Lower Bolton Lake

Bolton Town Hall

February 24, 2014

George Knoecklein
Northeast Aquatic Research
Mansfield, CT

Working Hypothesis

1. Deep drawdowns of Middle Bolton Lake fueled high growth rates of naiad in Lower Bolton Lake
    1. 60-70 inches during 2006-7, 2007-8, and 2008-9

2. Lower Bolton Lake provided better than average conditions for prolific naiad growth

3. Rafts of floating naiad caused nutrient levels to go up in Lower Bolton Lake
    1. 12-15 acres of floating rafts of southern naiad

4. Combination of higher phosphorus and nitrogen caused blue-green 2012 algae bloom in Lower Bolton Lake
    1. Clarity declined from 4 m in early July to 0.5 m in late August

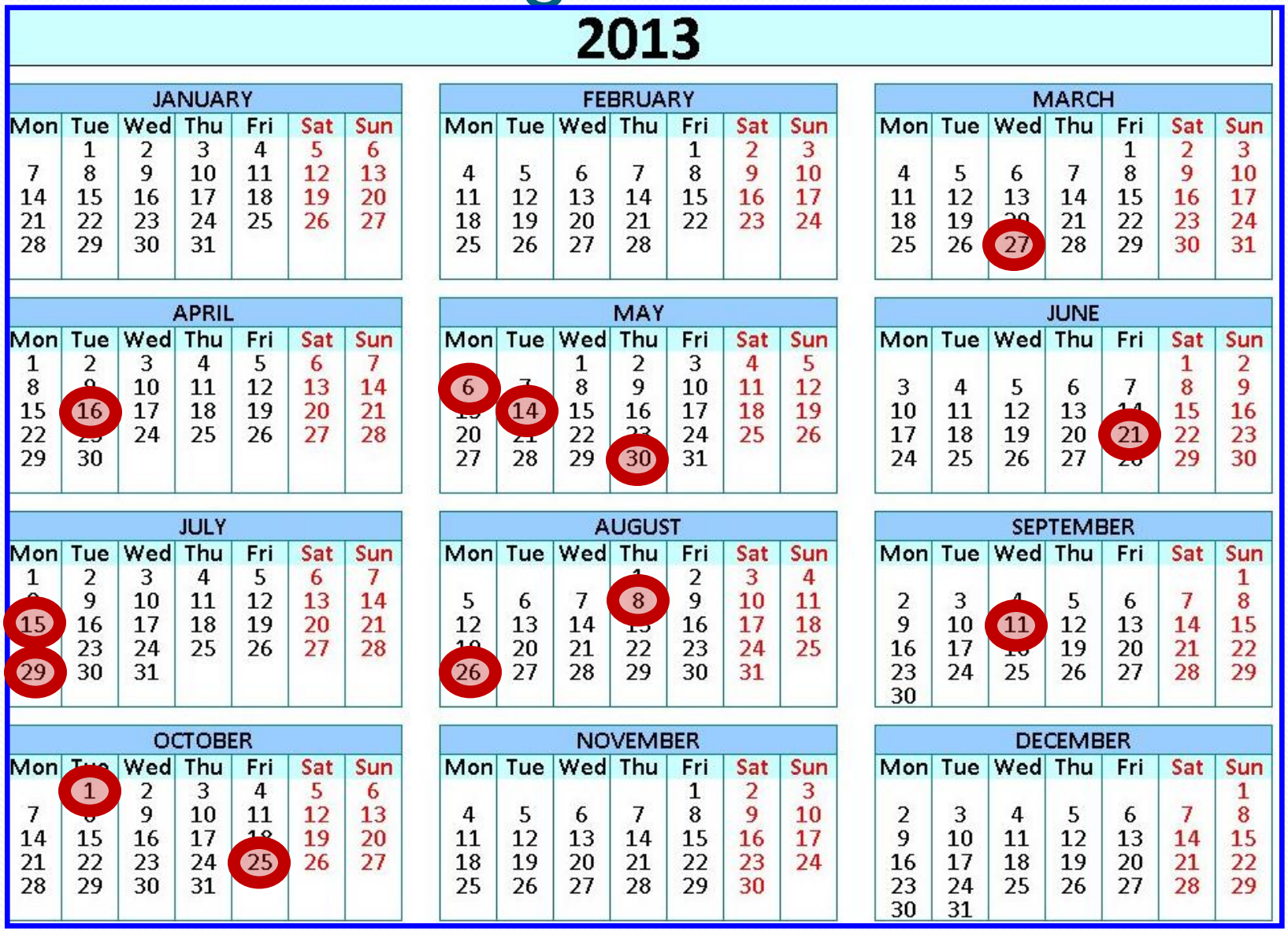
Approach for 2013

- Monitor the lake regularly during 2013, beginning in the spring to:
  - Track nutrient chemistry, water clarity, naiad growth, and blue-green cell numbers
  - Investigate watershed for sources of nutrients ***
  - Search for remaining fanwort beds
  - Construct a nutrient mass balance for the lake starting over the winter
  - May look under the ice if we have a good winter ***
  - Investigate the end-of-pipe area in LBL

Tonight's Presentation

- Lake visits to track nutrient chemistry, water clarity, naiad growth, (and blue-green cell numbers ***)
- Search for remaining fanwort beds
- Construct a nutrient mass balance for the lake starting over the winter
- Discuss 2014

lake monitoring visits in 2013



2013

JANUARY

Mon	Tue	Wed	Thu	Fri	Sat	Sun
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

FEBRUARY

Mon	Tue	Wed	Thu	Fri	Sat	Sun
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28			

MARCH

Mon	Tue	Wed	Thu	Fri	Sat	Sun
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	[illegible]	21	22	23	24
25	26	27	28	29	30	31

APRIL

Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	[illegible]	10	11	12	13	14
15	16	17	18	19	20	21
22	[illegible]	24	25	26	27	28
29	30					

MAY

Mon	Tue	Wed	Thu	Fri	Sat	Sun
		1	2	3	4	5
6	[illegible]	8	9	10	11	12
[illegible]	14	15	16	17	18	19
20	[illegible]	22	[illegible]	24	25	26
27	28	29	30	31		

JUNE

Mon	Tue	Wed	Thu	Fri	Sat	Sun
					1	2
3	4	5	6	7	8	9
10	11	12	13	[illegible]	15	16
17	18	19	20	21	22	23
24	25	26	27	[illegible]	29	30

JULY

Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
[illegible]	9	10	11	12	13	14
15	16	17	18	19	20	21
[illegible]	23	24	25	26	27	28
29	30	31				

AUGUST

Mon	Tue	Wed	Thu	Fri	Sat	Sun
			[illegible]	2	3	4
5	6	7	8	9	10	11
12	13	14	[illegible]	16	17	18
[illegible]	20	21	22	23	24	25
26	27	28	29	30	31	

SEPTEMBER

Mon	Tue	Wed	Thu	Fri	Sat	Sun
						1
2	3	[illegible]	5	6	7	8
9	10	11	12	13	14	15
16	17	[illegible]	19	20	21	22
23	24	25	26	27	28	29
30						

OCTOBER

Mon	Tue	Wed	Thu	Fri	Sat	Sun
	1	2	3	4	5	6
7	[illegible]	9	10	11	12	13
14	15	16	17	[illegible]	19	20
21	22	23	24	25	26	27
28	29	30	31			

