BOLTON LAKES MONITORING PROGRAM

What It Is & Why We Do It

C. Peter Van Dine
October 22, 2015

June 2015

Recall August 2012

- We thought maybe we solved the problem
- But in August 2015 it turned green again
- We want to know why
- We want to know what to do about it
- A chain of reservoirs is different from a single lake
- The Friends of Bolton Lakes welcomes all who use, live on, or love these lakes

That is why we monitor

OBSERVING AQUATIC PLANTS

Plants growing in fresh water are natural and mostly good. They provide protection for small fish and other microscopic animals called zooplankton. They help hold the bottom sediment in place. And some, like water lilies, are beautiful. To grow they need water, light, and food. They have plenty of water, the bottom sediment is rich in plant nutrients, and when the lake water is clear they get good light. In other words, fresh water lakes will naturally have aquatic plants.

However, some aquatic plants will grow and spread out of control. When this happens they seriously degrade and even destroy the usefulness and beauty of a lake. We need to be on constant watch for these plants. We must make sure we do nothing to encourage their growth. The Bolton Lakes have a history of such evil plant invasions.

Variable Leaf Milfoil
Myriophyllum heterophyllum

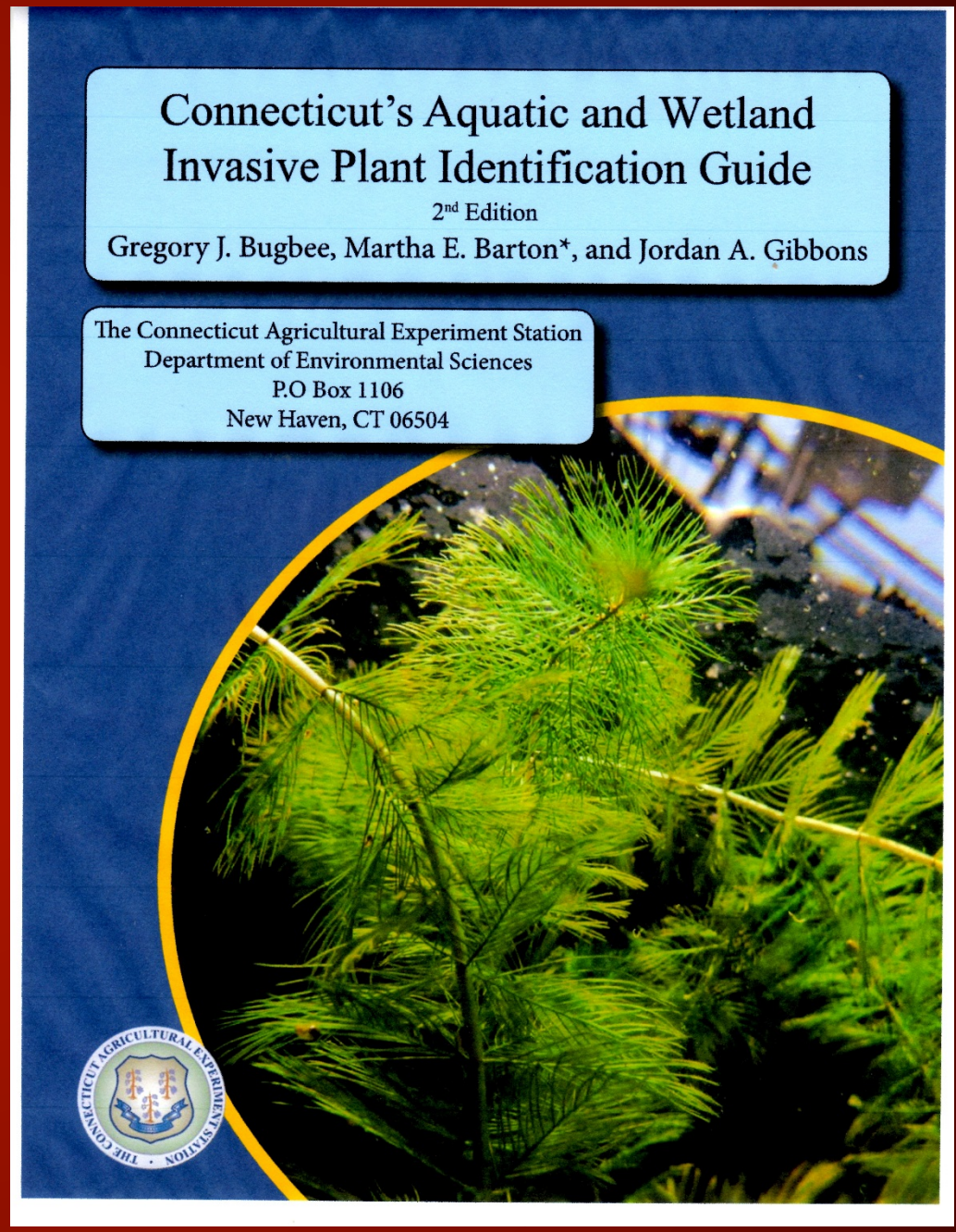
Southern Naiad
Najas guadalupensis

Fanwort
Cabomba caroliniana

Curly Leaf Pondweed
Potamogeton crispus

Purple Loosestrife
Lythrum salicaria

Hydrilla
Hydrilla verticillata



Invasive Aquatic Plant Identification Protocol

Invasive Aquatic Plant Identification Protocol

The Bolton lakes (Lower, Middle, Upper and Cedar Swamp) are inspected regularly by both professional and volunteer surveyors for the presence of invasive aquatic plants. Equally important, however, is monitoring by people who use our waterways on a daily basis. The following protocol can be used by residents, fishermen and boaters to determine if suspicious plants are non-native or invasive and pose a threat to the health of our natural resources or to recreational safety.

These guidelines can be used in conjunction with published descriptions of problem plants. Information about invasive species can be found at: Connecticut's Aquatic and Wetland Invasive Plant Identification Guide Bulletin 2nd Ed. Bulletin 1035. Public plant identification training sessions are also sponsored periodically by State and municipal resource agencies – watch local newspapers for announcements.

If you find an aquatic plant that you suspect is non-native or invasive, please collect a sample and submit it for formal identification. Follow the steps below to ensure the most accurate determination:

1. Email a photograph of the plant sample to Bolton Lake Commissioner Kim Welch at Kim.Welch@boltonct.org . To assist in identification please spread the sample on a piece of white paper in a manner that makes sure the key characteristic features of the plant are visible.

