Silver Lake
Kenosha Co. WI

2015 Sonar® Treatment Plan

Updated: 25MAR2015

Summary of Update (updated 25MAR2015)

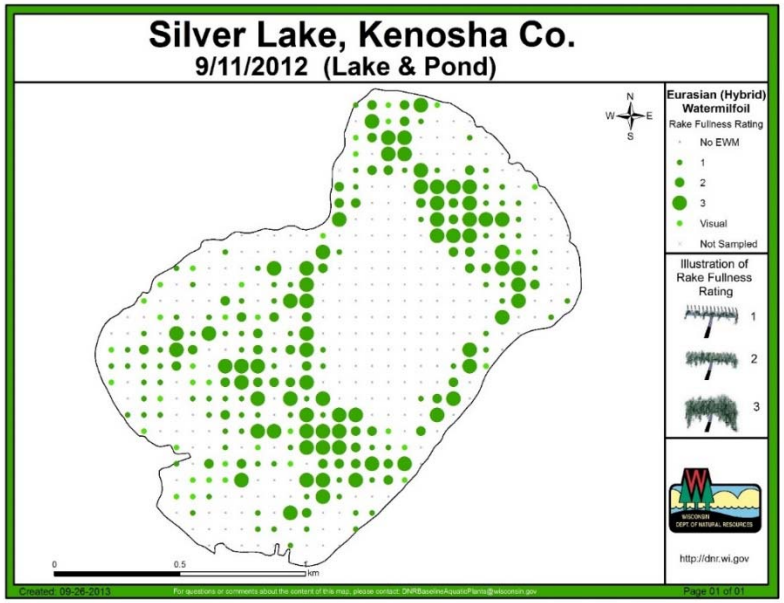
- Based upon continued discussion with applicator, estimates of thermocline formation, plant growth and other factor small adjustments have been proposed compared to the plan submit 5MAR2015.
  - Planned application on the first bump to 4 ppb
  - Planned start date of approximately May 10th when water temperature is around 55 degrees and likely prior to thermocline formation (a small percentage of the in-water Sonar will be trapped under the thermocline)
  - Outflow events during peak rain evens may cause some additional dilution

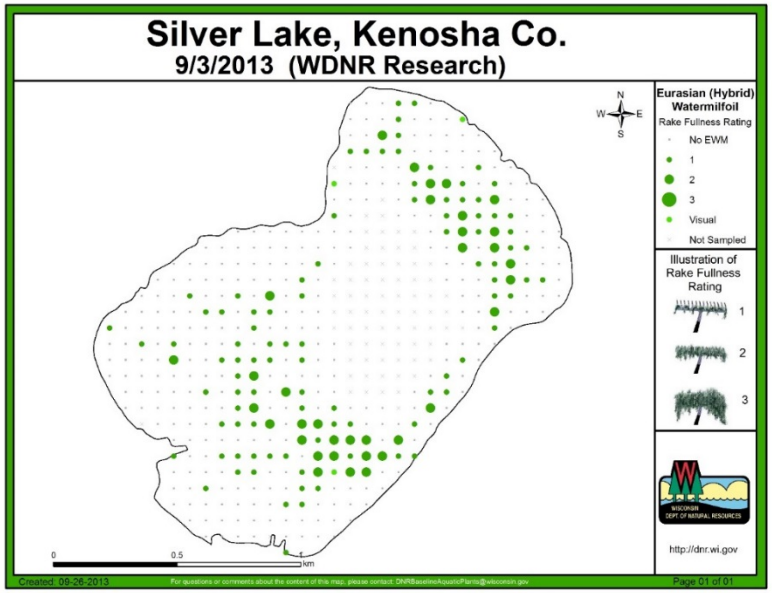
Silver Lake – Kenosha County, WI

- Project Objective:
  - Demonstrate milfoil control with increased selectivity to native submersed aquatic plants utilizing low-dose Sonar pellet applications.
- Project Site Description:
  - Revised data based upon latest GIS data available
  - Lake: 525.6 acres
  - Mean Depth: 11.1 feet
  - Volume: 5824 acre-feet
    - Littoral Treatment Area: 220 acres
    - Treatment Area Mean Depth: 7.4 feet

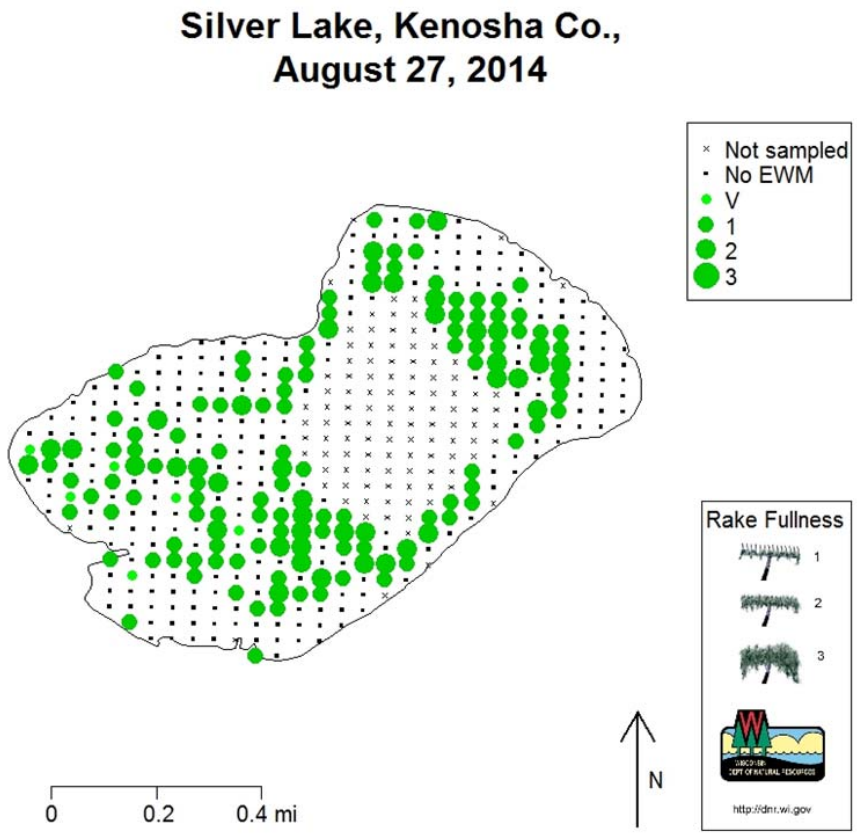
Silver Lake – Kenosha County, WI

- Recent Treatment History:
  - 2013 – Whole-lake DMA4 at 300 ppb (applied to littoral area)
  - No treatment in 2014
  - Hybrid milfoil expanding





