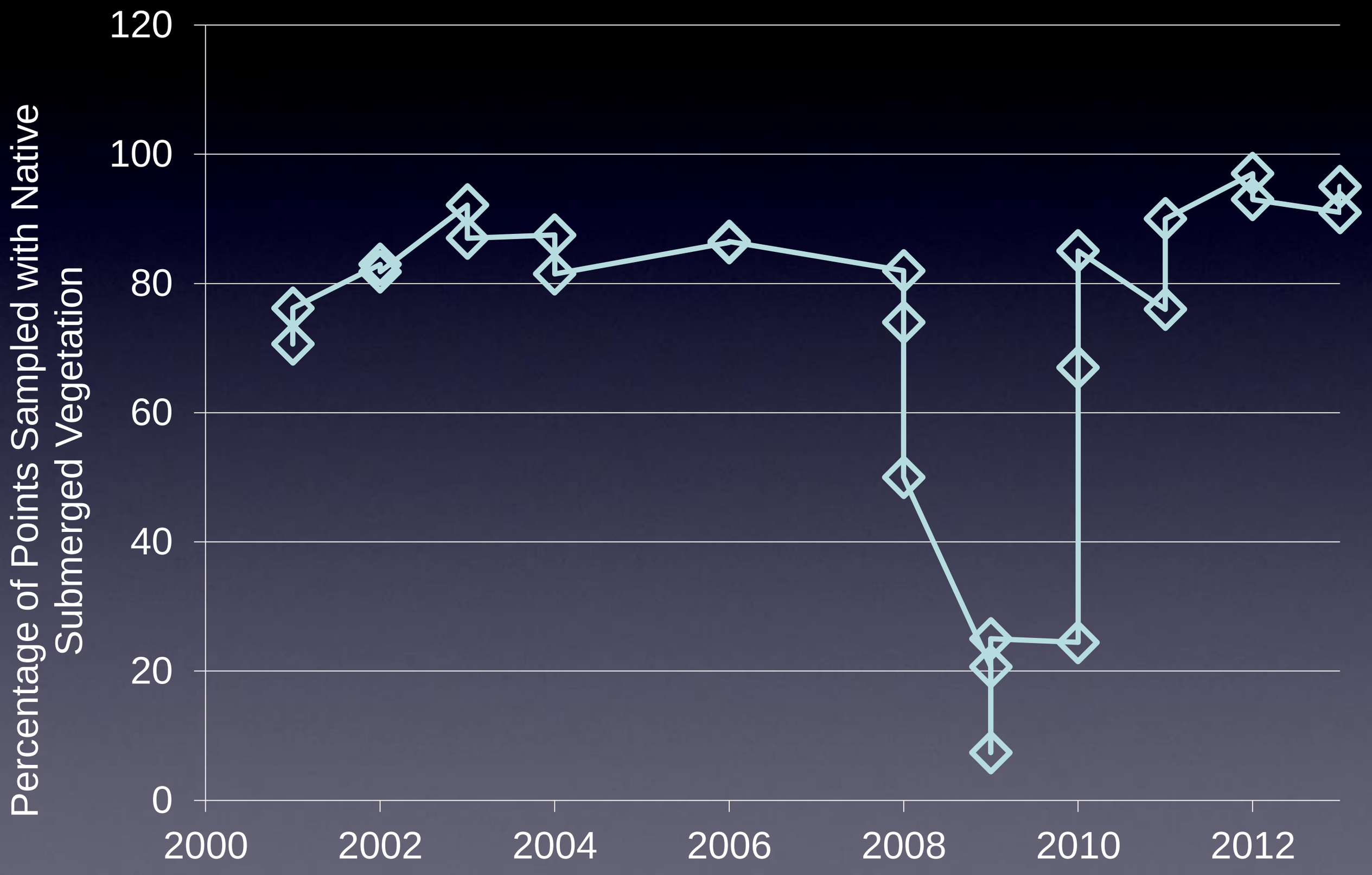
Partial Lake Herbicide Treatment

Frequency of Occurrence of CLP (% of Sample Points Shallower than Maximum Depth of Plant Growth)