2. Email the following information with the photograph:

   - Collector's name, address, phone number and/or email address.
   - The date the plant was found.
   - The location where the plant was found.
   - Whether the plant was 1) rooted in that location, 2) loosely floating, or washed ashore.
   - Whether there was a sizable population of the plant in that location.
   - Any additional information.

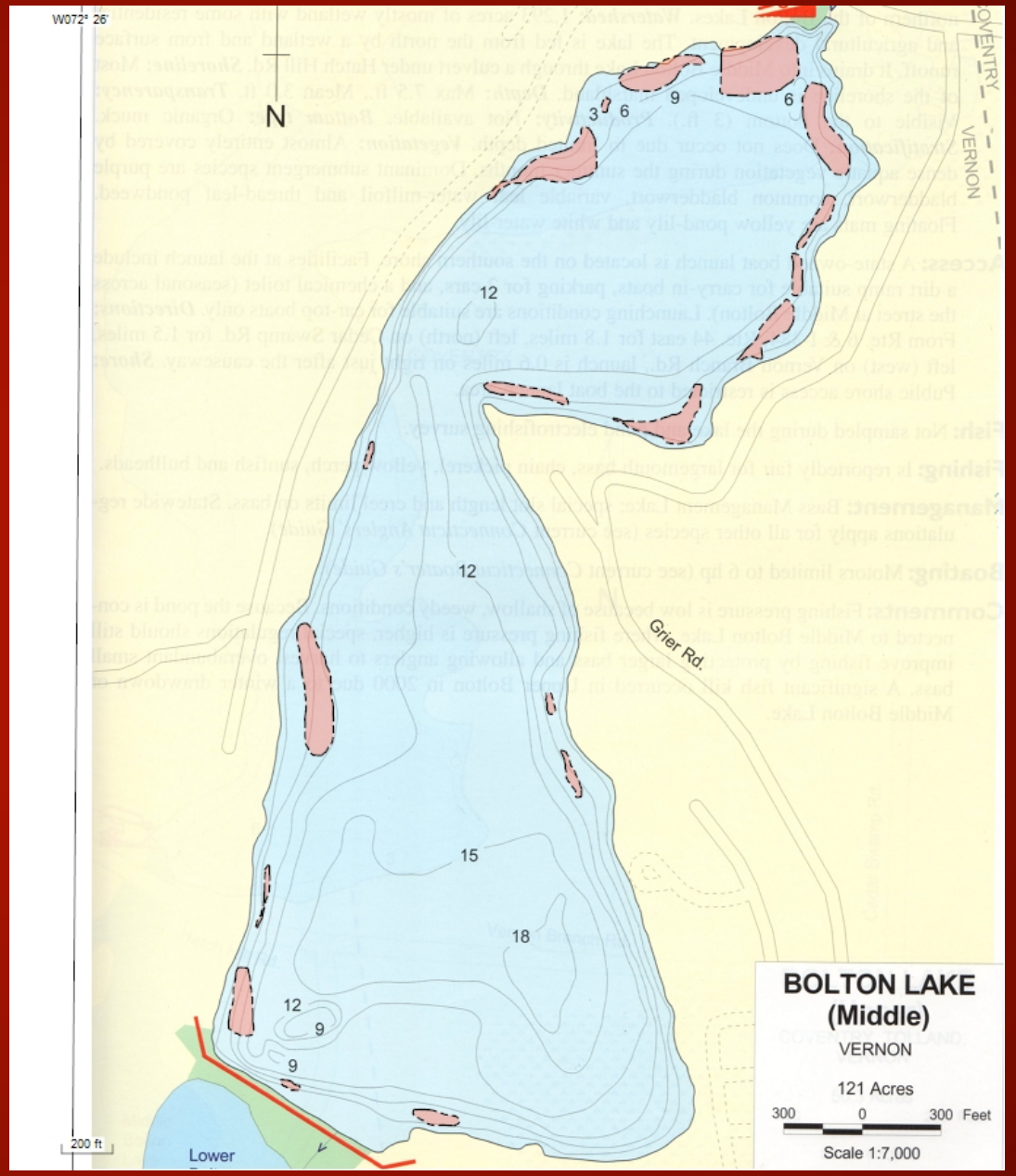
3. Please retain and refrigerate the sample in a ziploc bag containing enough water to keep it moist. Label the bag with your name and the date and location of collection.

4. You will be notified if the plant has been identified from your photograph. If further examination is required for identification, you will be asked to deliver the refrigerated sample to Kim Welch at 51 Vernon Rd, Bolton, CT