NOVEMBER

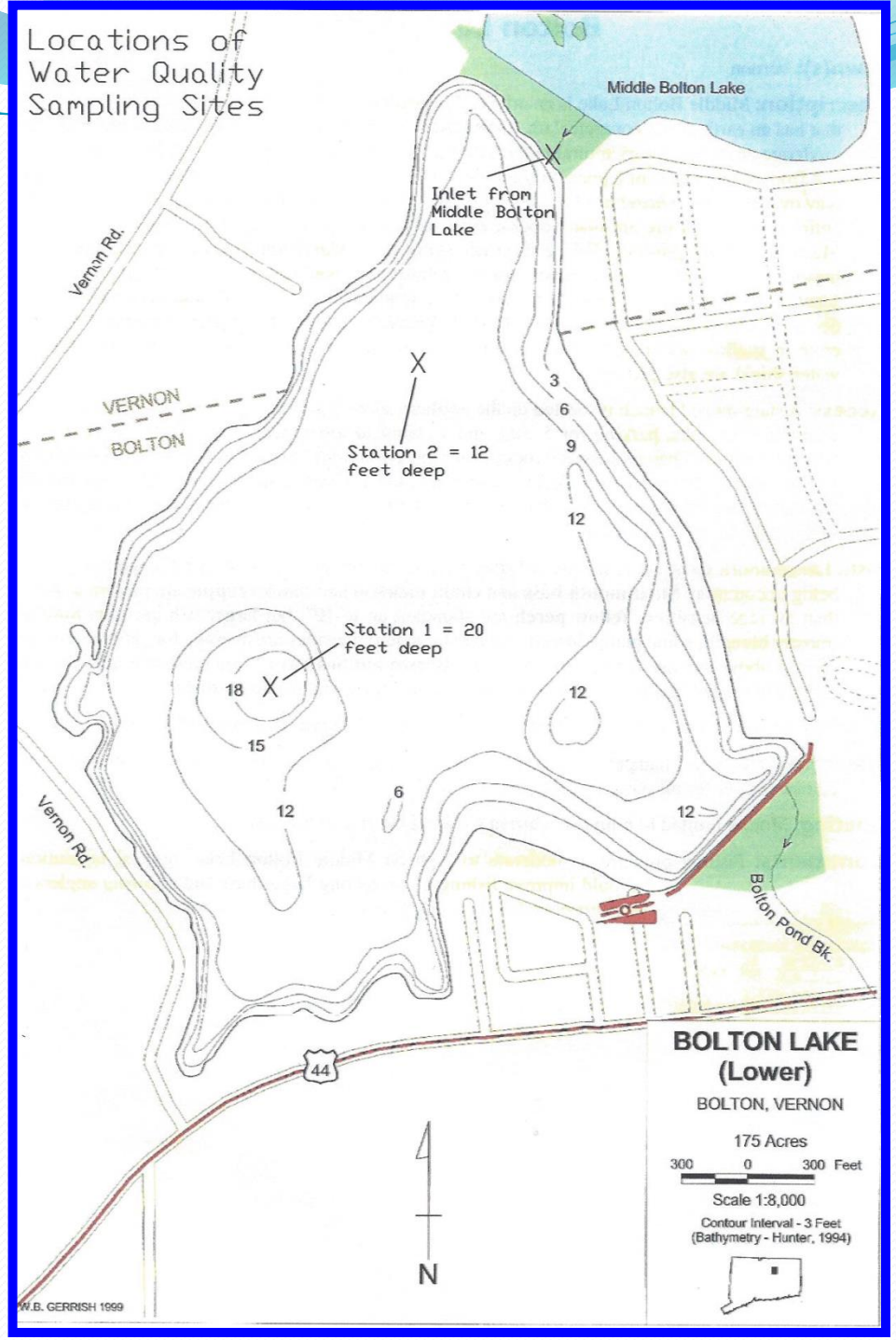
Mon	Tue	Wed	Thu	Fri	Sat	Sun
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

DECEMBER

Mon	Tue	Wed	Thu	Fri	Sat	Sun
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

Lake Visits

- Visited two stations
  - Station 1
    - Deep water =
    - Top, middle, bottom
  - Station 2
    - Shallow water =
    - Top, bottom
  - Outflow from Middle Bolton Lake