Silver Lake – Kenosha County, WI



2014 FOO%: 37.97%
Milfoil coverage: 220 acres

Bathymetry

Lake: 525.6 acres
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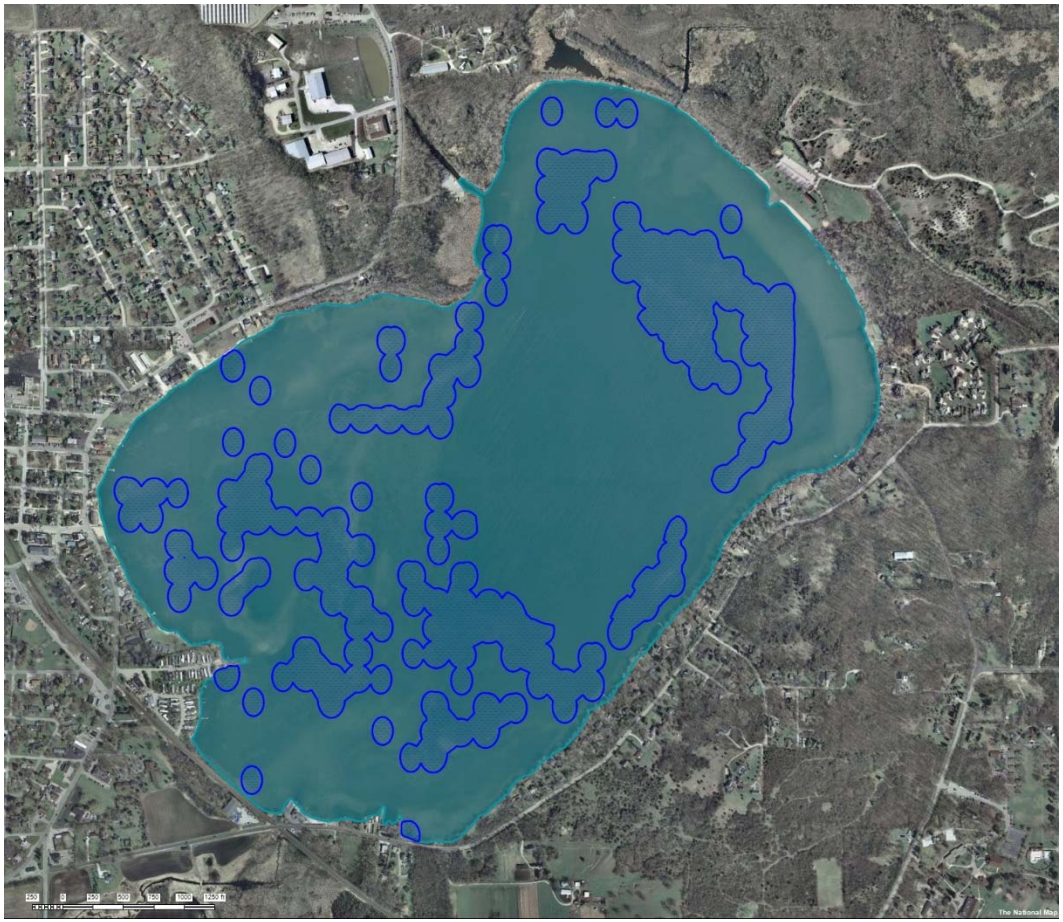
Treatment Area Mean Depth: 7.4 feet

2014 Milfoil Coverage



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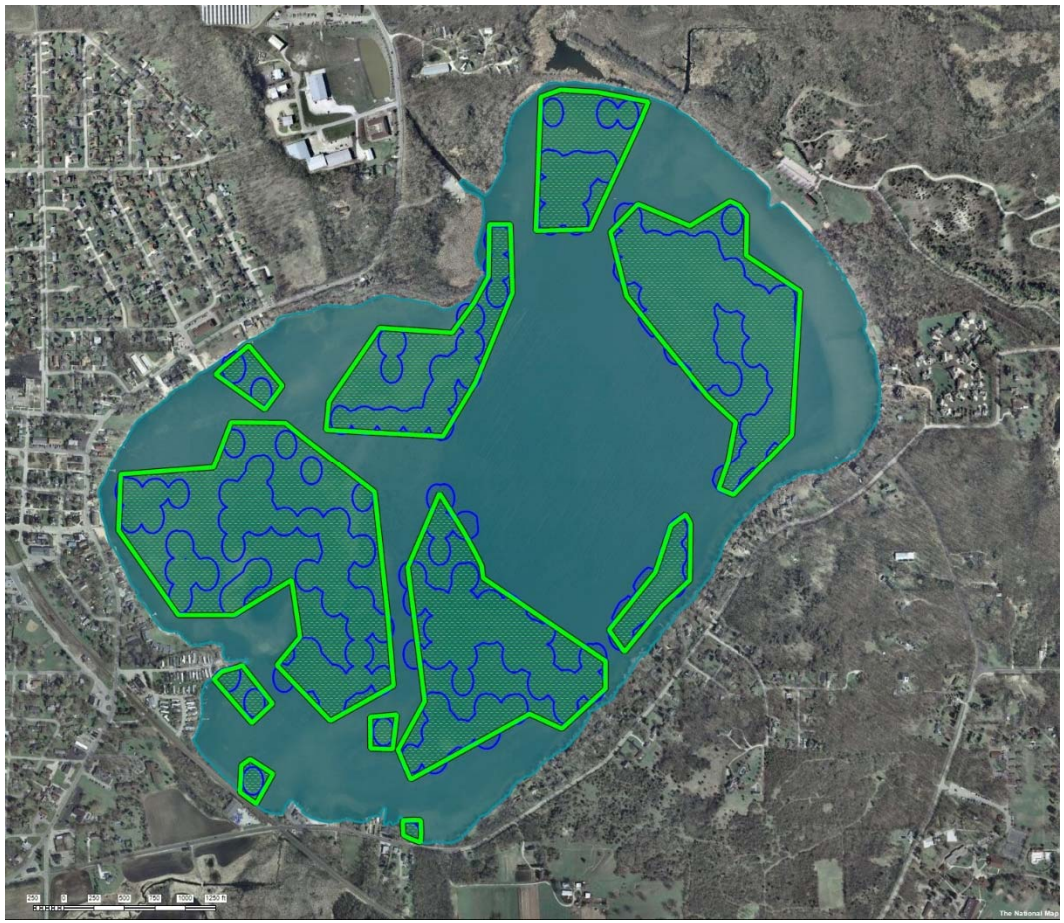
Estimated Milfoil Coverage based upon August 2014 Survey – 220 acres

Proposed SonarOne® Pellet Treatments Area (2015)



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Estimated Milfoil Coverage based upon August 2014 Survey – 220 acres

Proposed Treatments Area (2015)

Treatment Area	Size (acres)	Mean Depth (ft.)	Volume (acre-feet)
1	17.4	6.4	110.7
2	46.0	9.3	428.3
3	5.9	10.2	60.0
4	43.8	8.3	361.8
5	0.5	1.5	0.8
6	1.2	4.2	5.1
7	1.4	2.5	3.5
8	2.5	3.8	9.4
9	72.9	6.5	476.0
10	3.2	4.3	13.9
11	25.1	6.7	166.9
	219.9		**1636.3**
% of Total	**42%**		**28%**

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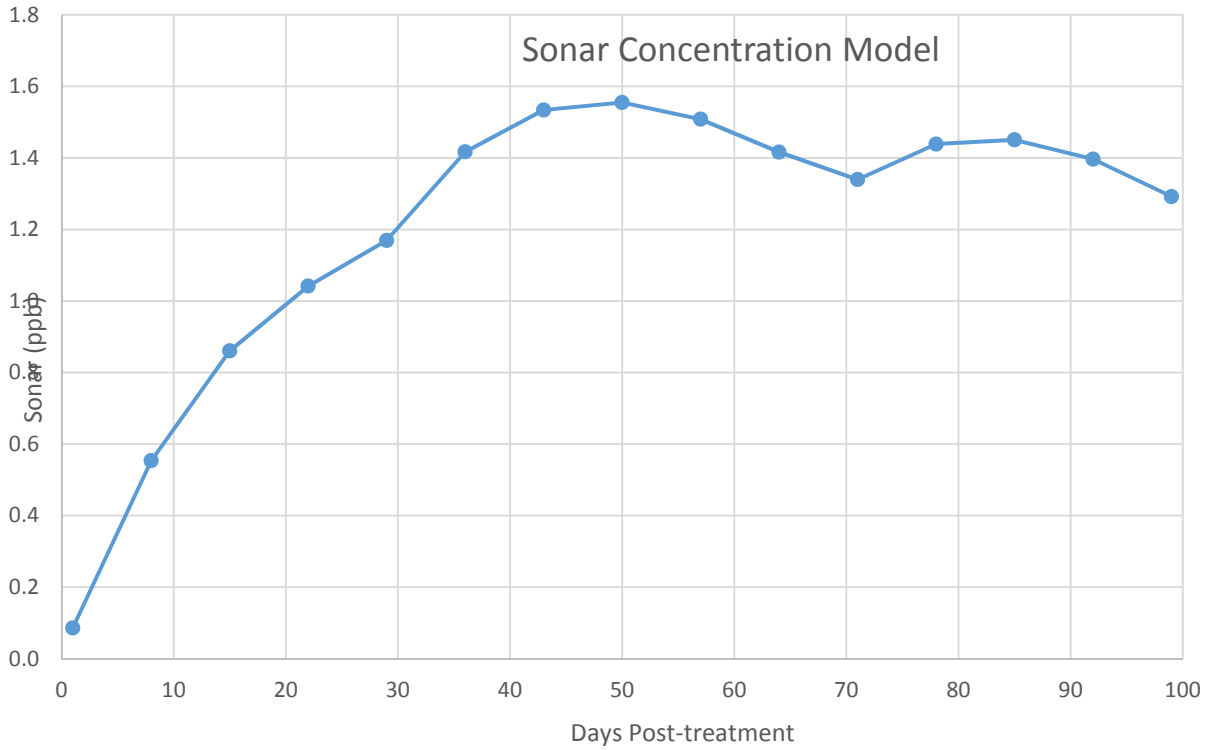
  - Volume: 5824 acre-feet
    - Littoral Treatment Area: 220 acres
    - Treatment Area Mean Depth: 7.4 feet
- Proposed Application Plan
  - Apply pellets to the littoral zone with documented milfoil infestations in 2014
  - ~42% of the total lake surface area