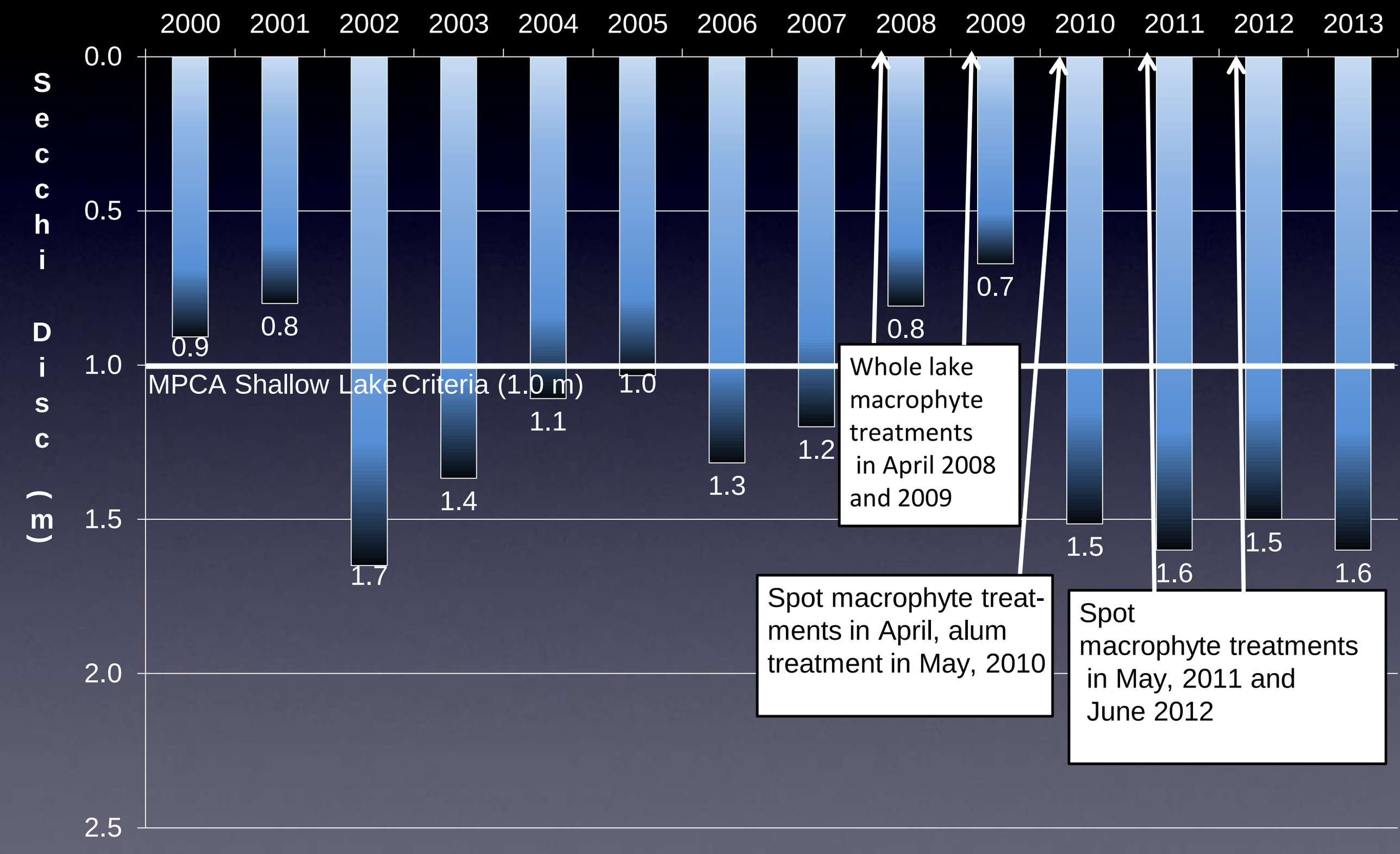
80
70
60
50
40
30
20
10
0

6/12/2001
6/26/2002
6/6/2003
6/13/2006
4/22/2008
6/12/2008
4/18/2009
6/8/2009
3/31/2010
6/15/2010
4/25/2011
6/7/2011
3/21/2012
6/21/2012
5/24/2013
6/27/2013