Variable Leaf Milfoil

Myriophyllum heterophyllum

Mapped on June 20, 2014



Plant & Algae Nutrients

If it makes your yard green
it will make your lake green

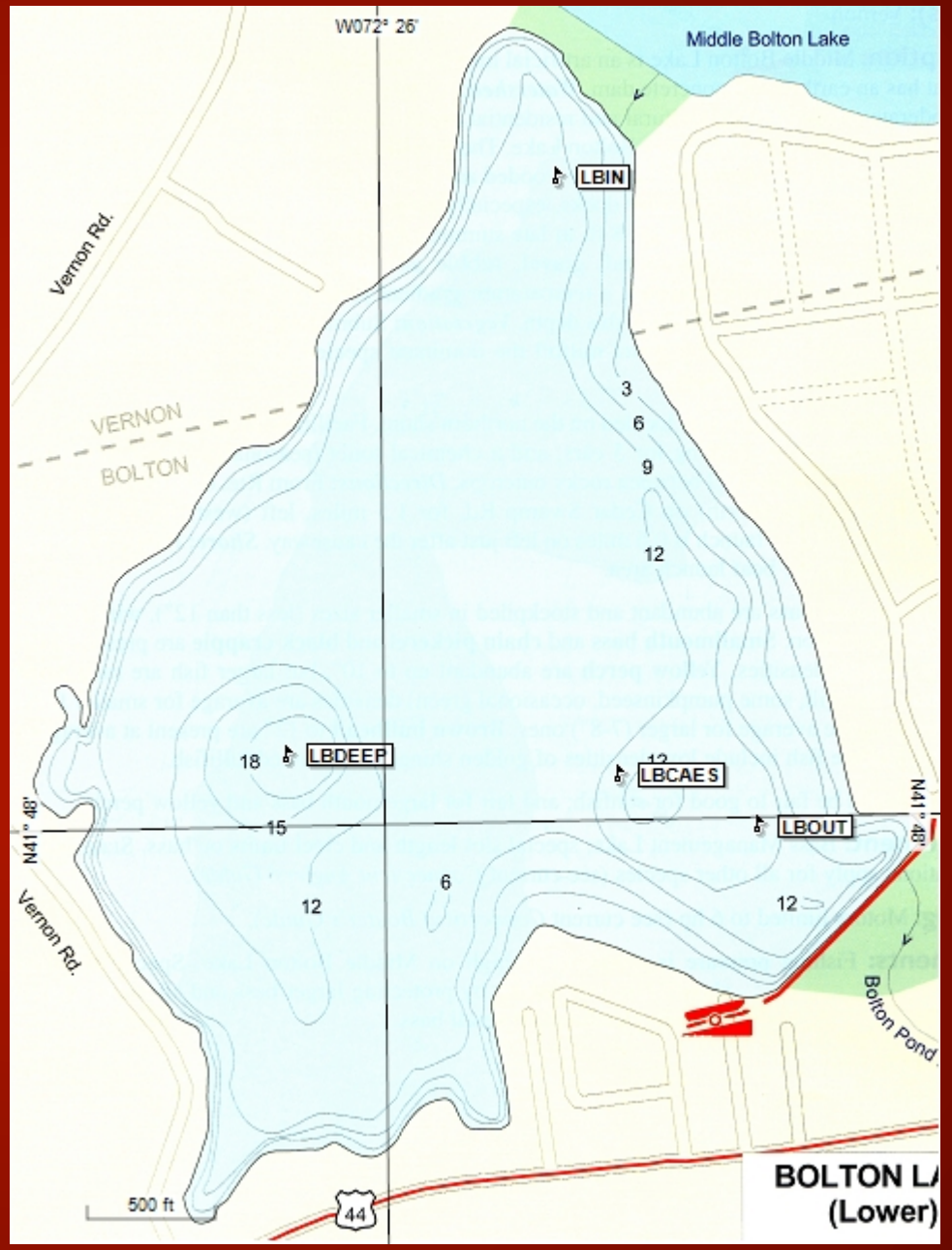
Table 2-3.—The listed elements are required for plant growth. Plant demand is represented by the percentage of these essential elements in the living tissue of freshwater plants. Supply is represented by the proportions of these elements in world mean river water. The imbalance between demand and supply is an important factor in limiting plant growth (Valentyne, 1974).

ELEMENT	SYMBOL	DEMAND BY PLANTS (%)	SUPPLY IN WATER (%)	DEMAND SUPPLY RATIO[1]
Oxygen	O	80.5	89.0	1
Hydrogen	H	9.7	11.0	1
Carbon	C	6.5	.0012	5,000
Silicon	Si	1.3	.00065	2,000
NITROGEN	**N**	**.7**	**.000023**	**30,000**
Calcium	Ca	.4	.0015	< 1,000
Potassium	K	.3	.00023	1,300
PHOSPHORUS	**P**	**.08**	**.000001**	**80,000**
Magnesium	Mg	.07	.0004	< 1,000
Sulfur	S	.06	.06	.0004
Sodium	Na	.04	.0006	< 1,000
Iron	Fe	.02	.00007	< 1,000

[1] Percent of element in plant tissue ÷ percent in available water. The higher the ratio, the scarcer the nutrient. Phosphorus, in particular, is likely to limit plant growth in a lake. If more phosphorus is supplied, however, plant growth is likely to accelerate unless and until limited by some other factor.

Looking for Nutrients

Lower Bolton Lake Sample Points



Our Equipment

- GPS
- Secchi Disk
- Oxygen & pH Probes
- Water Sampler

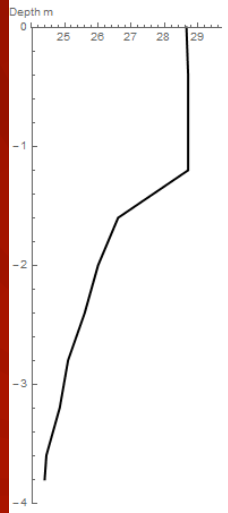
Graphical Data

Compiled & Computed

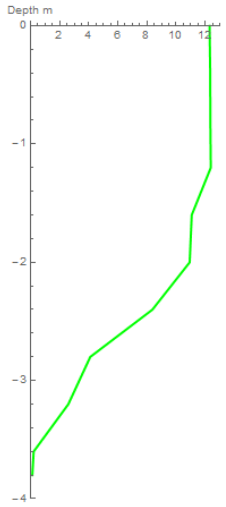
from Probes

Lower Bolton Lake August 19, 2015, 05:27 PM Station: LBCAES Collectors: PV
Secchi 1.0 m Weather: Sunny, Scattered Cumulus, Fresh South Wind
Notes: Water Column Green, No Flow over Dams, Gauge @ −0.5 ft

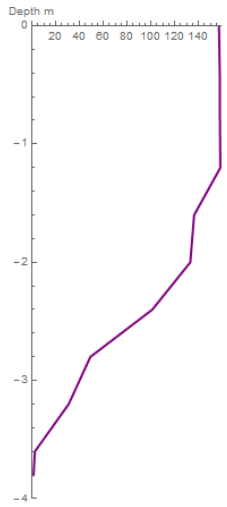
Temperature °C



DO mg/L



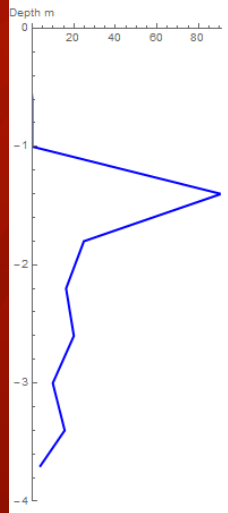
% Saturation DO



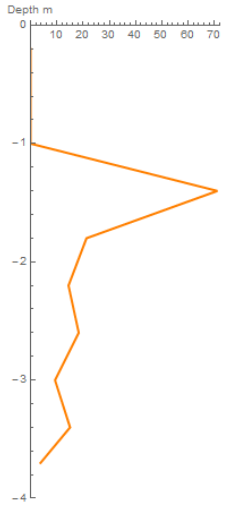
Input Data

D	T	O	P
0.00	28.65	12.30	8.44
−0.40	28.70	12.34	8.44
−0.80	28.70	12.35	8.48
−1.20	28.70	12.38	8.46
−1.60	26.60	11.07	8.01
−2.00	26.00	10.93	8.02
−2.40	25.60	8.37	7.19
−2.80	25.10	4.10	6.28
−3.20	24.85	2.59	6.12
−3.60	24.45	0.21	5.97
−3.80	24.40	0.12	6.01