- SonarOne applications (based upon lake volume)
- Initial Application: 4 ppb (63 pails)
- ~4 WAT: 4 ppb (63 pails) Updated 25MAR2015
- ~11 WAT: 2 ppb (32pails)
- Actual bump application rates will range from 1-4 ppb based upon FasTEST, thermocline, rain events and milfoil response

Silver Lake – Kenosha County, WI

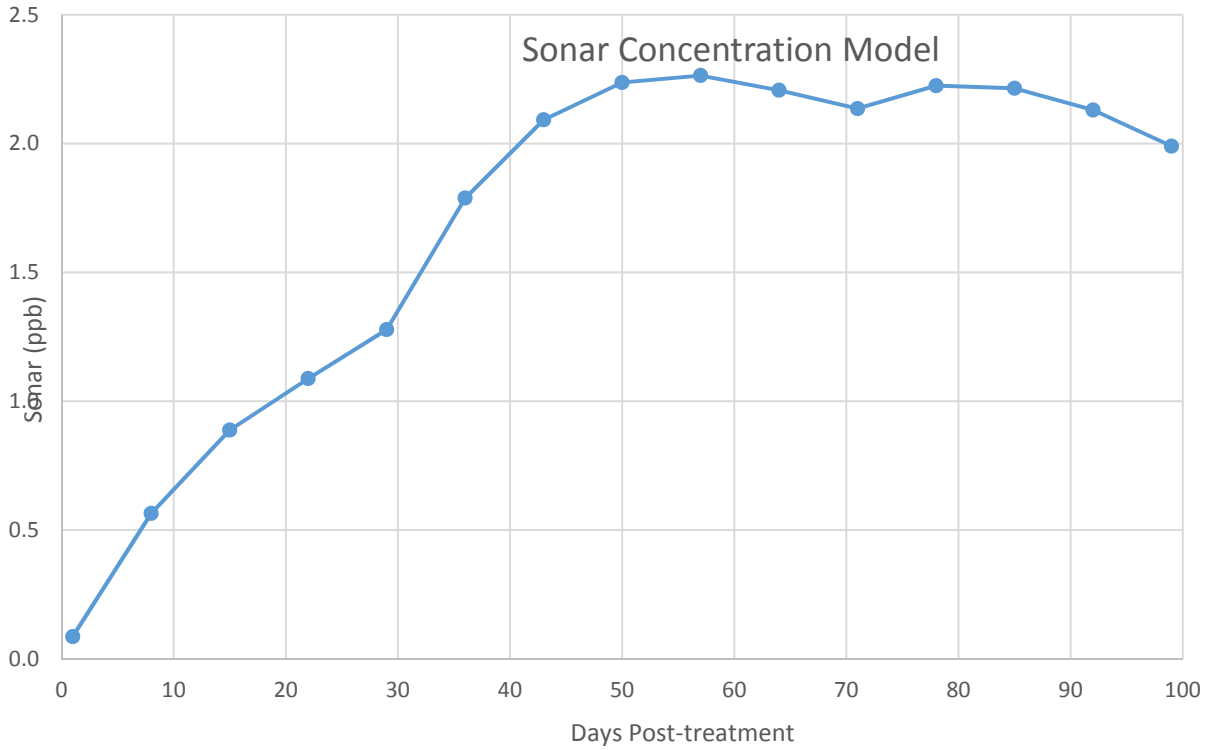


Model of expected mean lake-wide Sonar concentration from prescribed treatment for Silver Lake.

Objective is to keep Sonar concentrations in the 2-4 ppb in the areas where pellets are applied.

Silver Lake – Kenosha County, WI

Updated 25MAR2015



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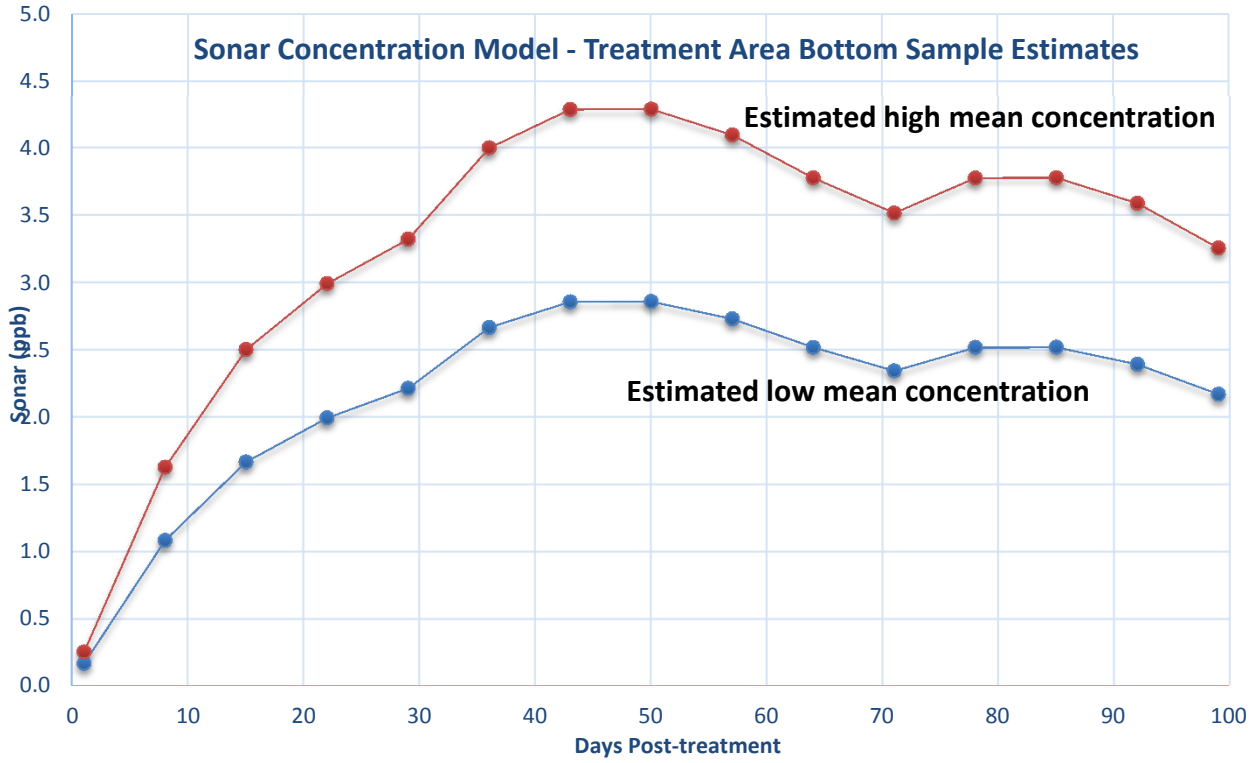
Silver Lake – Kenosha County, WI



Model of expected Sonar concentration in the lower water column within treatment areas.