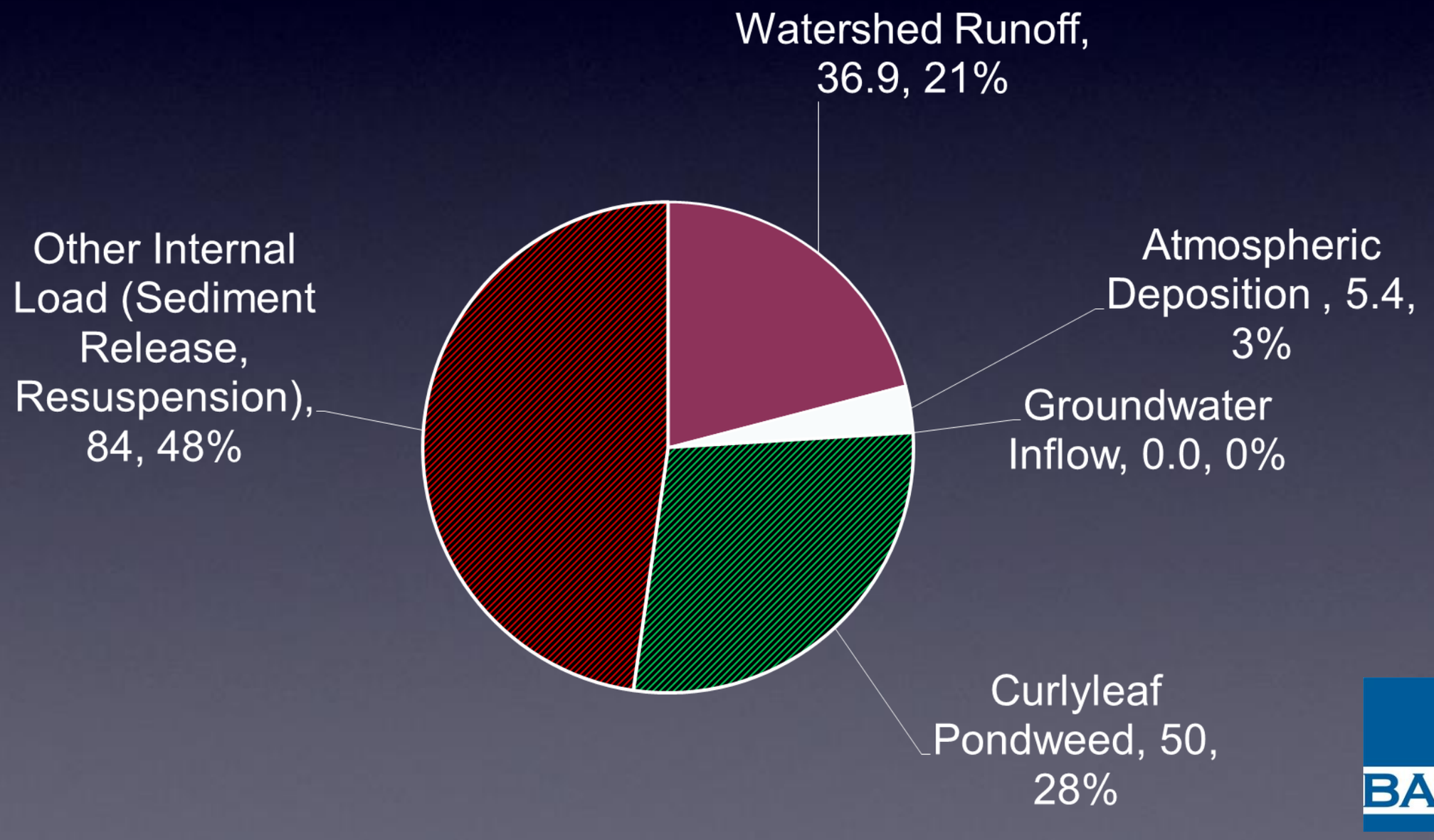
2001-2013 Kohlman Lake Frequency of Occurence of Native Submerged Species (Shallower than Max Depth)



Kohlman Lake Growing Season (June through September)
Average Secchi Disc Transparency Measurements
Years 2000-2013



Valley Branch Watershed District