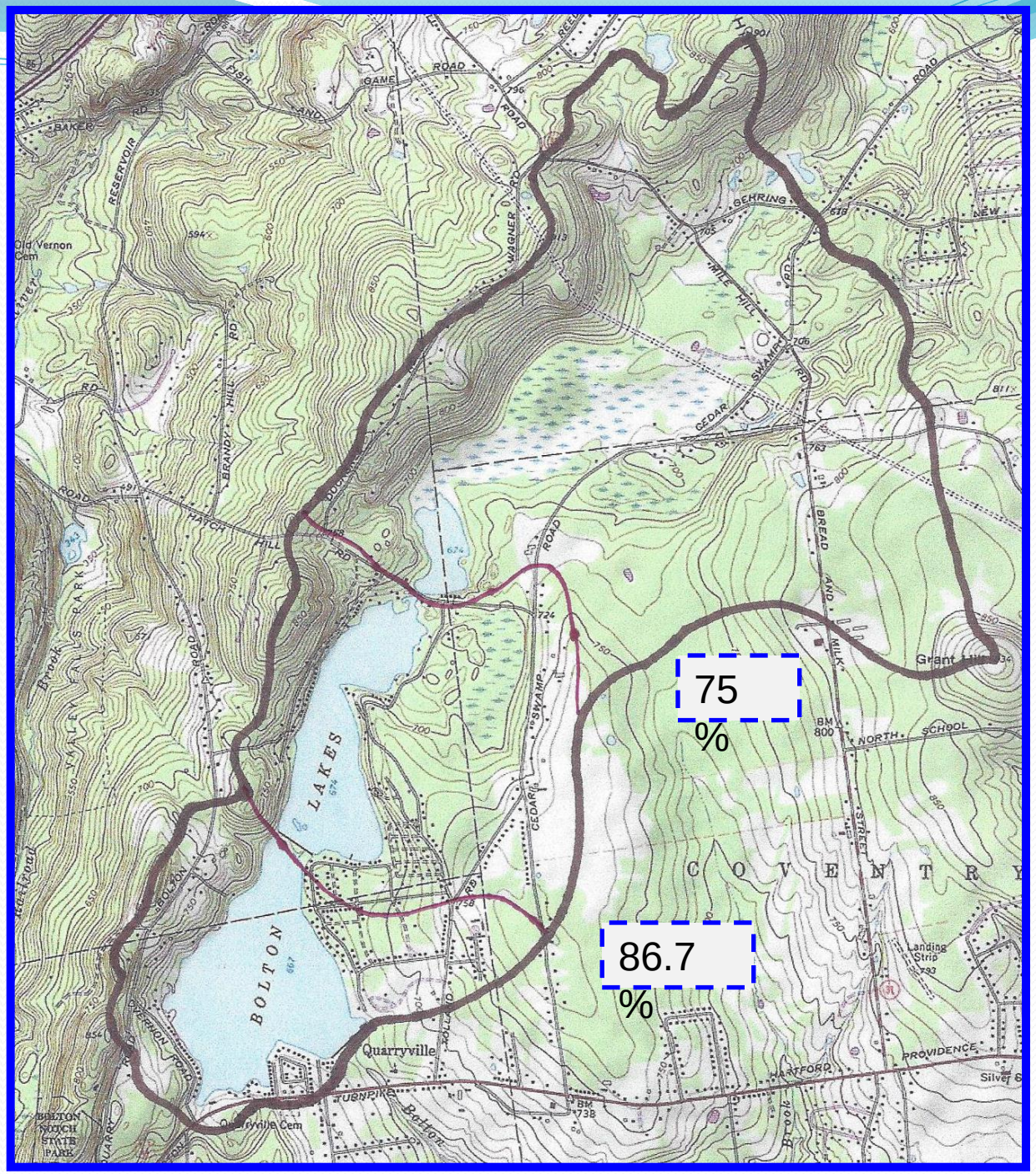


Lower Bolton Lake Watershed

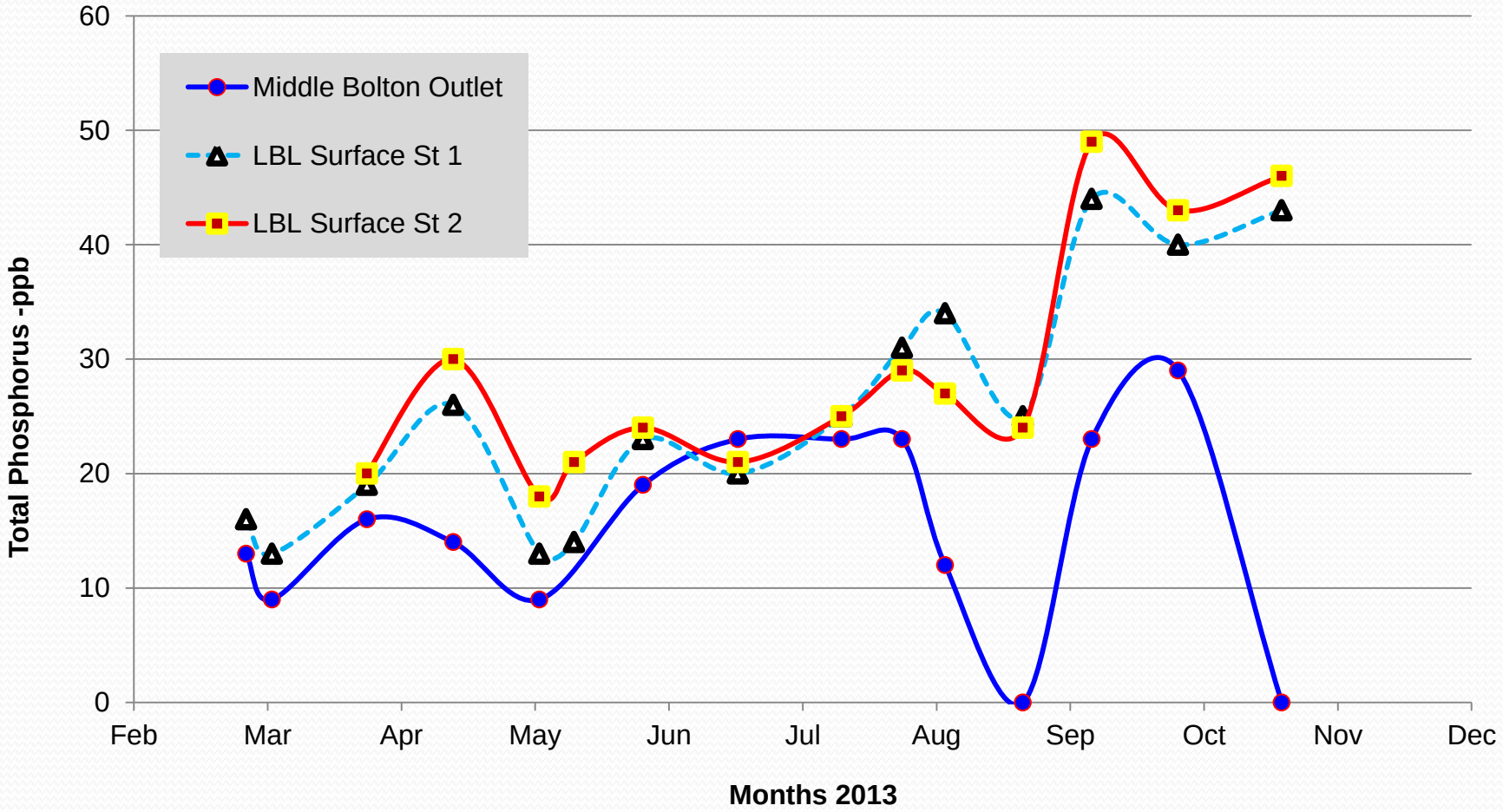
Watershed size of 2,419 acres
= drainage area of 2,244 acres

Watershed of Middle Bolton Lake = 1,945 acres

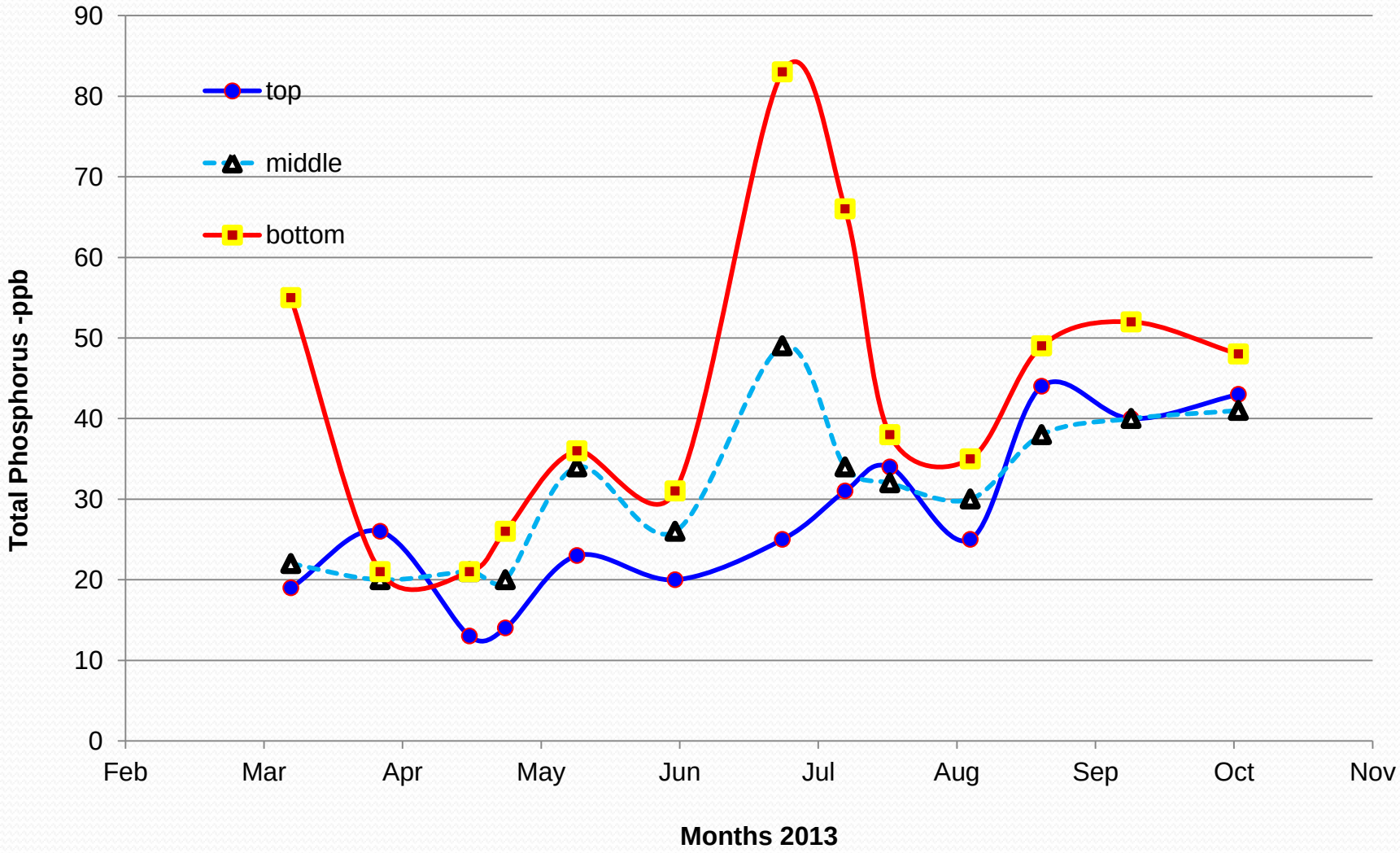
Watershed of Upper Bolton Lake = 1,460 acres