Objective is to keep Sonar concentrations in the 2-4 ppb in the areas where pellets are applied.

Proposed FasTEST® Sites (2015)

FasTEST Sample Collection Schedule

Site	21 DAT (surface)	21 DAT (bottom)	42 DAT (surface)	42 DAT (bottom)	63 DAT (surface)	63 DAT (bottom)	90 DAT (surface)	120 DAT (surface)
1	X	X	X	X	X	X	X	X
2	X	X	X	X	X	X		
3	X	X	X	X	X	X	X	X
4	X	X	X	X	X	X		
5	X		X		X		X	X
6	X	X	X	X	X	X		
7	X	X	X	X	X	X	X	X

FasTEST Summary:
7 sites
5 sampling events (21, 42, 63, 90 & 120 DAT)
Bottom samples at sites 1-4, 6 &7 (21,42 & 63 DAT)

Silver Lake – Kenosha County, WI

Preliminary Treatment Detail (3/5/2015) – Subject to Revision

Treatment Area	Size (acres)	Mean Depth (ft.)	Volume (acre-feet)	Application 1 ppb	Application 1 # SonarOne	Application 2 ppb	Application 2 # SonarOne	Application 3 ppb	Application 3 # SonarOne
1	17.4	6.4	110.7	13.0	78	6.5	39	6.5	39
2	46.0	9.3	428.3	13.0	301	6.5	150	6.5	150
3	5.9	10.2	60.0	30.0	97	15.0	49	15.0	49
4	43.8	8.3	361.8	13.0	254	6.5	127	6.5	127
5	0.5	1.5	0.8	60.0	2	30.0	1	30.0	1
6	1.2	4.2	5.1	60.0	16	30.0	8	30.0	8
7	1.4	2.5	3.5	60.0	11	30.0	6	30.0	6
8	2.5	3.8	9.4	40.0	20	20.0	10	20.0	10
9	72.9	6.5	476.0	13.0	334	6.5	167	6.5	167
10	3.2	4.3	13.9	40.0	30	20.0	15	20.0	15
11	25.1	6.7	166.9	13.0	117	6.5	59	6.5	59
219.9			**1636.3**		**1261**		**631**		**631**

Note: ppb listed are based on application area water volume.

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3	5.9	10.2	60.0	30.0	97	30.0	97	15.0	49
4	43.8	8.3	361.8	13.0	254	13.0	254	6.5	127
5	0.5	1.5	0.8	60.0	2	60.0	2	30.0	1
6	1.2	4.2	5.1	60.0	16	60.0	16	30.0	8
7	1.4	2.5	3.5	60.0	11	60.0	11	30.0	6
8	2.5	3.8	9.4	40.0	20	40.0	20	20.0	10
9	72.9	6.5	476.0	13.0	334	13.0	334	6.5	167
10	3.2	4.3	13.9	40.0	30	40.0	30	20.0	15
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219.9			**1636.3**	**1261**		**1261**			**631**

Note: ppb listed are based on application area water volume.

Silver Lake – Kenosha County, WI

- Assessment:
  - Start date determination:
    - Monitor weather (Growing Degree Days - *GDD*)
      - *See the assessment that follows*
    - Early spring surveys for submersed plant growth (May 11th-22nd)
    - Anticipated start date – ~~May 18th – June 5th~~
    - Updated start date approximately May 10th
  - FasTEST Collection (see detail outlined in plan)
  - Plant Assessment
    - Reconnaissance survey corresponding *approximately* with second and third application dates
    - DNR Survey per protocol in August or September 2015
    - Follow-up survey in 2016 pending results from 2015 and prescribed follow-up management plan

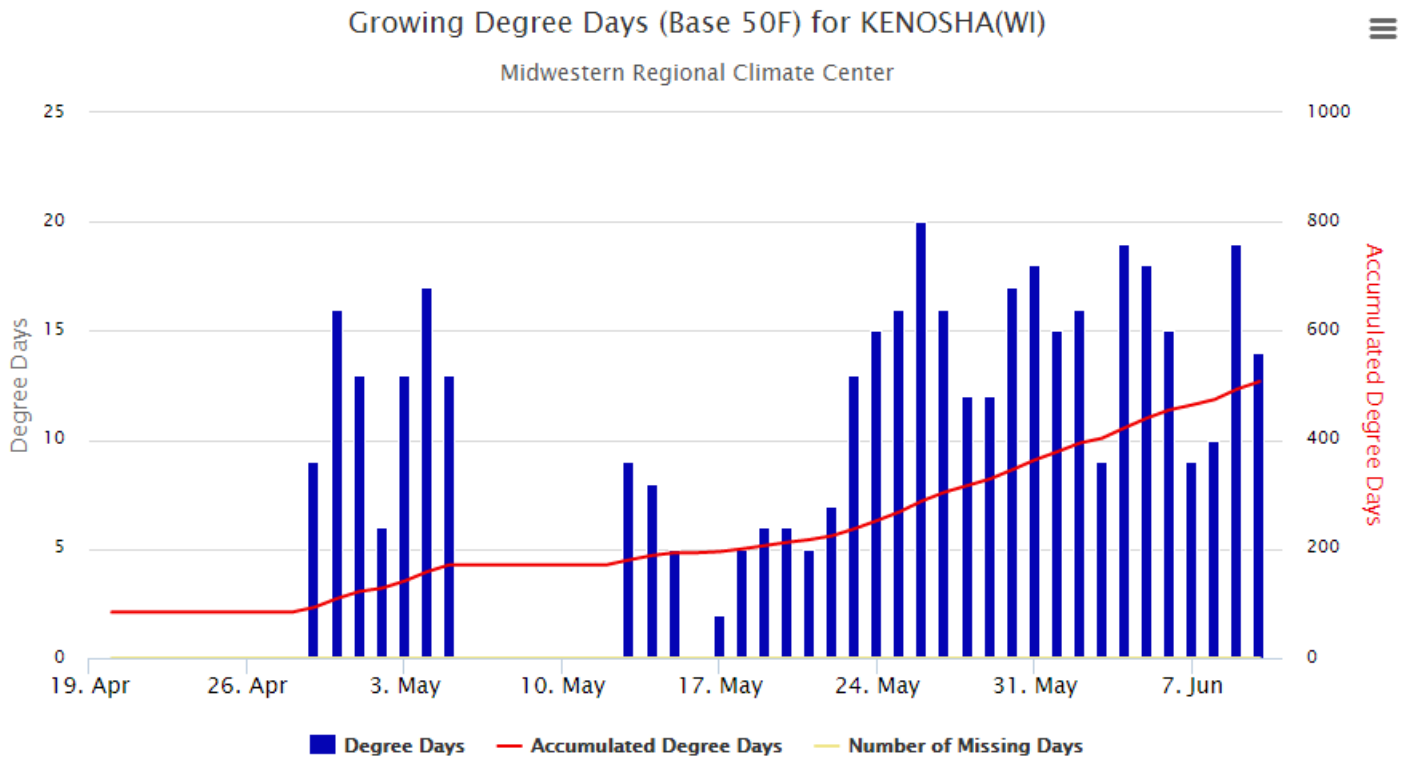
Silver Lake – Kenosha County, WI

- Project Objective:
  - Demonstrate milfoil control with increased selectivity to native submersed aquatic plants utilizing low-dose Sonar pellet applications.
- Next Steps:
  - Develop consensus on treatment plan
  - Permit approval
  - Detailed treatment plan by site (application tracks, equipment, etc.)
  - Implement treatment program
  - Assessment (FasTEST, plant community YOT, 2016)
  - Develop follow-up management plan for 2016