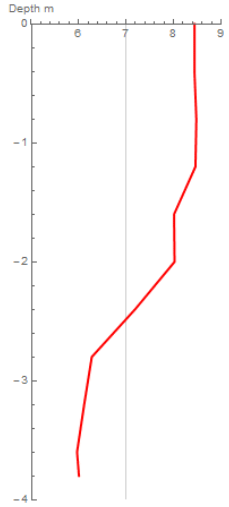
RTRM



RVG



pH

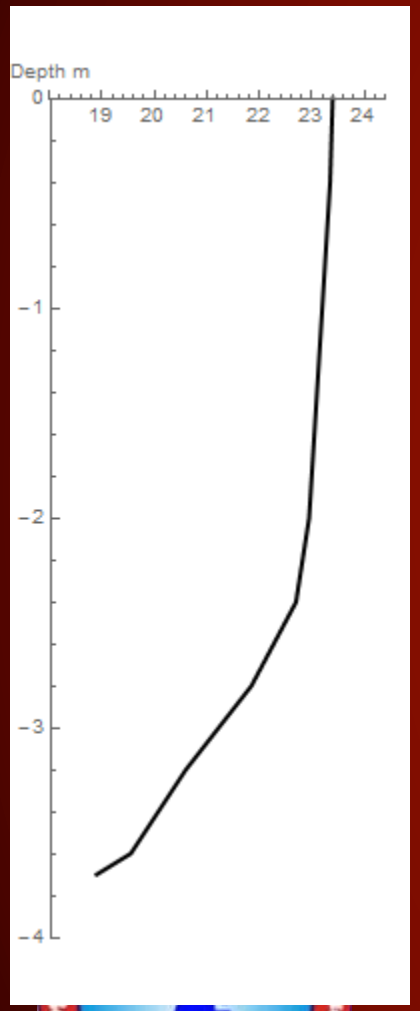


Output Data

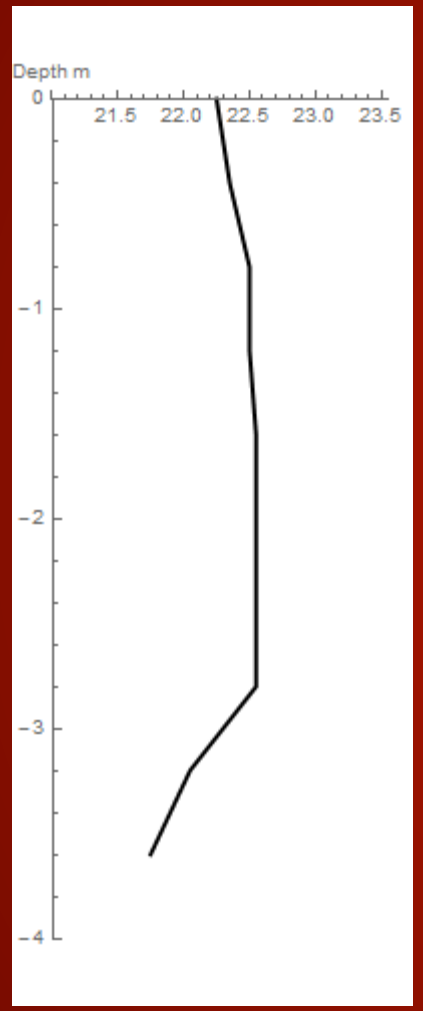
D	RT	RV	%S
0.0	0.0	0.0	157.2
−0.4	−2.2	0.0	157.9
−0.8	0.0	0.0	158.0
−1.2	0.0	0.0	158.4
−1.6	90.8	71.1	136.3
−2.0	24.8	21.3	133.1
−2.4	16.2	14.4	101.2
−2.8	20.0	18.3	49.1
−3.2	9.9	9.3	30.9
−3.6	15.6	15.0	2.5
−3.8	3.9	3.8	1.4