Silver Lake Watershed Restoration and Protection Strategies (WRAPS) Study



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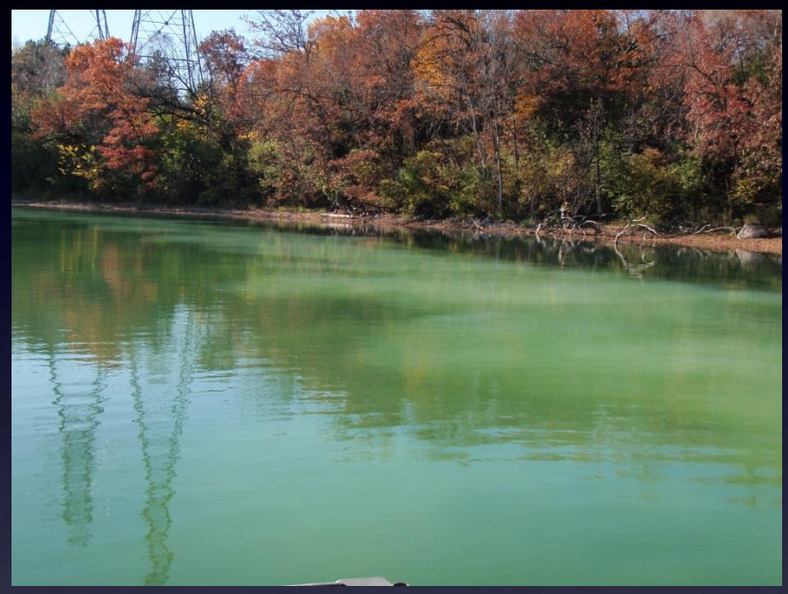
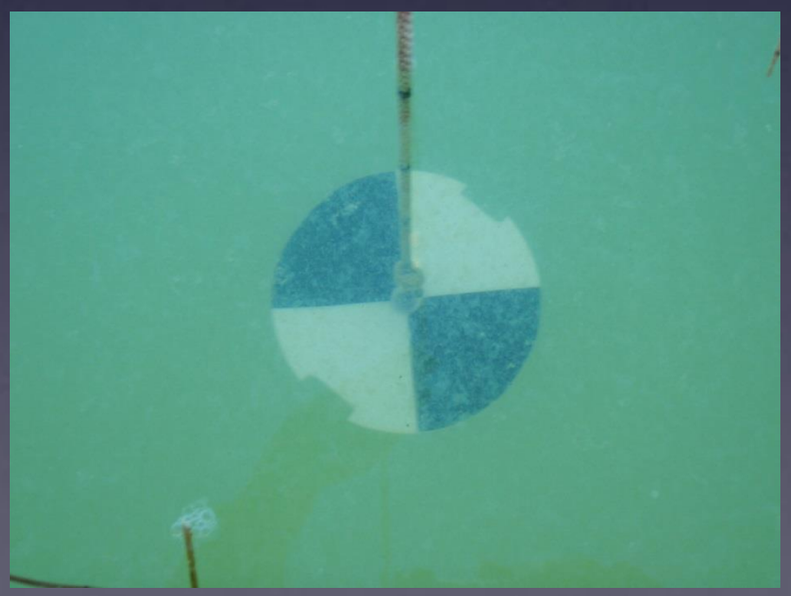
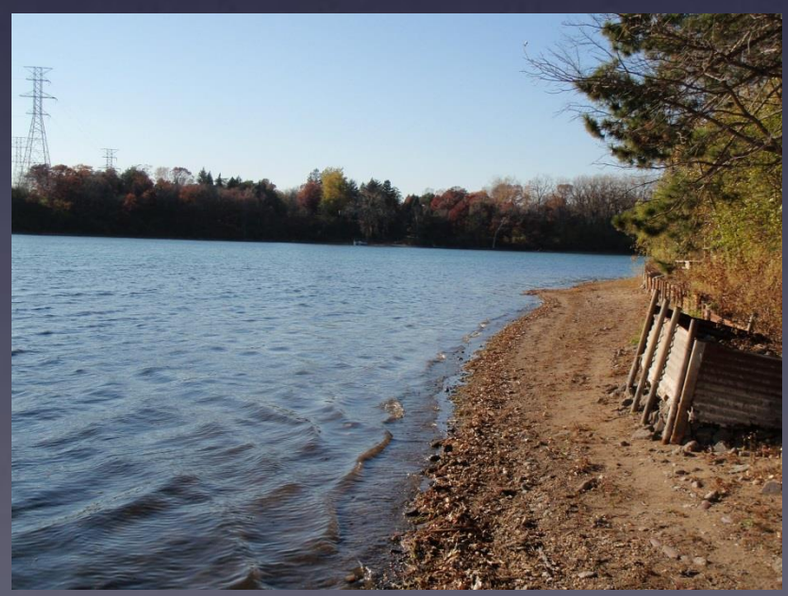
Valley Branch Watershed District Silver Lake Watershed Restoration and Protection Strategies (WRAPS) Study