Assessment information for Growing Degree Days for Kenosha County, Wisconsin (2010-2014)

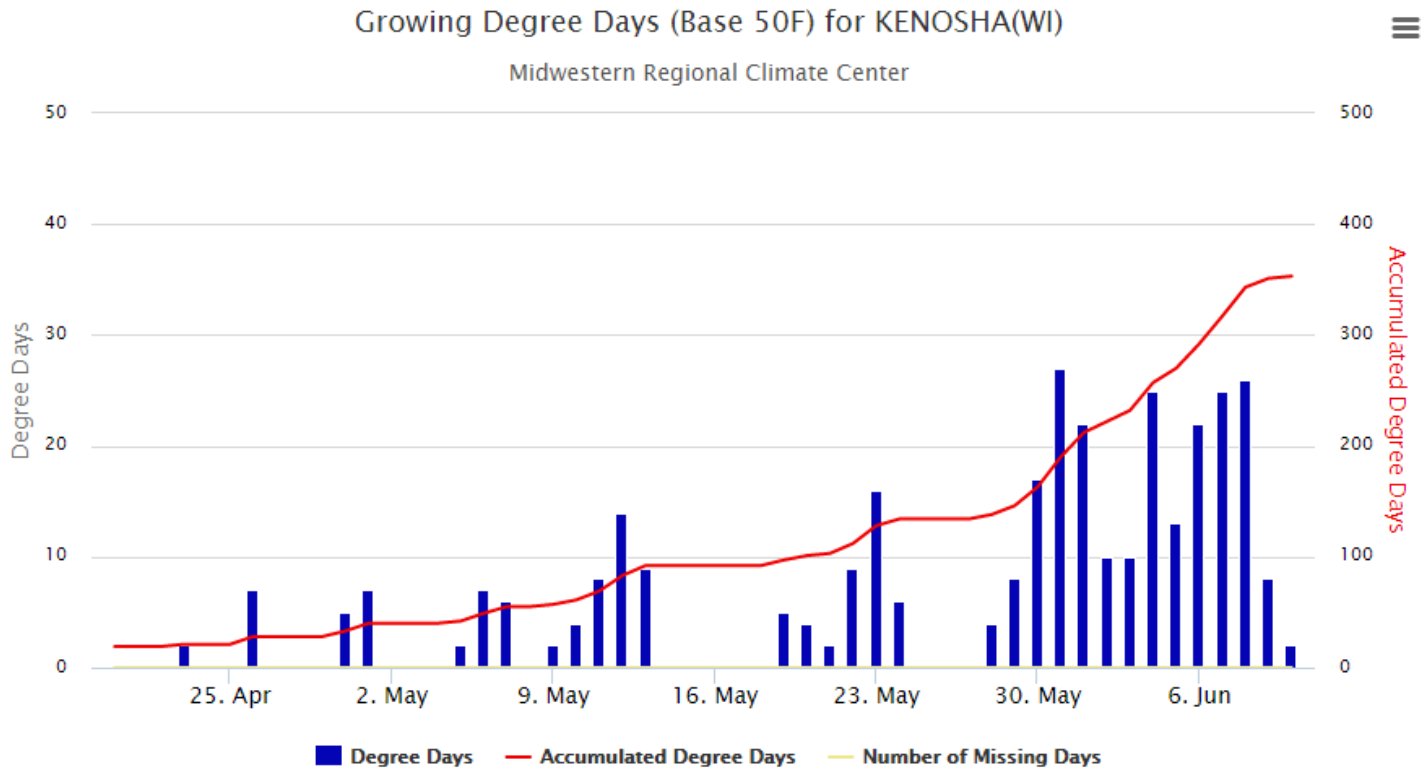
Silver Lake – Kenosha County, WI

2010



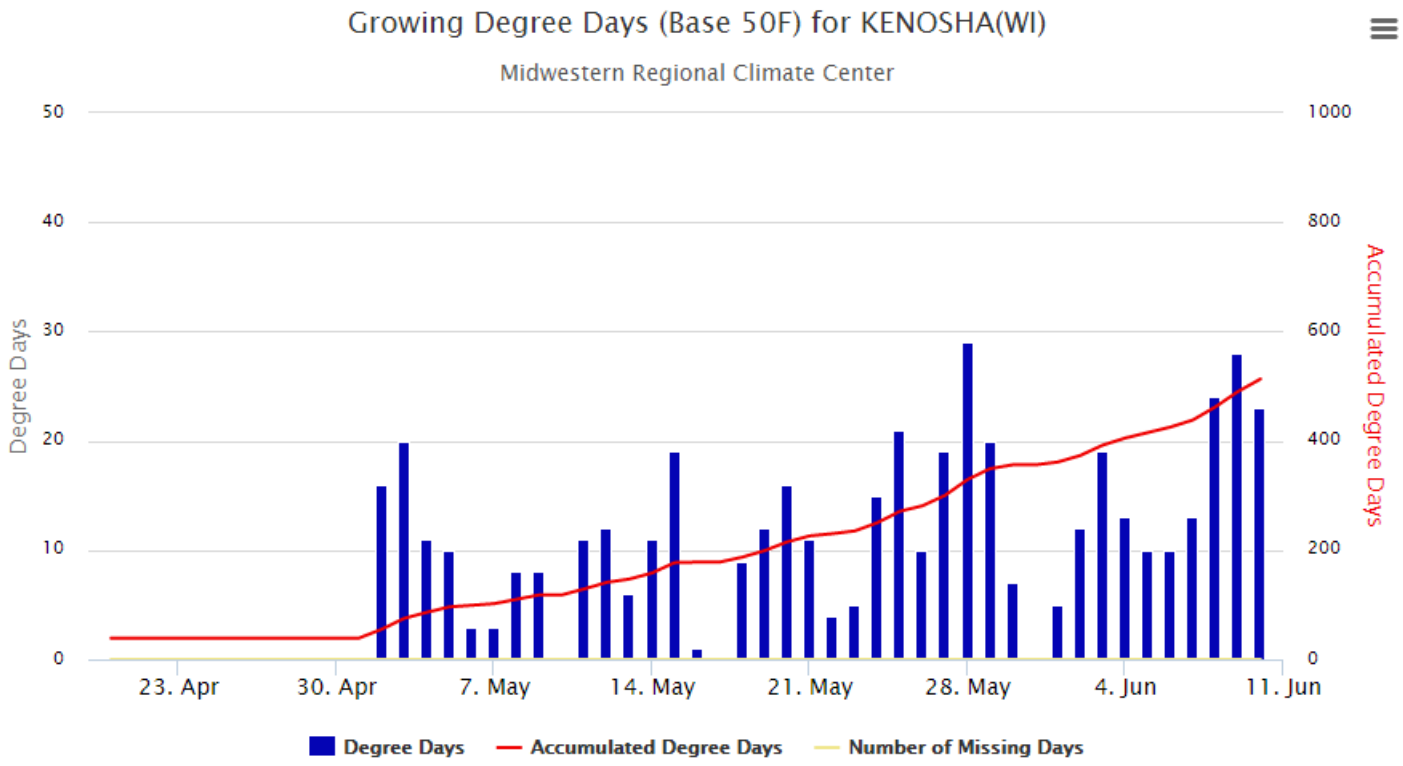
Silver Lake – Kenosha County, WI

2011



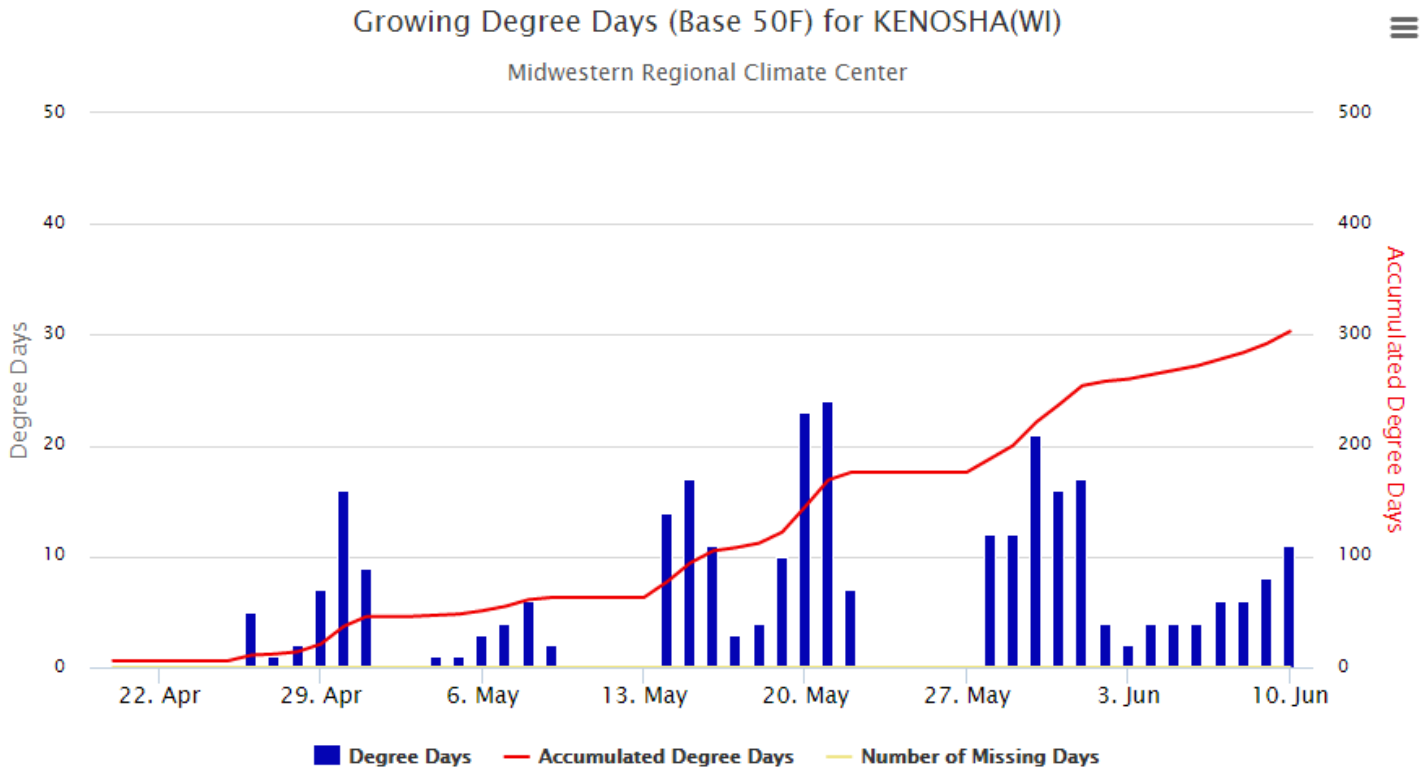
Silver Lake – Kenosha County, WI

2012



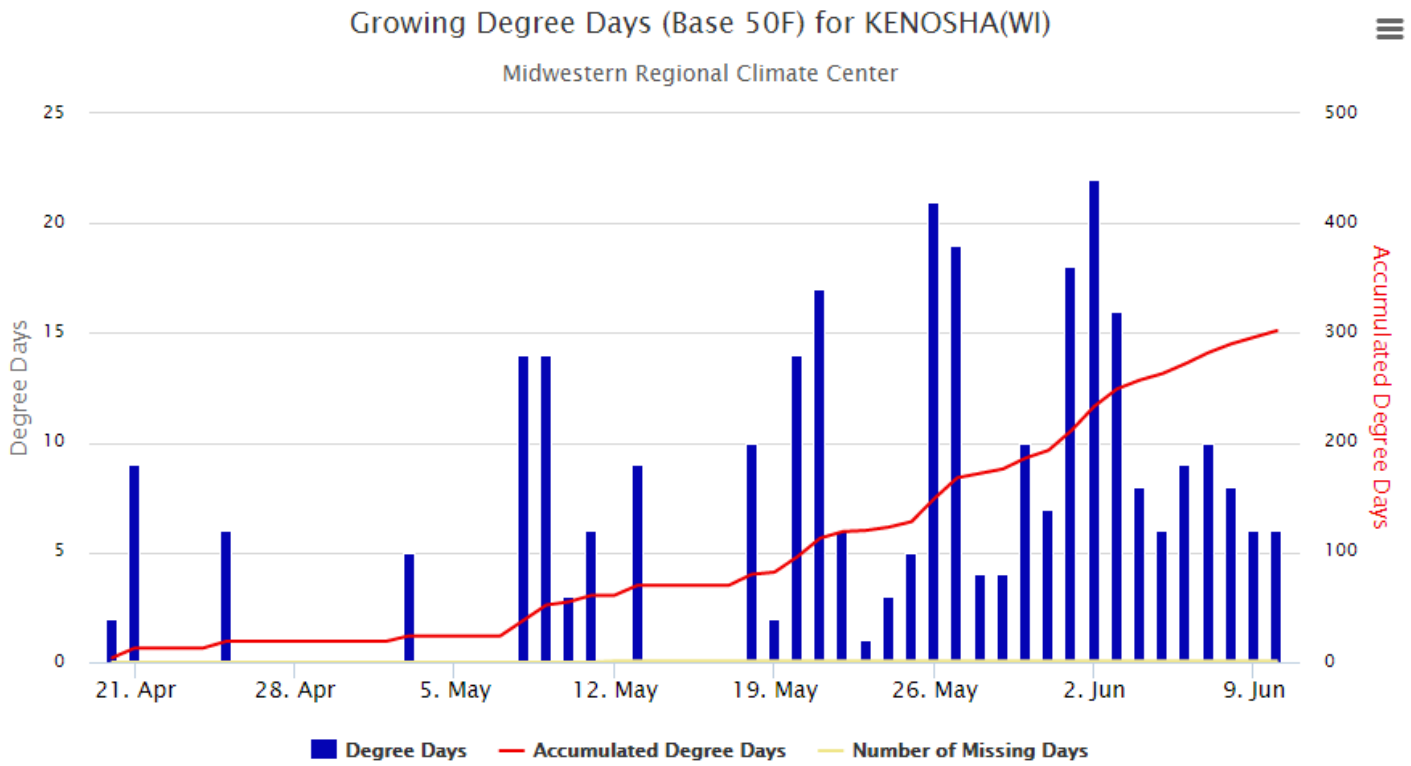
Silver Lake – Kenosha County, WI

2013



Silver Lake – Kenosha County, WI

2014



Growing Degree Day Summary

- Average date to 150+ GDD
  - May 19th
  - Range: May 4th – May 27th
- Average date to 200+ GDD
  - May 26th
  - Range: May 18th – June 1st
- Average date to 300+ GDD
  - June 3rd
  - Range: May 27th – June 10th

Supporting information for selectivity of proposed treatment program.