2015 Temperature °C at LBCAES

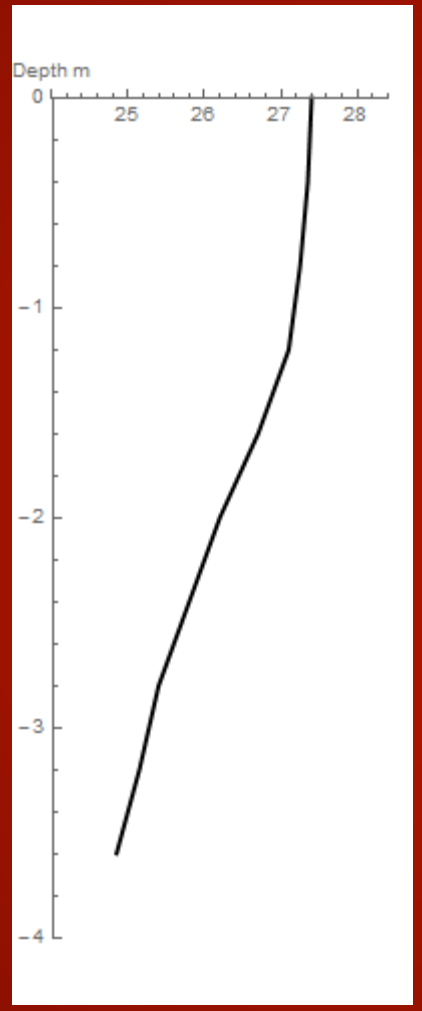
May 31



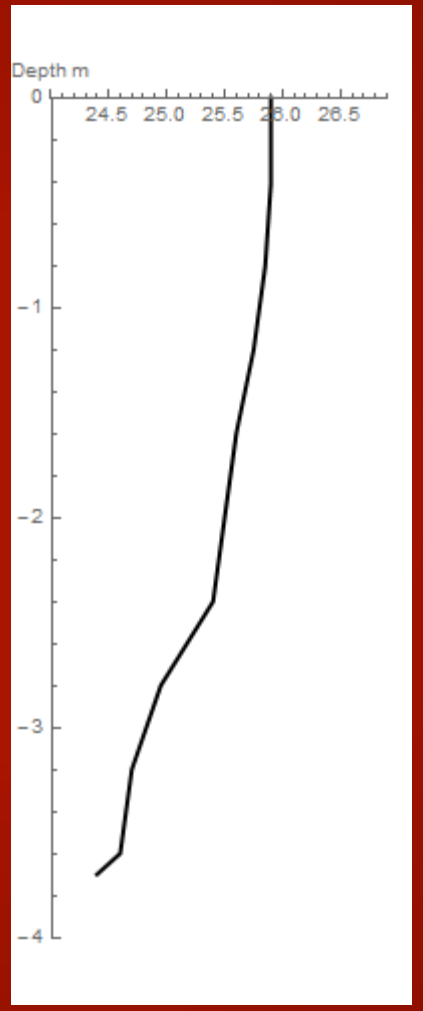
June 20



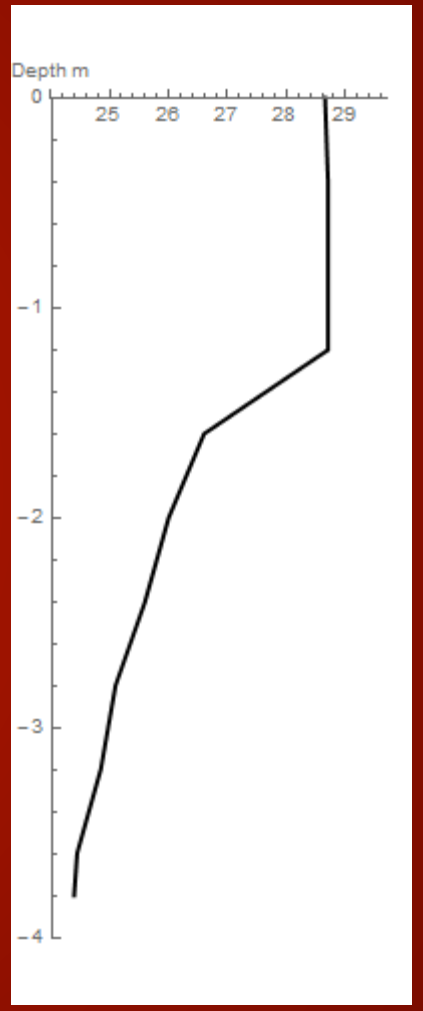
July 21



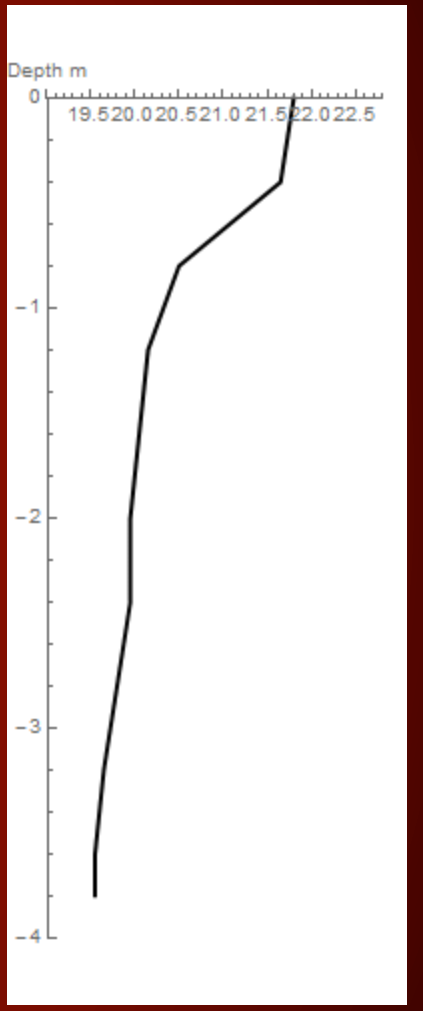
August 14



August 19

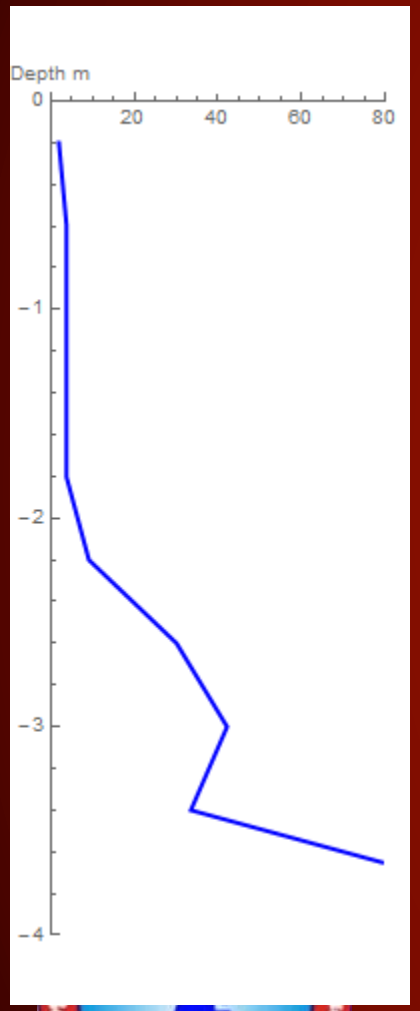