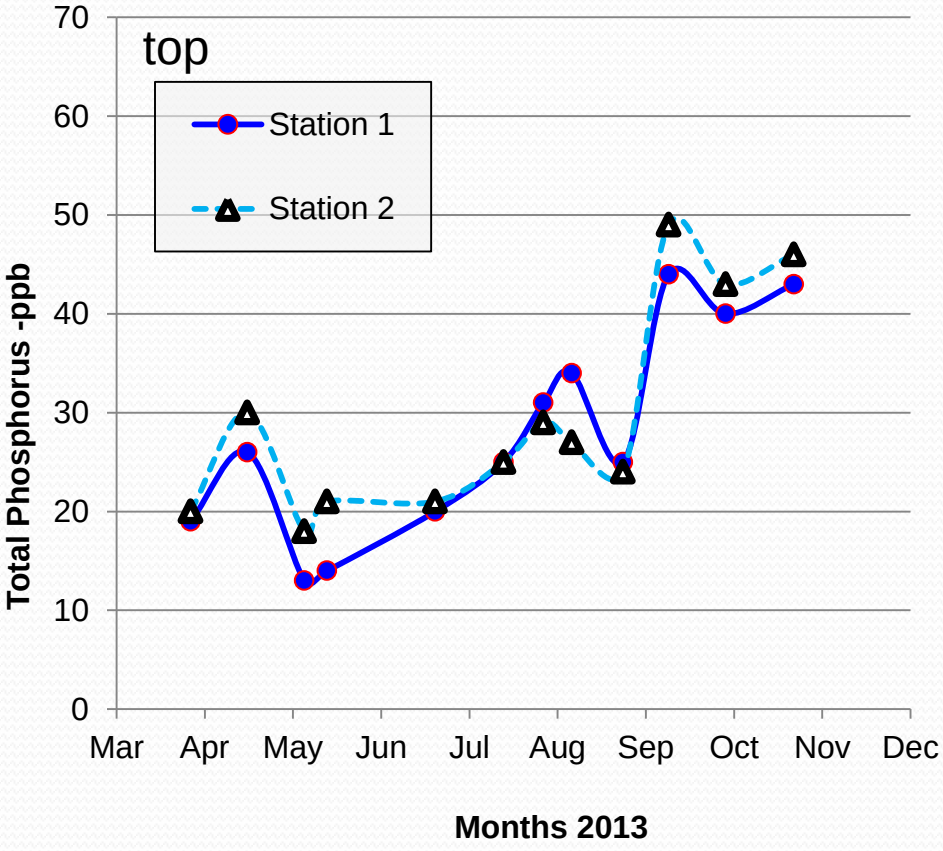
Phosphorus in Middle Bolton outflow and LBL