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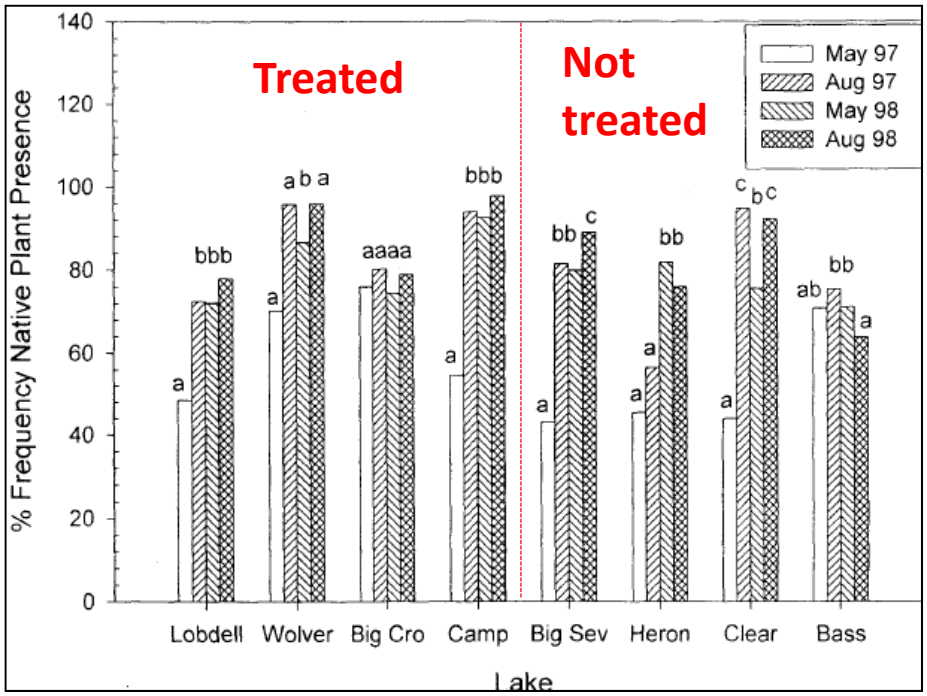
Aquatic Herbicide

Early-Season, 'Low-Dose' Use Pattern for EWM



MI Low-Dose Sonar Milfoil Field Demonstration
Native Plant Frequency of Occurrence
Madsen et al. 2002, Lake and Reserv Mgmt 18:191-200

Invasive Milfoil versus Native SAV

Seasonal Differences in Growth and Biomass

(Herb and Stefan 2006)

- Milfoil grows early and vertically but maximum biomass not reached until late summer.
- Other natives reach max biomass earlier and growth slows.

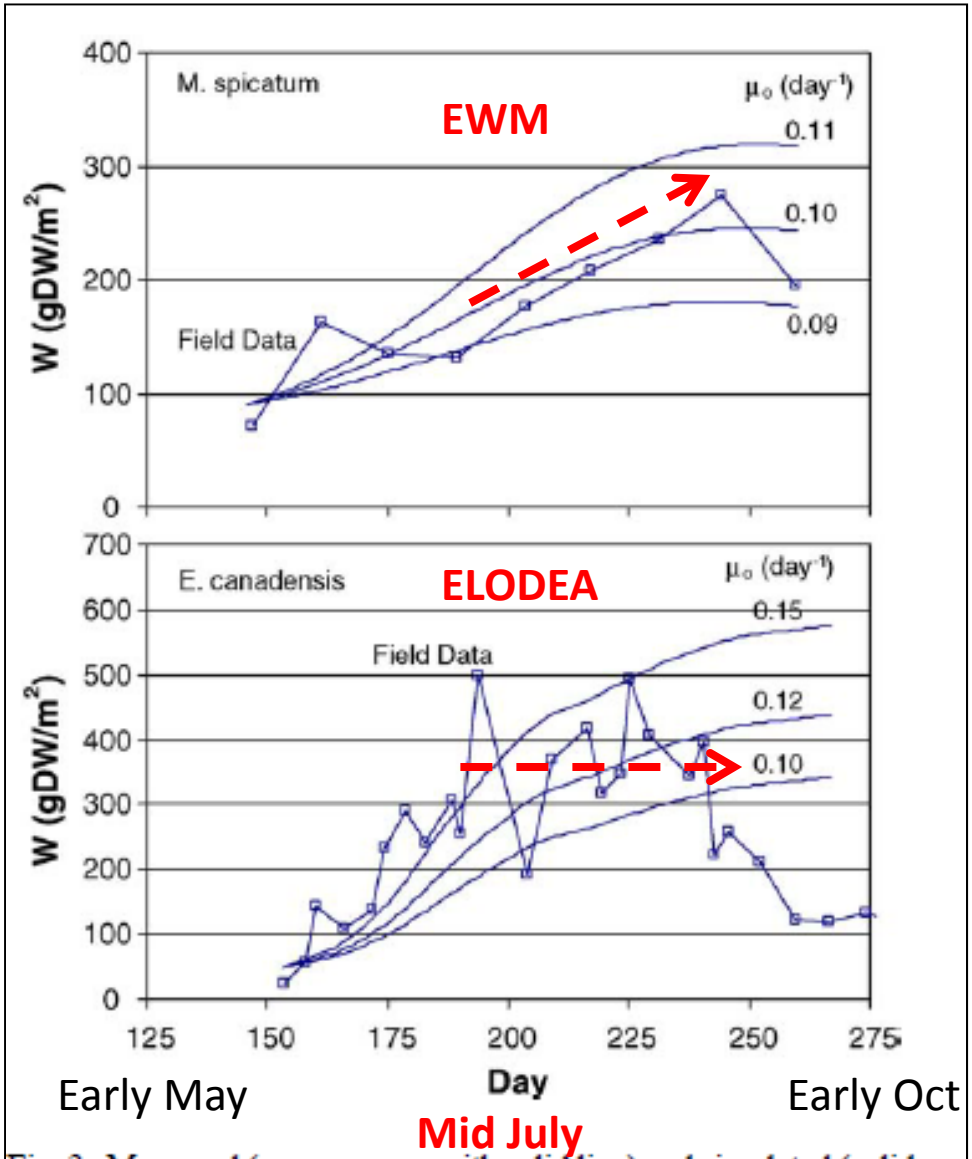


Fig. 3. Measured (open squares with solid line) and simulated (solid line) integral biomass (W) vs. time for *M. spicatum* L. (upper panel) and *E. canadensis* M. (lower panel). Measured *M. spicatum* biomass from Lake Wingra, Wisconsin (Adams and McCracken, 1974); measured *E. canadensis* biomass from Malý Dubovec fishpond, Czech Republic (Pokorny et al., 1984).