September 27

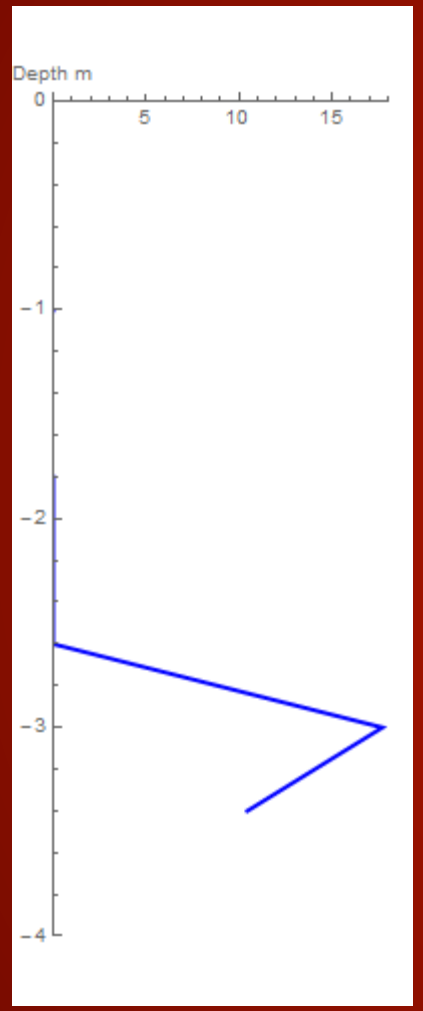


2015 Relative Thermal Resistance to Mixing at LBCAES

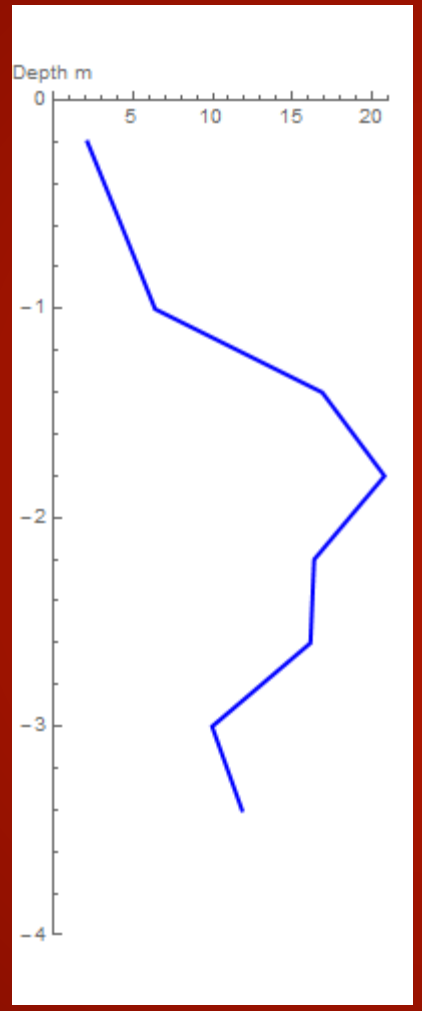
May 31



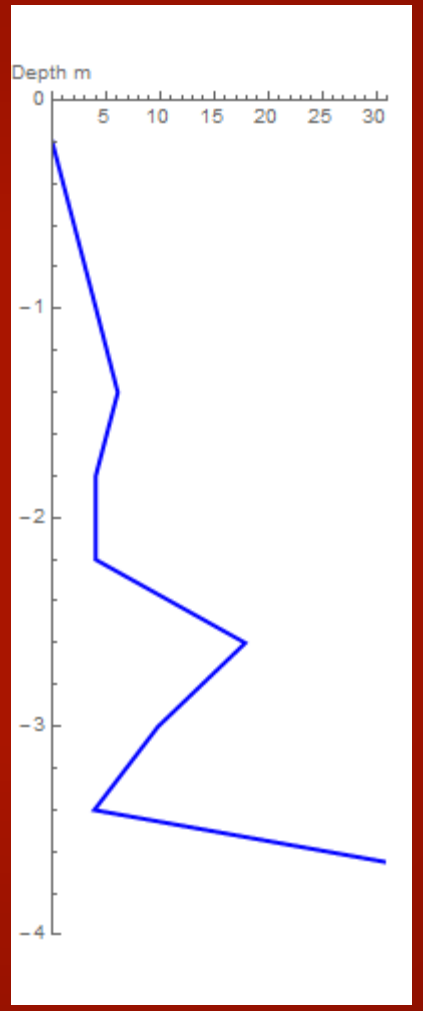
June 20



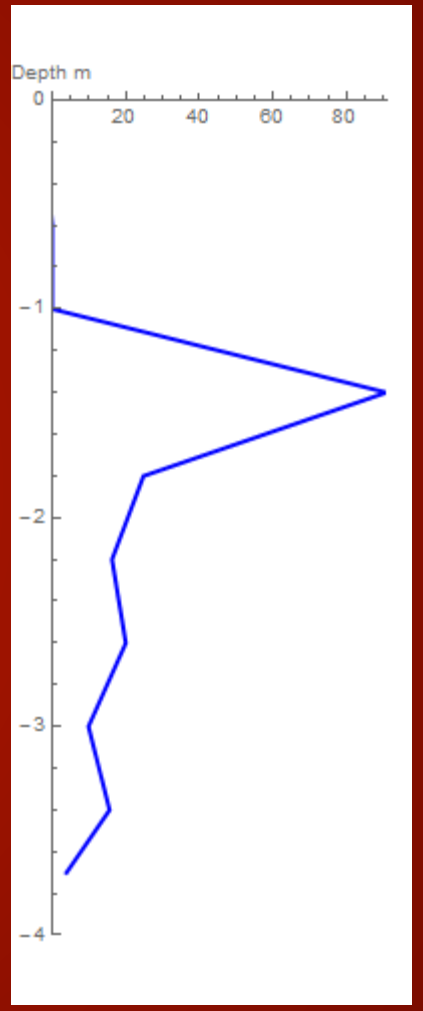