- Alum Treatment
  - Reduce internal loading from sediments
  - Improved clarity may promote aquatic plant growth
  - Constant disturbance of bottom sediments (lack of aquatic plants and boat activity) might reduce longevity of treatment

Valley Branch Watershed District
Silver Lake Watershed Restoration and Protection Strategies (WRAPS) Study







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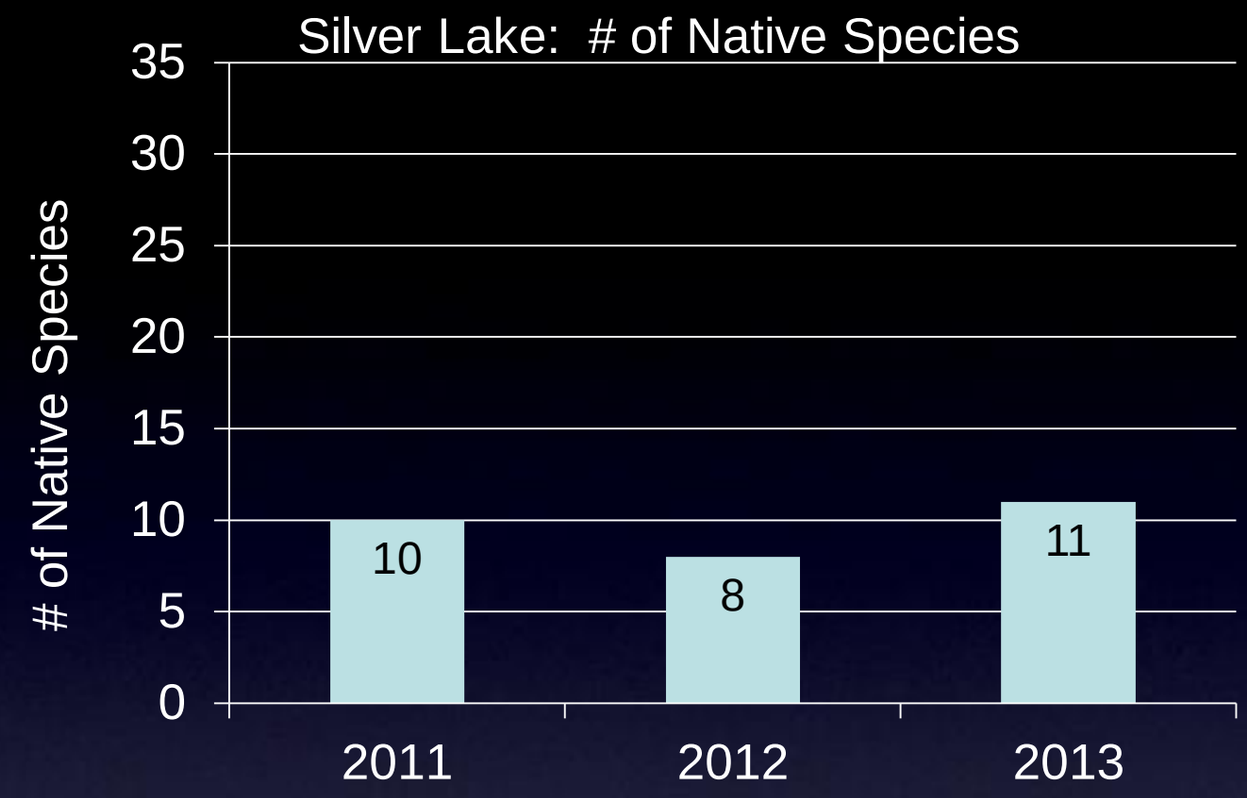
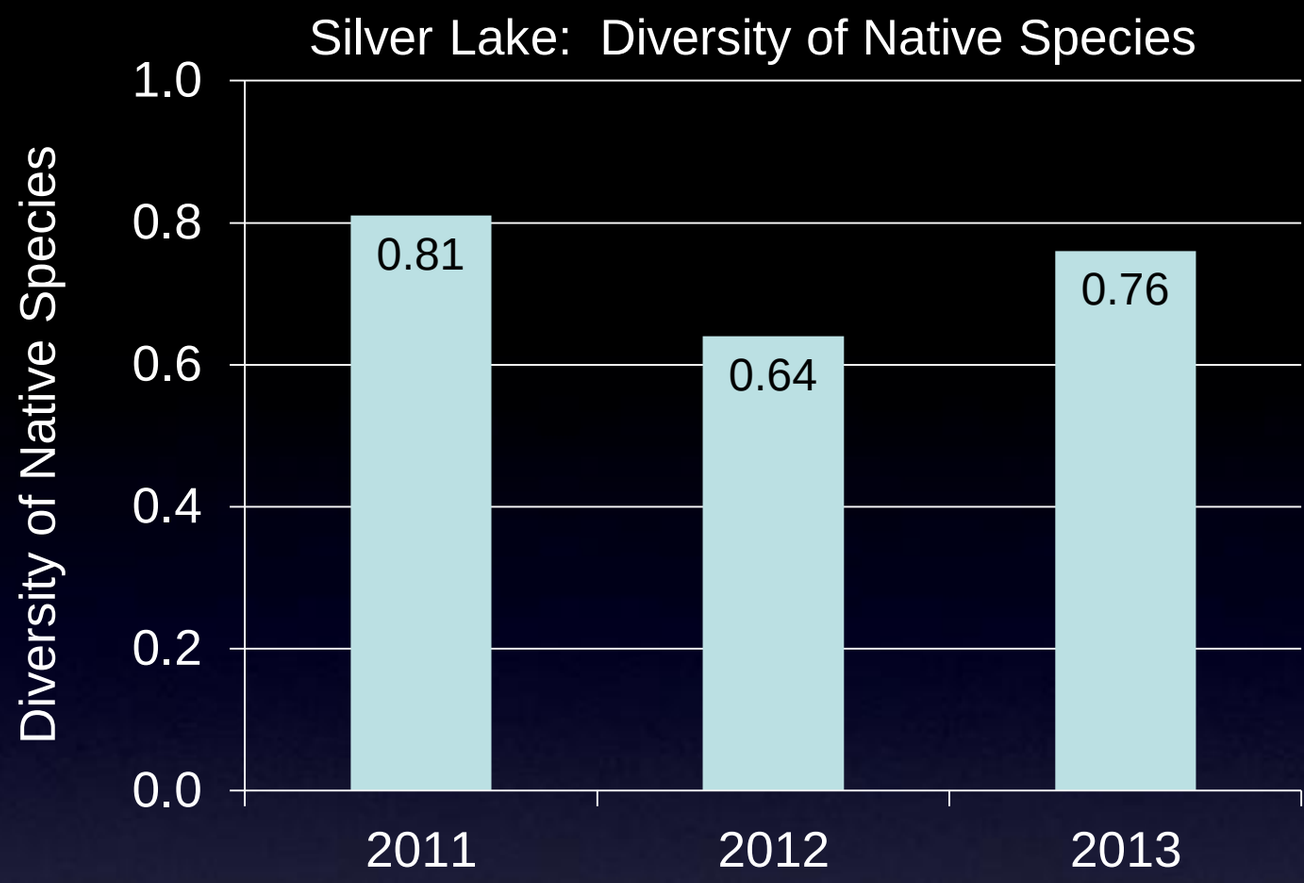
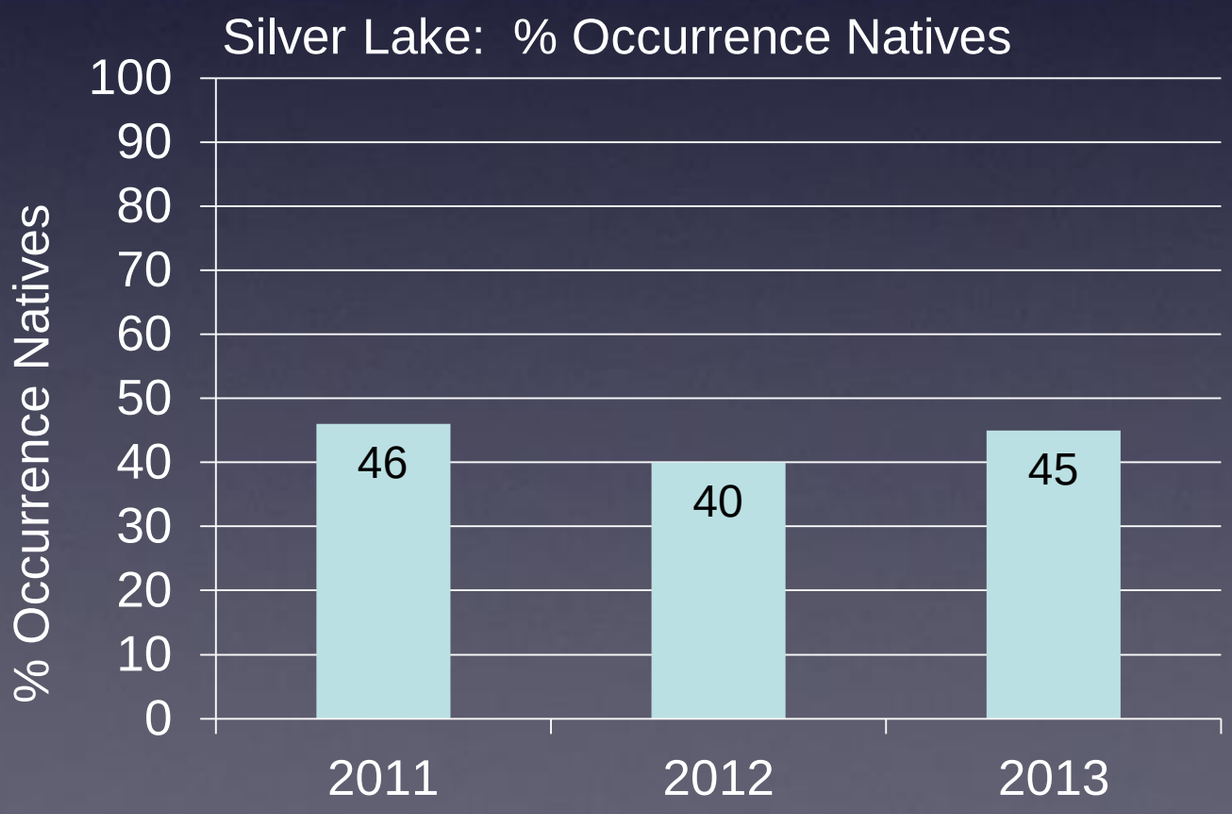
Potential Next Steps for SLIA