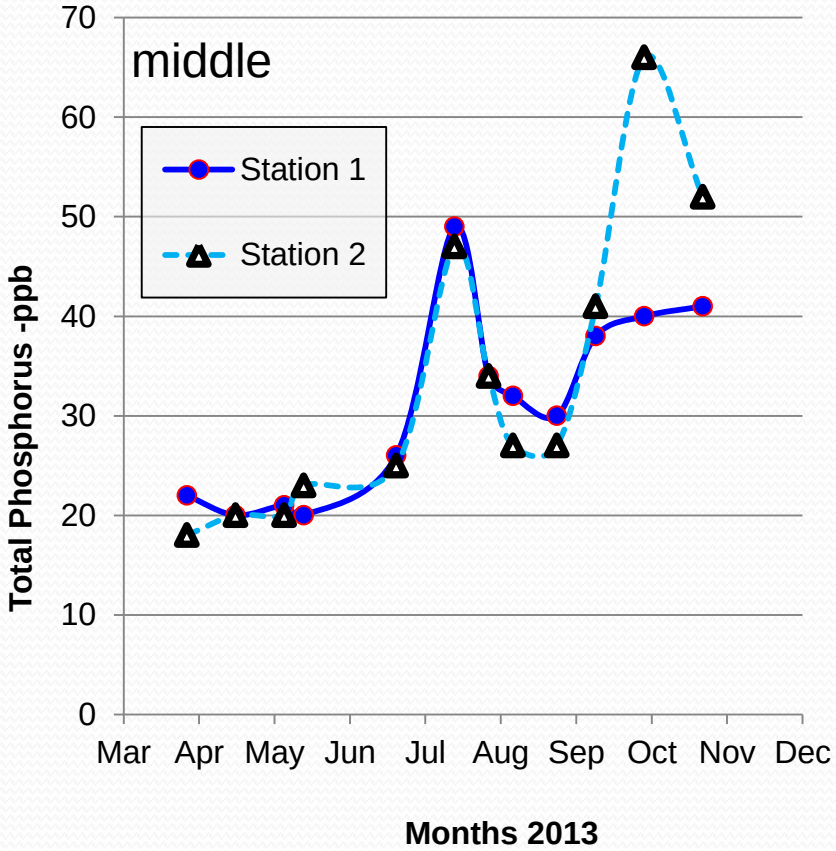


LBL 2013 Phosphorus

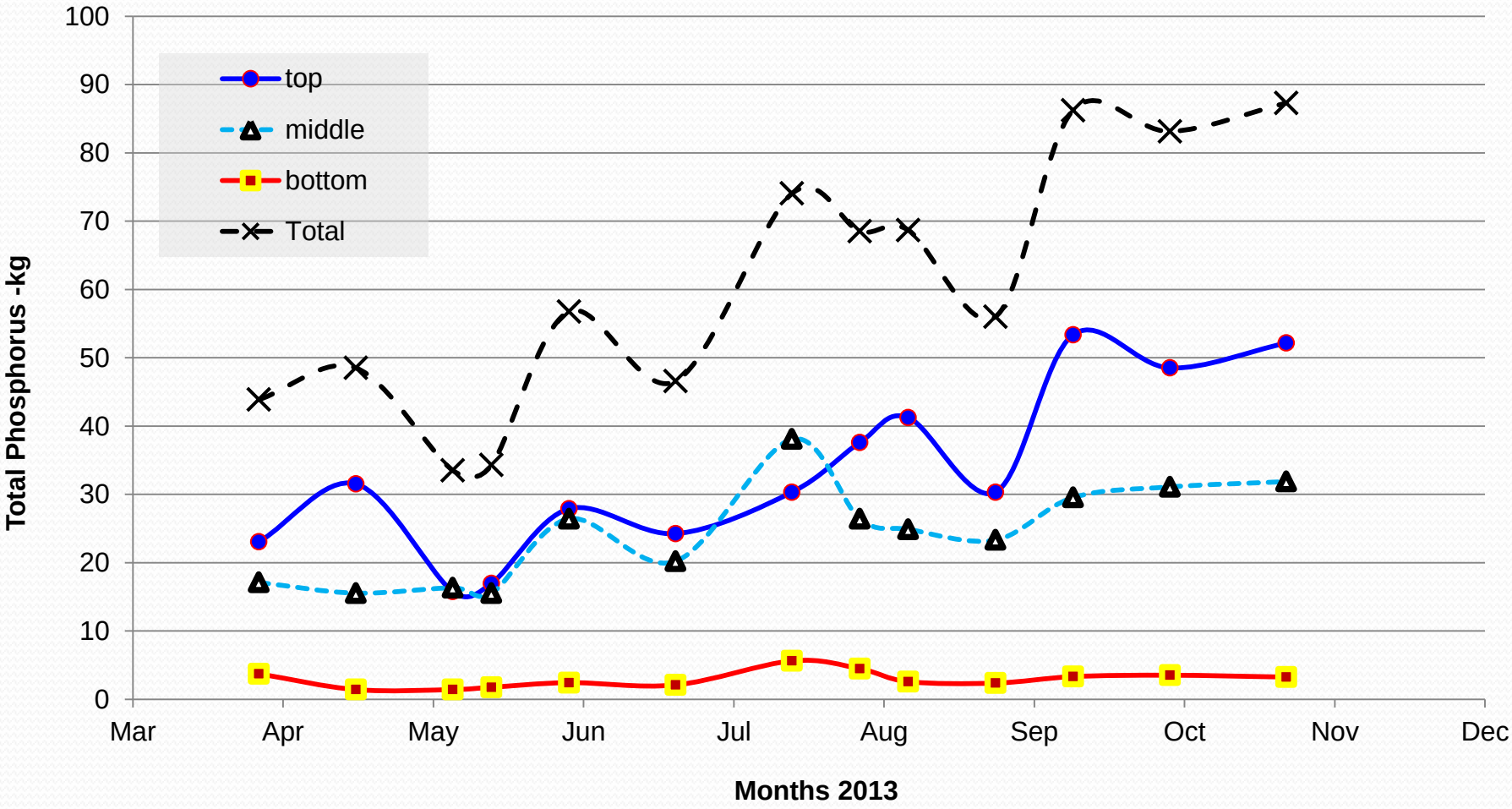


Phosphorus at different stations in LBL

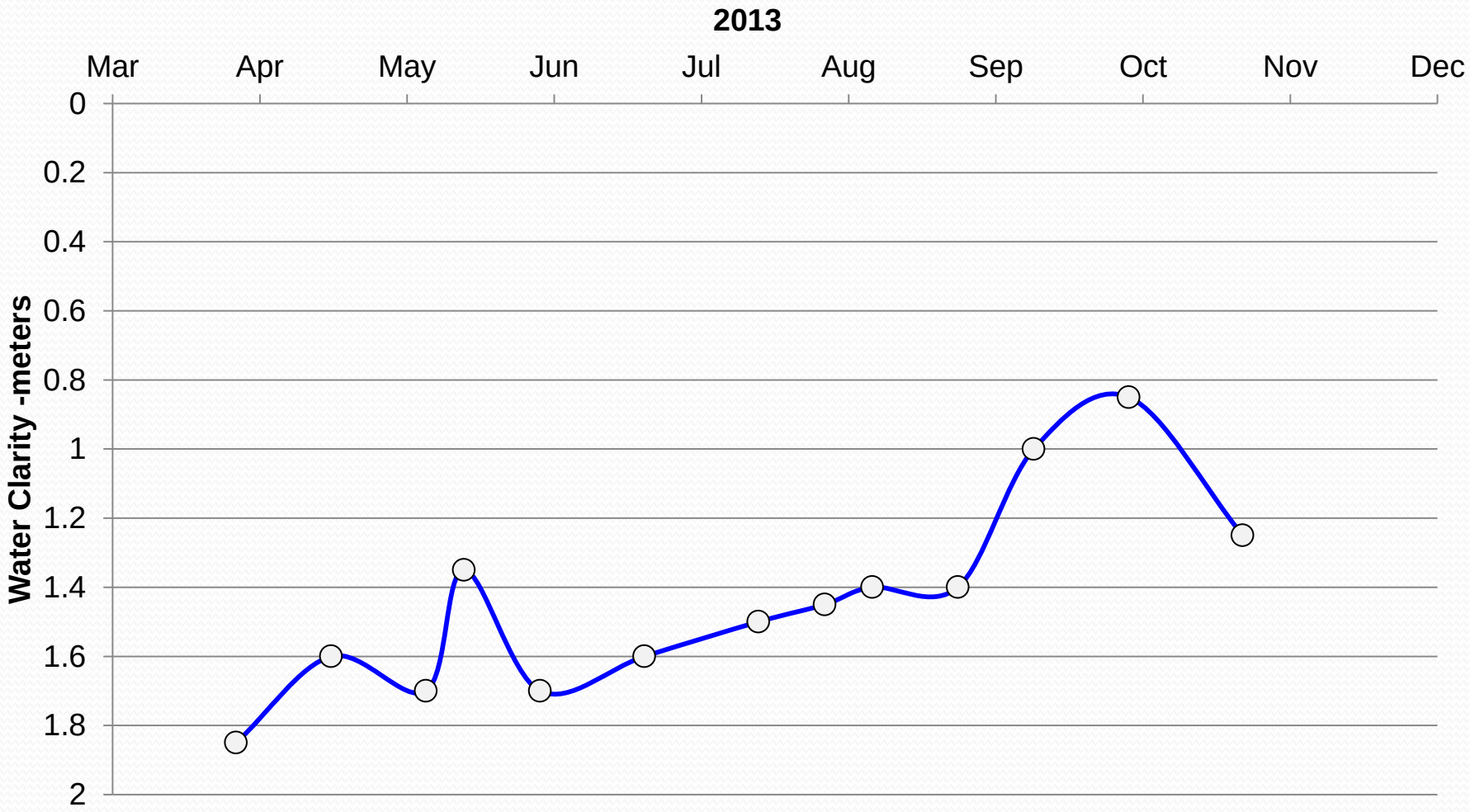




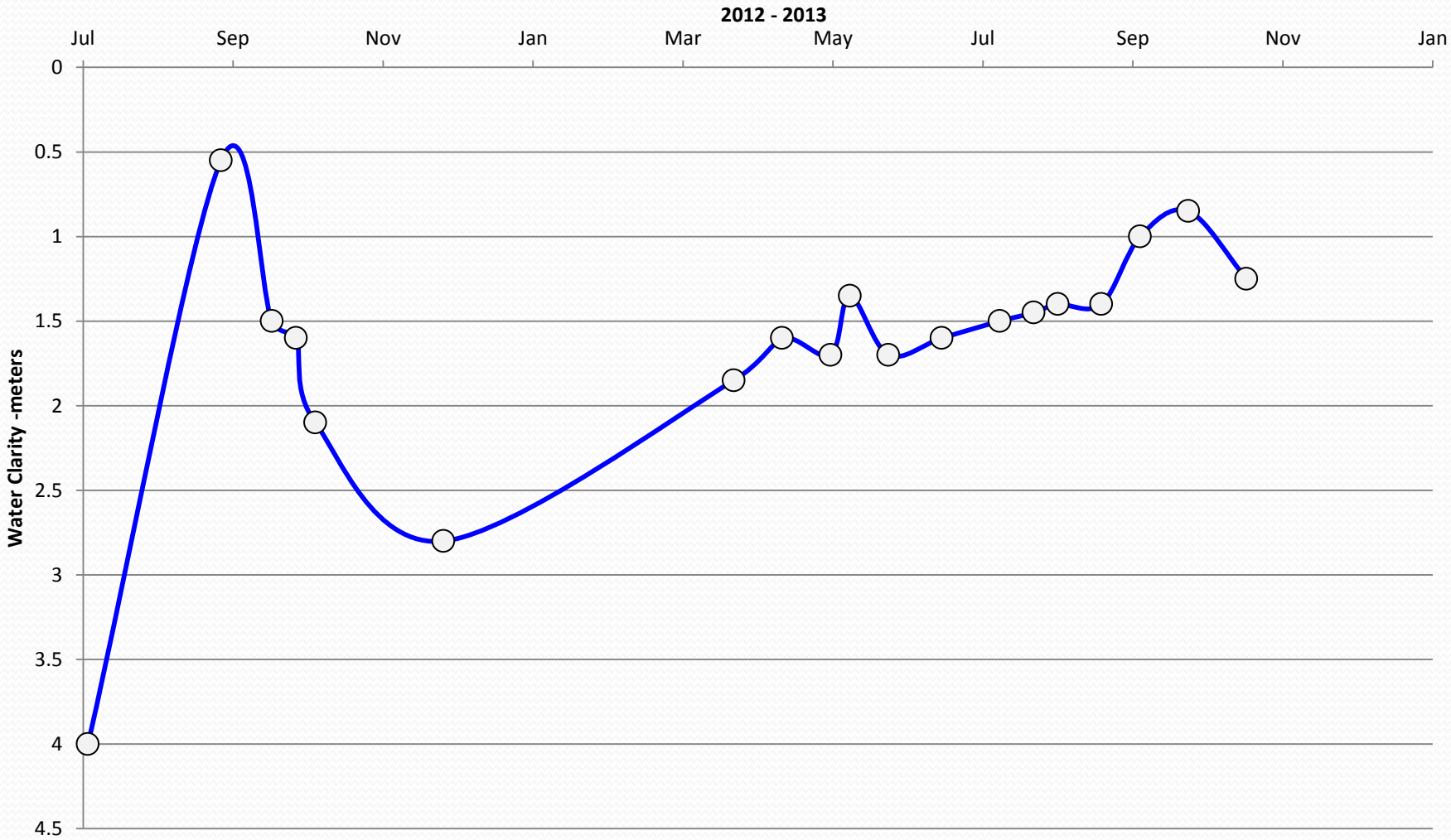
LBL 2013 Phosphorus as Mass



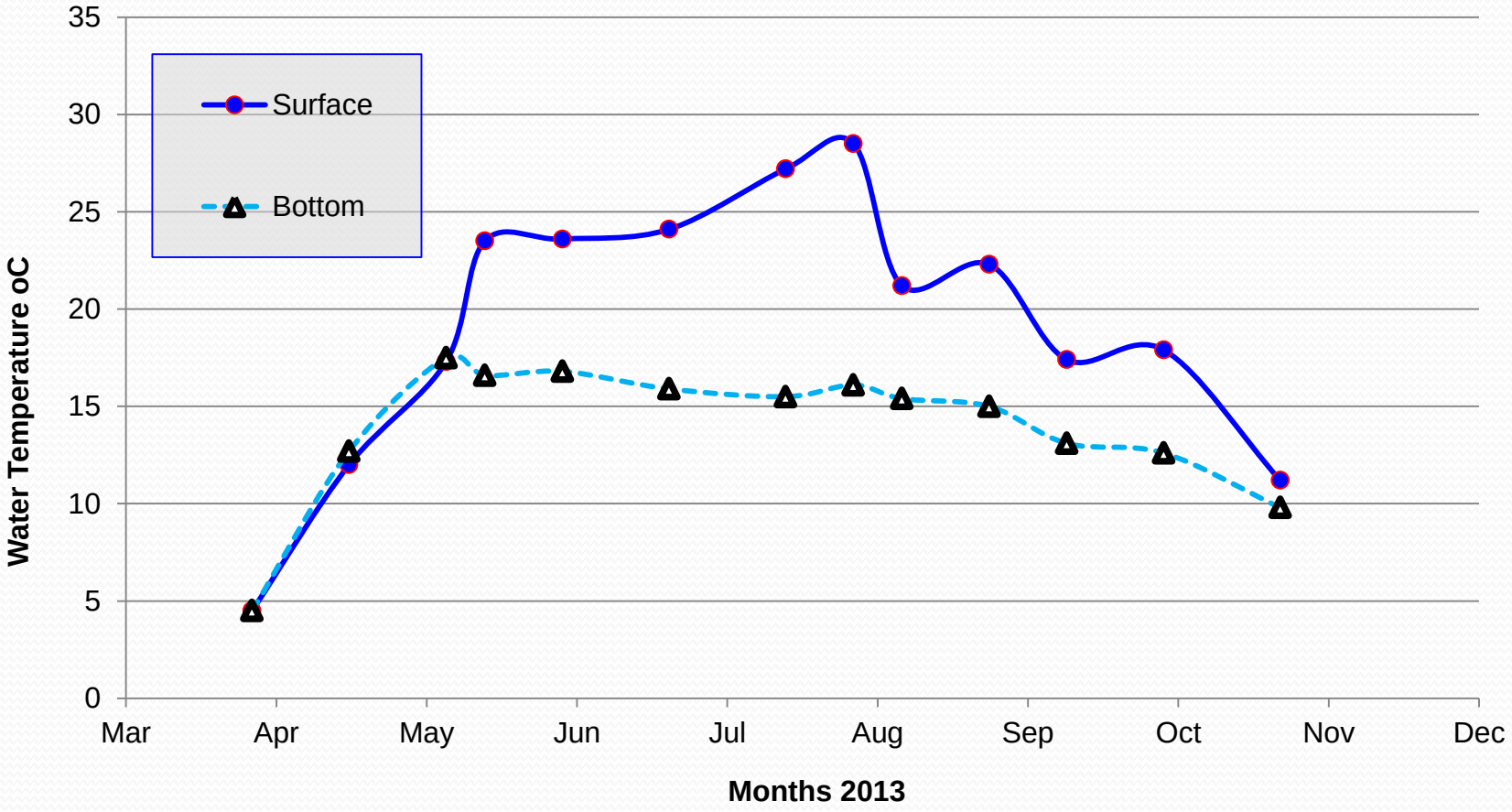
Water Clarity During 2013



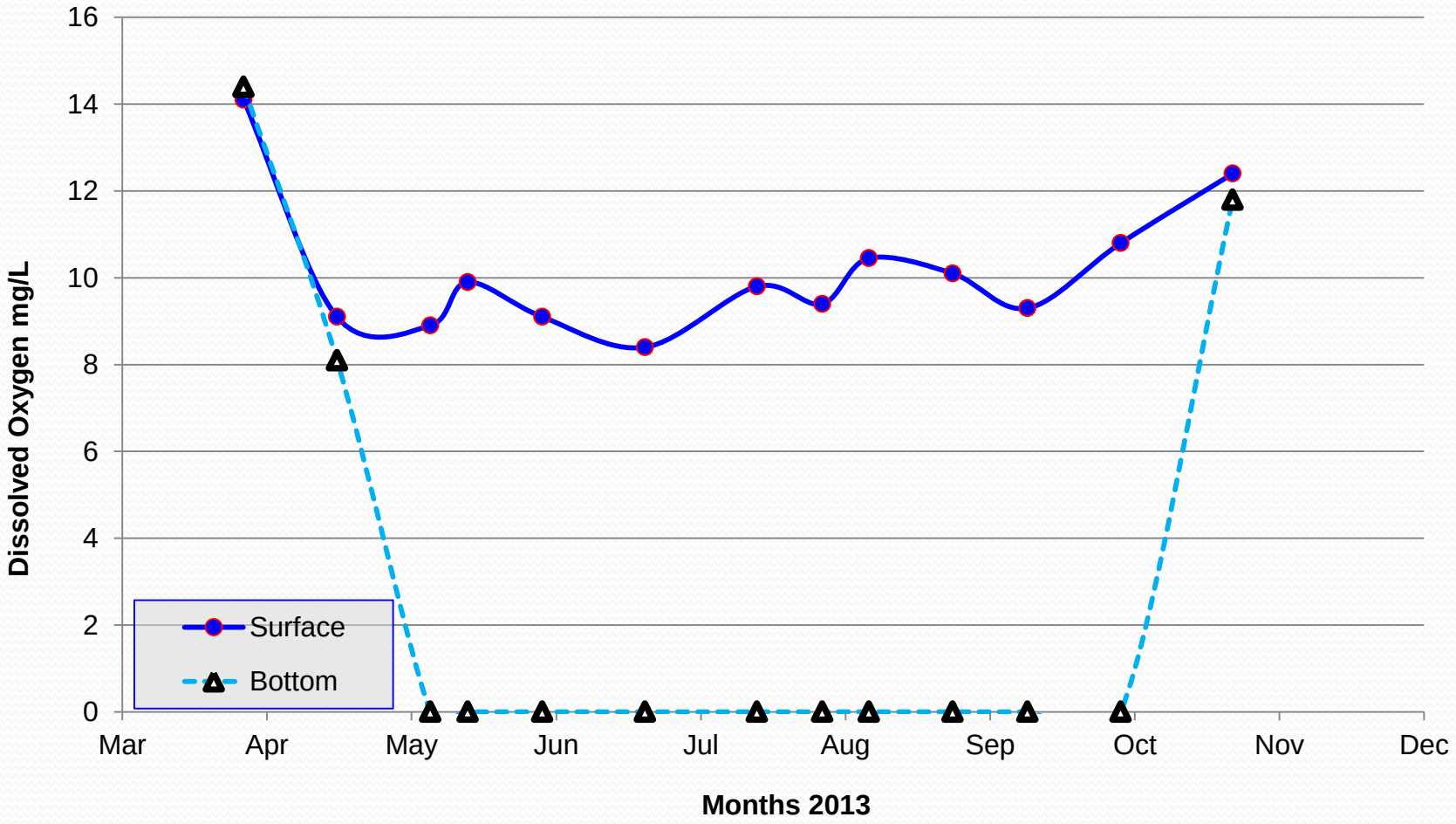
Two Years of Water Clarity



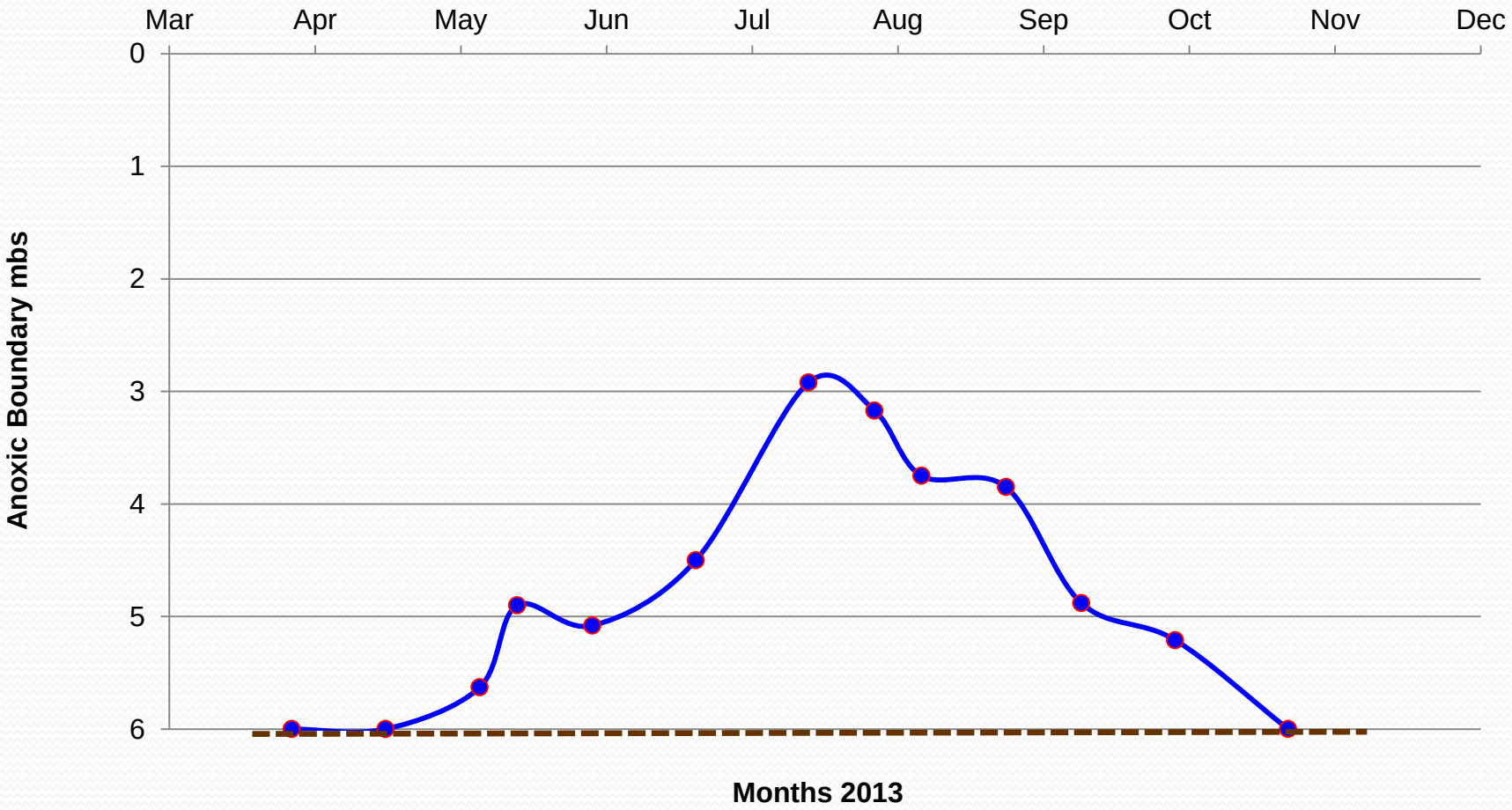
Water Temperature



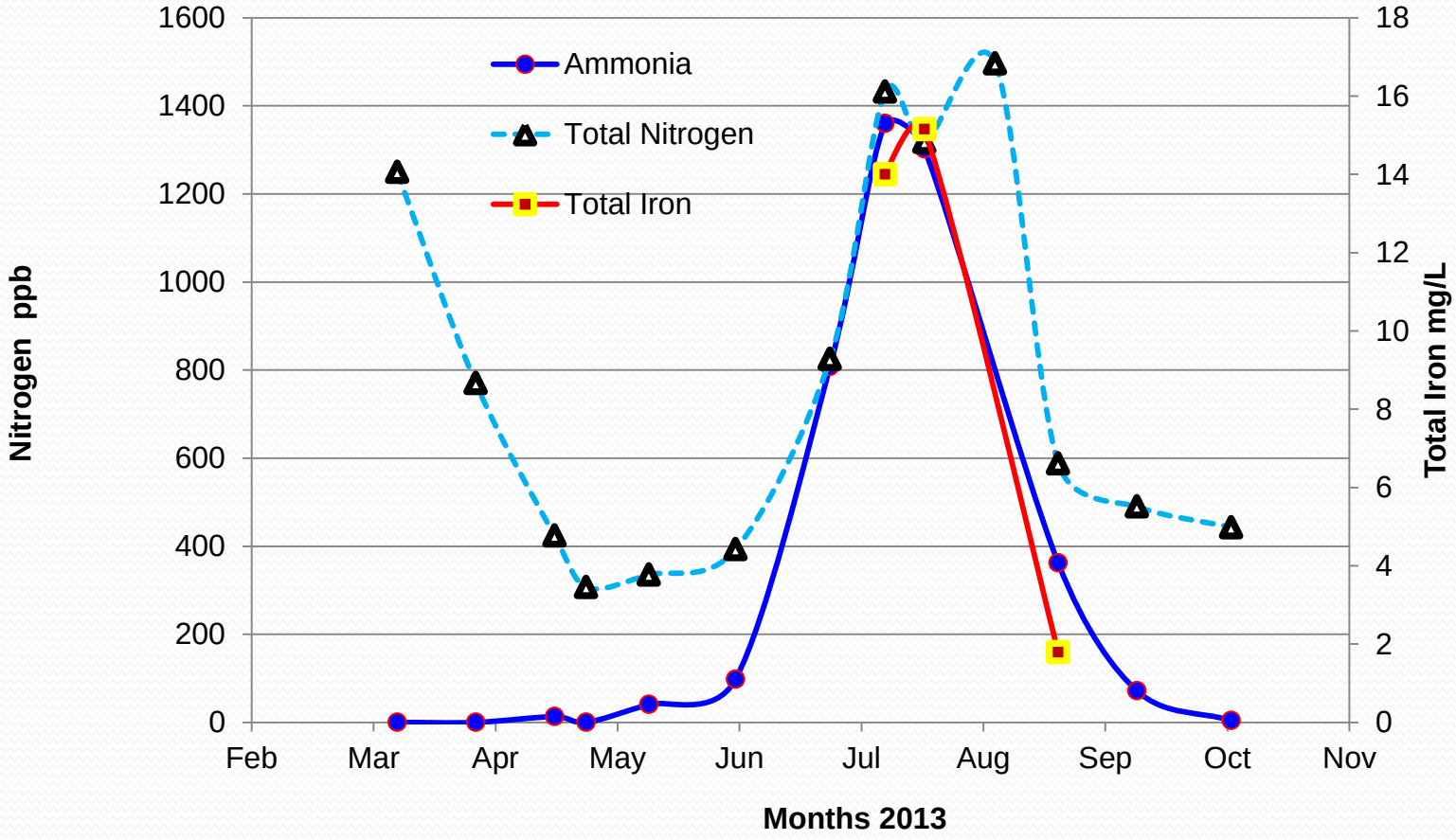
Dissolved Oxygen