July 21



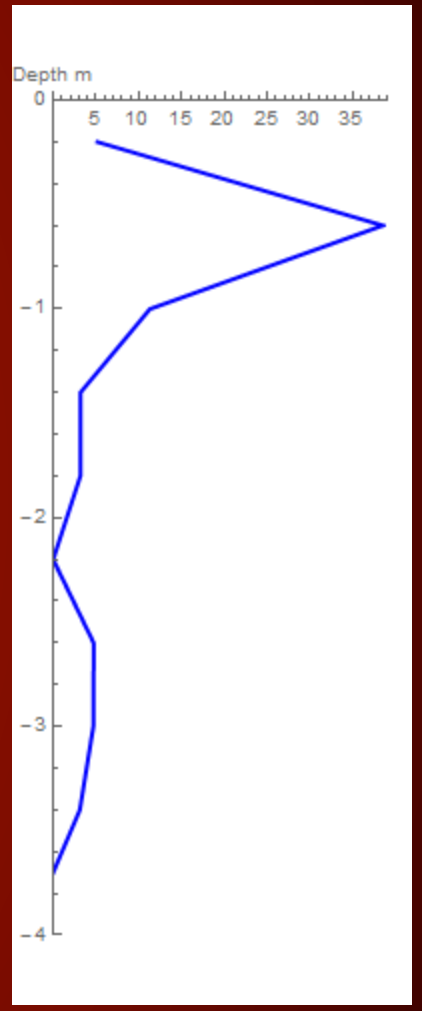
August 14



August 19

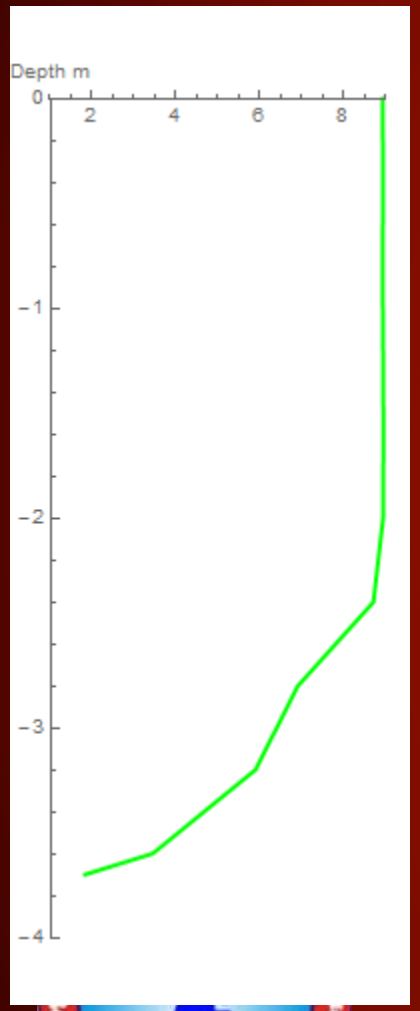


September 27

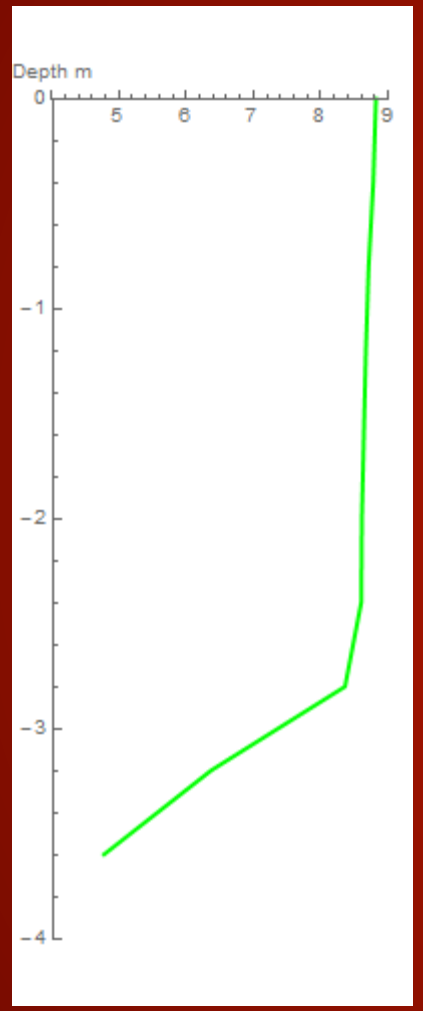


2015 Dissolved Oxygen mg/L at LBCAES

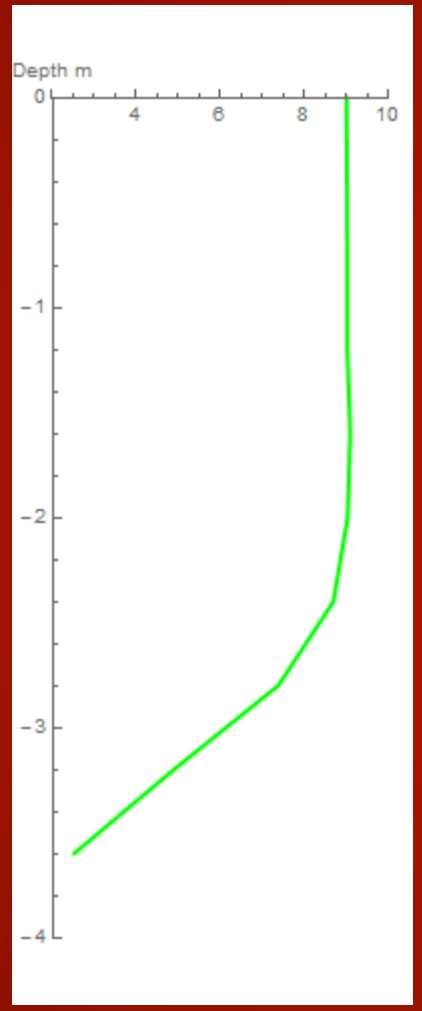
May 31