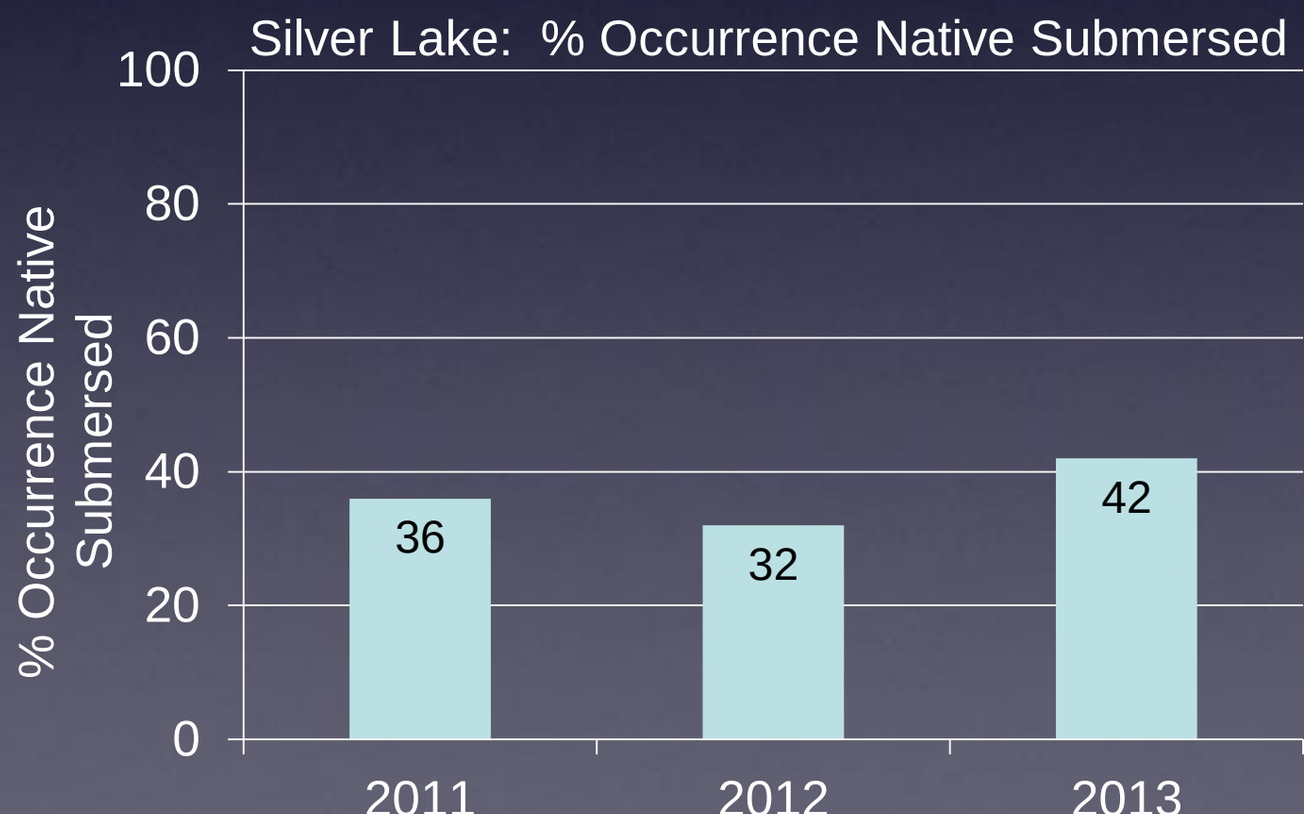
- Complete a study to determine boat activity in the lake and whether increased boat activity is correlated with decreased Secchi Disc Transparency
- If boat activity reduces transparency, voluntary no wake while natives are becoming established each year
- Focus efforts on restoration of native plant community and improvement of lake health
- Wait to Treat EWM/CLP until native plant community improves and water quality improves