Anoxic Boundary in LBL



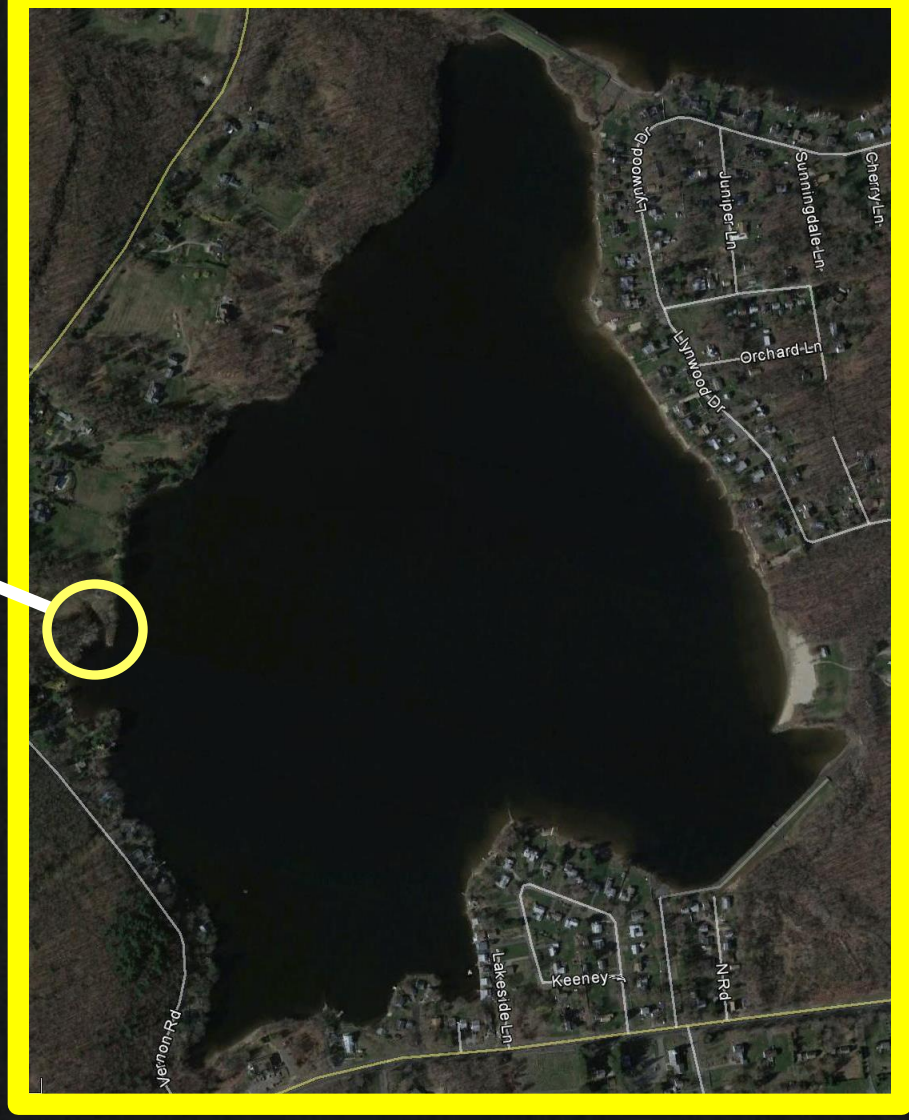
Deep Water Conditions



Southern Naiad in LBL July 29, 2013

Large-leaf pondweed
Tape grass
Coontail
Fanwort

Location of fanwort in LBL



Summary

- Phosphorus in LBL increased steadily during the season
- Phosphorus in the LBL was higher than in water from MBL
- Water clarity declined steadily during the season
  - blue-greens did not dominate instead plankton was composed of green and diatom alga
- Dissolved oxygen was depleted in bottom waters
- Total iron became dissolved in water column at high concentrations adding to poor clarity
- Southern naiad was practically none existent throughout the lake
- A few fanwort plants were found in a small cove on the western shore

Lower Bolton Lake – Treatment Program Summary

Task	Date
Received CT DEEP Permit	April 9th
Pre-Treatment Inspection (ACT)	April 16th
Initial Sonar Herbicide Treatment	May 20th
Inspection	June 4th
-Follow-Up Booster Herbicide Treatment -Copper Sulfate Algaecide Treatment (1/2 lake)	June 27th
Inspection	August 6th
-Inspection -Small Fanwort Treatment	September 5th

- **Inspections also conducted by NEAR**
- **Excellent naiad control (>95% reduction) achieved by end of July**

Lower Bolton Lake – 2014 Recommendations

- **Prepare and file Permit application with CT DEEP**
- **Contingency Reward and/or Clipper herbicide treatment (for naiad or fanwort re-growth)**
- **Copper sulfate algaecide treatments as needed**
- **OPTIONAL – TO BE DISCUSSED - SeClear/Alum treatment – Added water quality enhancement, phosphorus removal**

Recommended Budget :