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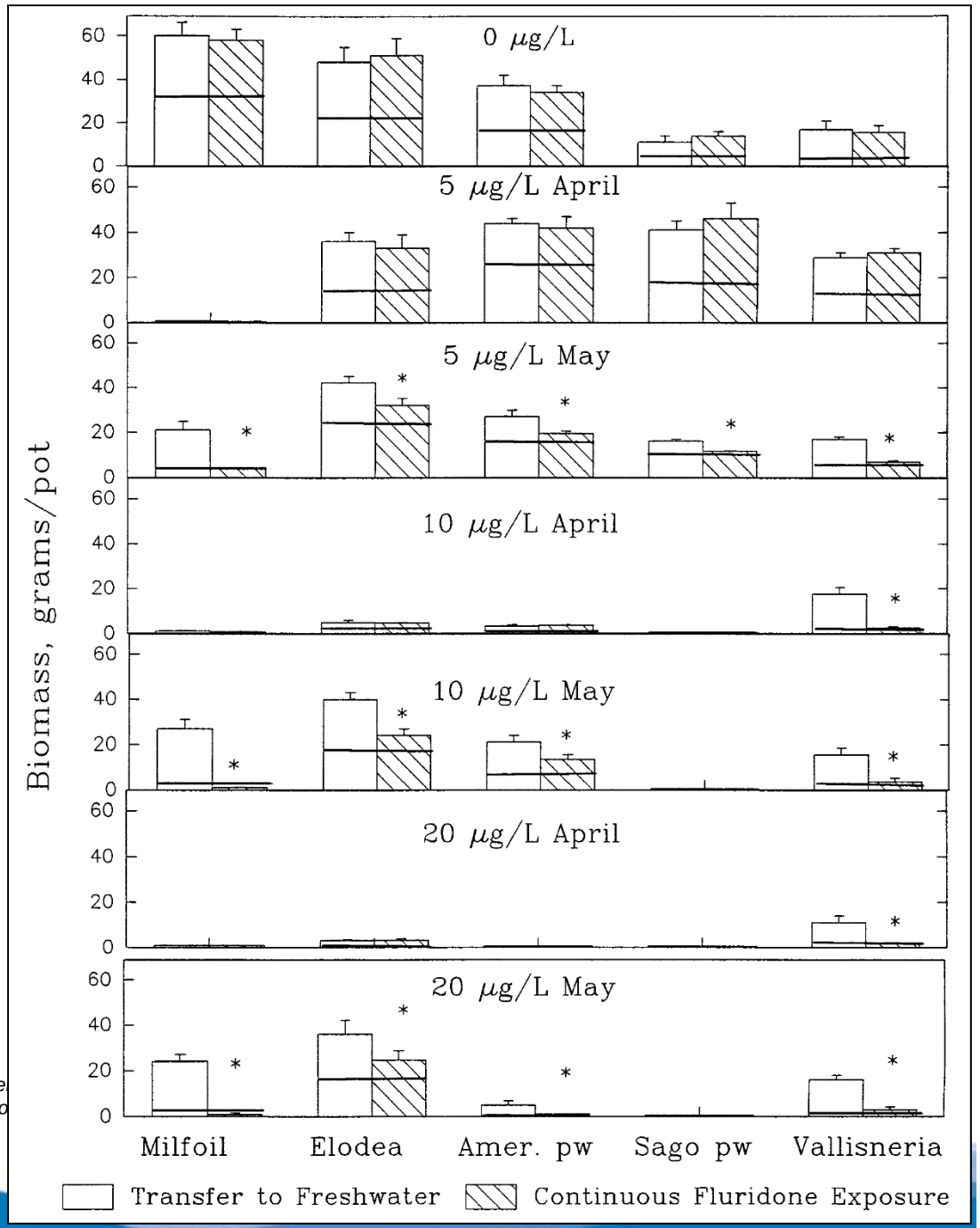
Use Pattern for Invasive Watermilfoil

1. **LOW** rate is critical for best selectivity to native SAV of moderate to high sensitivity.
   - 5 ppb avg = 2.5 ppb
   - 10 ppb avg = 4.9 ppb
2. **LATER** timing of treatment initiation enhanced selectivity, particularly to elodea, but longer exposure required for milfoil control.



Netherland et al. 1997, JAPM 35:41-50

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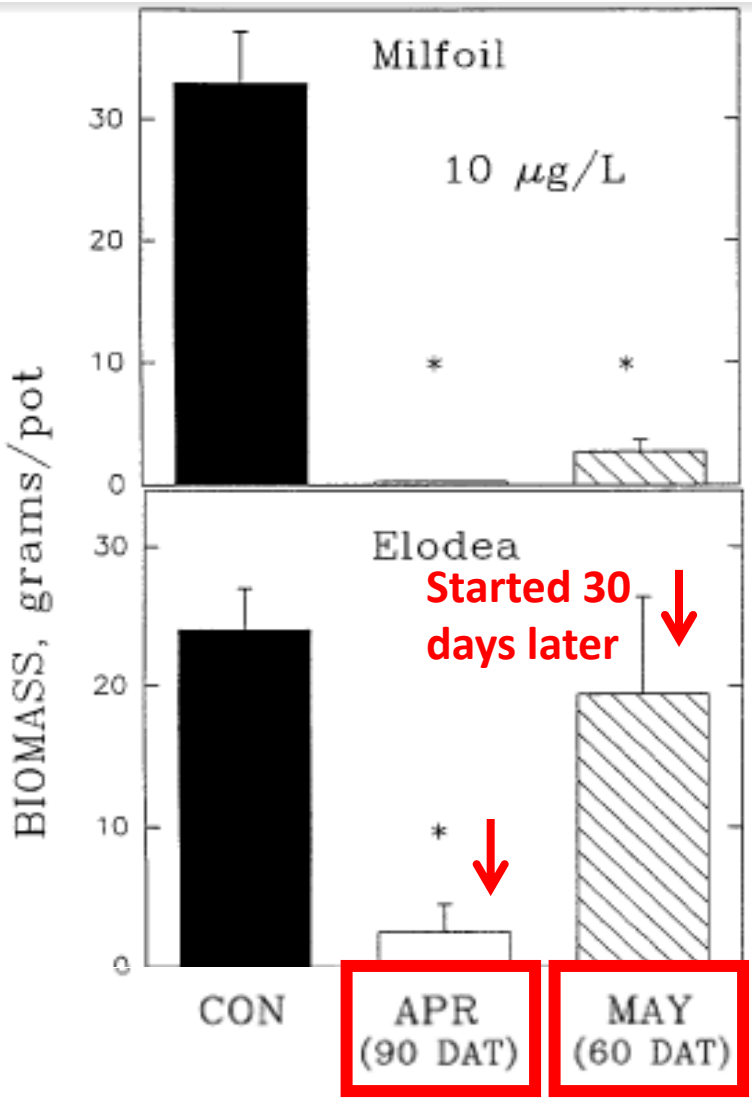
Use Pattern for Invasive Watermilfoil

- **Selectivity to Common Natives in Eutrophic Sites**
  - **SOLUTION**: Stay **LOW** with **LATER** Treatment Timing
  - LATER timing is not a new idea…why not operational…in MW?



From Netherland et al. 1997, JAPM 35:41-50

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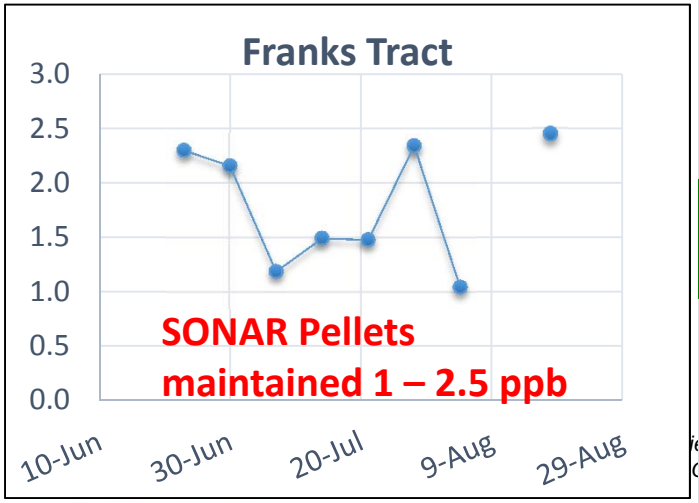
Franks Tract (CA) Vegetation Assessment: 2013 and 2014



	Oct-13		Oct-14	
	Count	FOO	Count	FOO
Sample Points	195	100%	100	
Area Surveyed (acres)	2152		2152	
	'13 Not Treated		**'14 Sonar Pellets**	
Egeria densa	152	78%	55	55%
Ceratophyllum demersum	74	38%	72	72%
Myriophyllum spicatum		0%		0%
Potamogeton crispus	67	34%	25	25%
Stuckenia filiformis	29	15%	13	13%
Cabomba caroliniana		0%		0%
Stuckenia pectinatus	40	21%	12	12%
Potamogeton nodosus		0%	1	1%
Potamogeton richardsonii	7	4%	40	40%
Elodea canadensis	18	9%	39	39%
Najas quadalupensis	99	51%	30	30%
Species Richness	8		9	
Species Diversity (Simpson)	5.34		6.65	
Species Diversity (Shannon)	1.79		1.92	

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Aquatic Herbicide

- **LOW and LATER Invasive Watermilfoil Treatments**
  - **Advantages**
    - More selectivity to susceptible natives
    - Late-season exposure prevents regrowth
    - Window of reduced precipitation in MW
  - **Disadvantages**
    - Slower control of established milfoil
    - May require longer exposure
  - **SOLUTIONS:**
    - **Pellets gradually initiate as well as efficiently localize and extend treatment.**
    - **Integrate with spot systemic treatment**