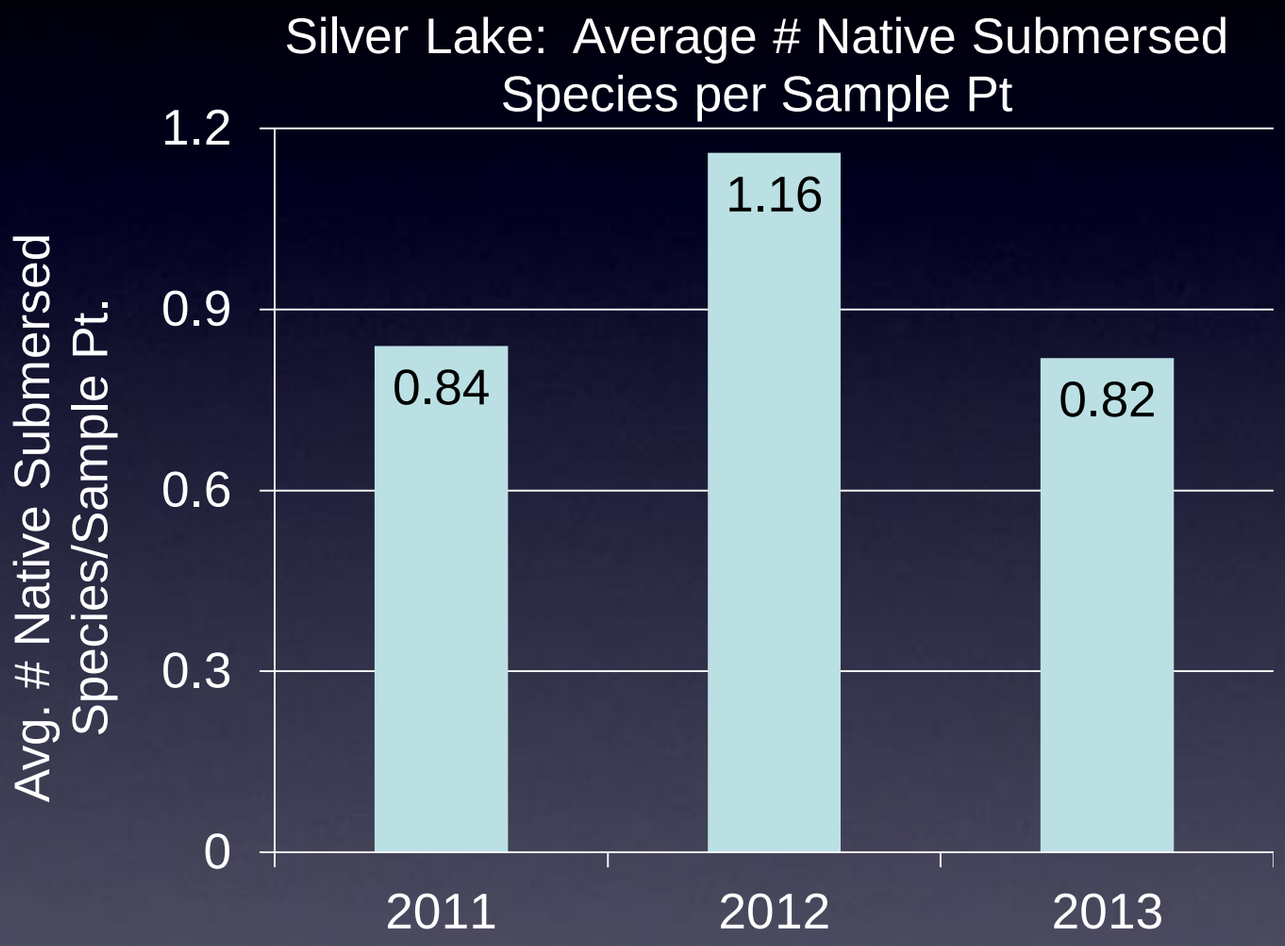

6. 6. 2006

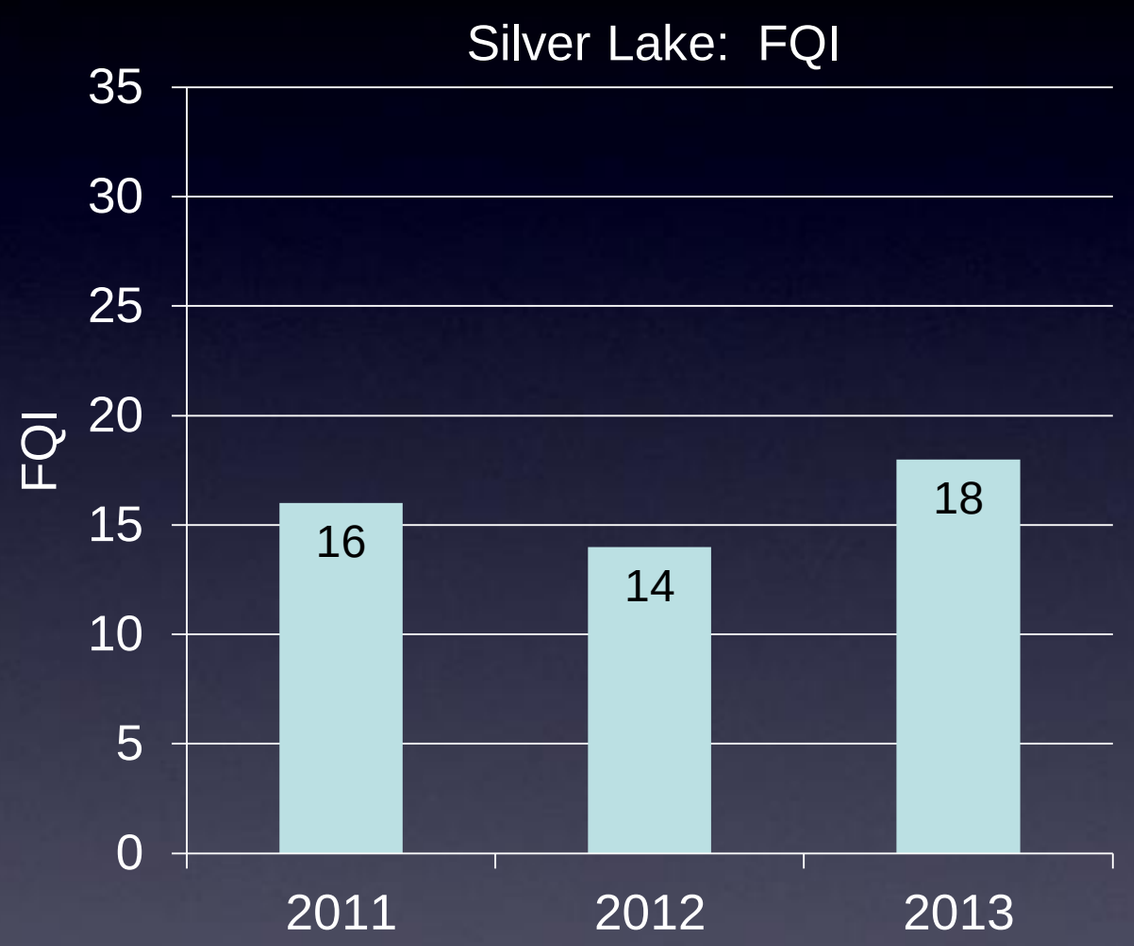

Silver Lake: # of Native Species
# of Native Species
35
30
25
20
15
10
5
0
10
8
11
2011
2012
2013


Silver Lake: Diversity of Native Species
Diversity of Native Species
1.0
0.8
0.6
0.4
0.2
0.0
0.81
0.64
0.76
2011
2012
2013


Silver Lake: % Occurrence Natives
% Occurrence Natives
100
90
80
70
60
50
40
30
20
10
0
46
40
45
2011
2012
2013


Silver Lake: % Occurrence Native Submersed
% Occurrence Native Submersed
100
80
60
40
20
0
36
32
42
2011
2012
2013


Silver Lake: Average # Native Submersed Species per Sample Pt
Avg. # Native Submersed Species/Sample Pt.
1.2
0.9
0.6
0.3
0
0.84
1.16
0.82
2011
2012
2013


Silver Lake: FQI
FQI
35
30
25
20
15
10
5
0
16
14
18
2011
2012
2013