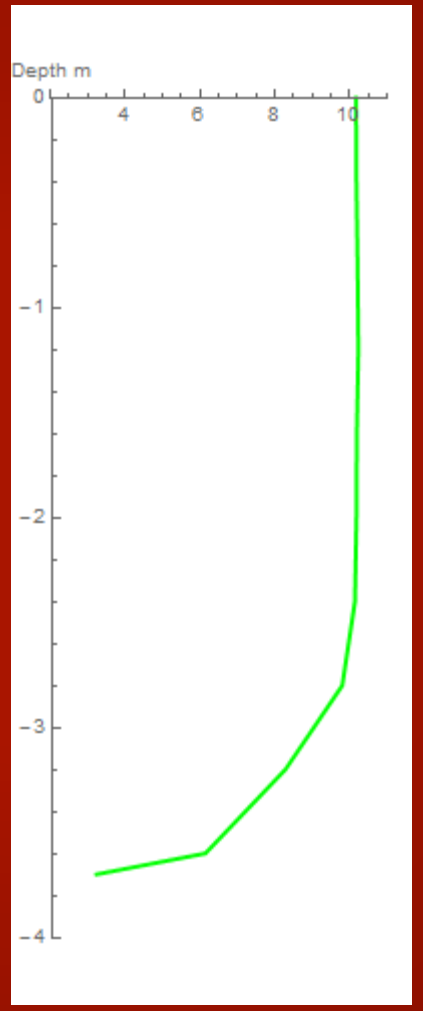
June 20



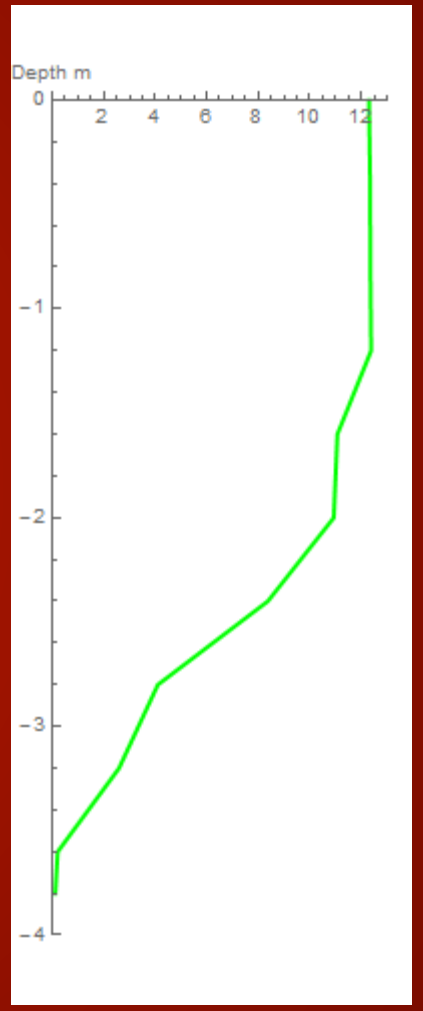
July 21



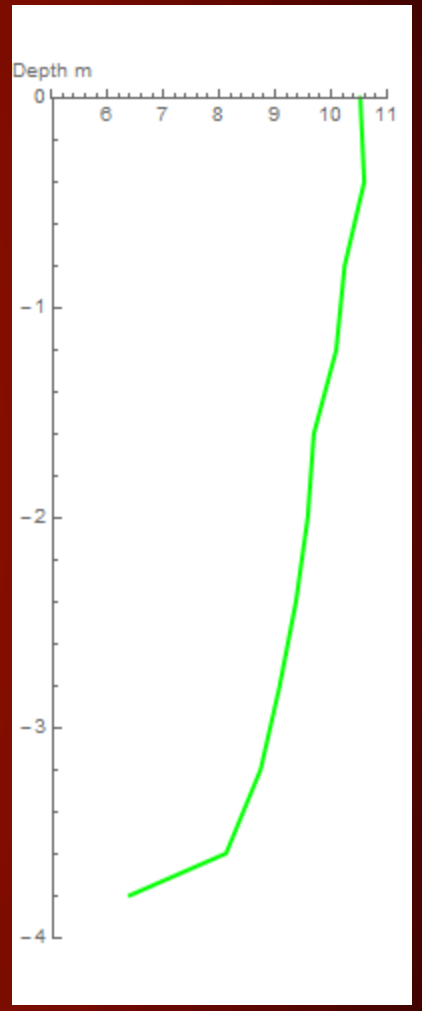
August 14



August 19

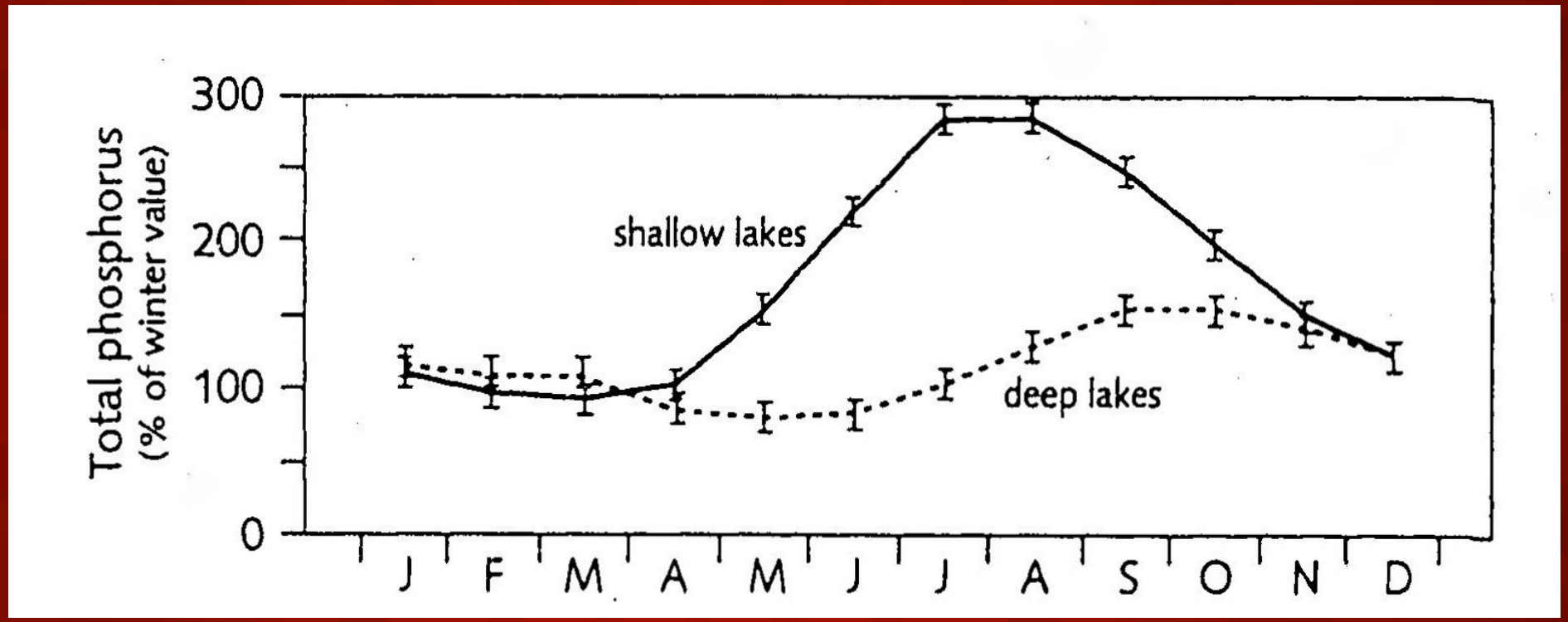


September 27



Coventry Tolland

Annual Phosphorus in Shallow & Deep Lakes

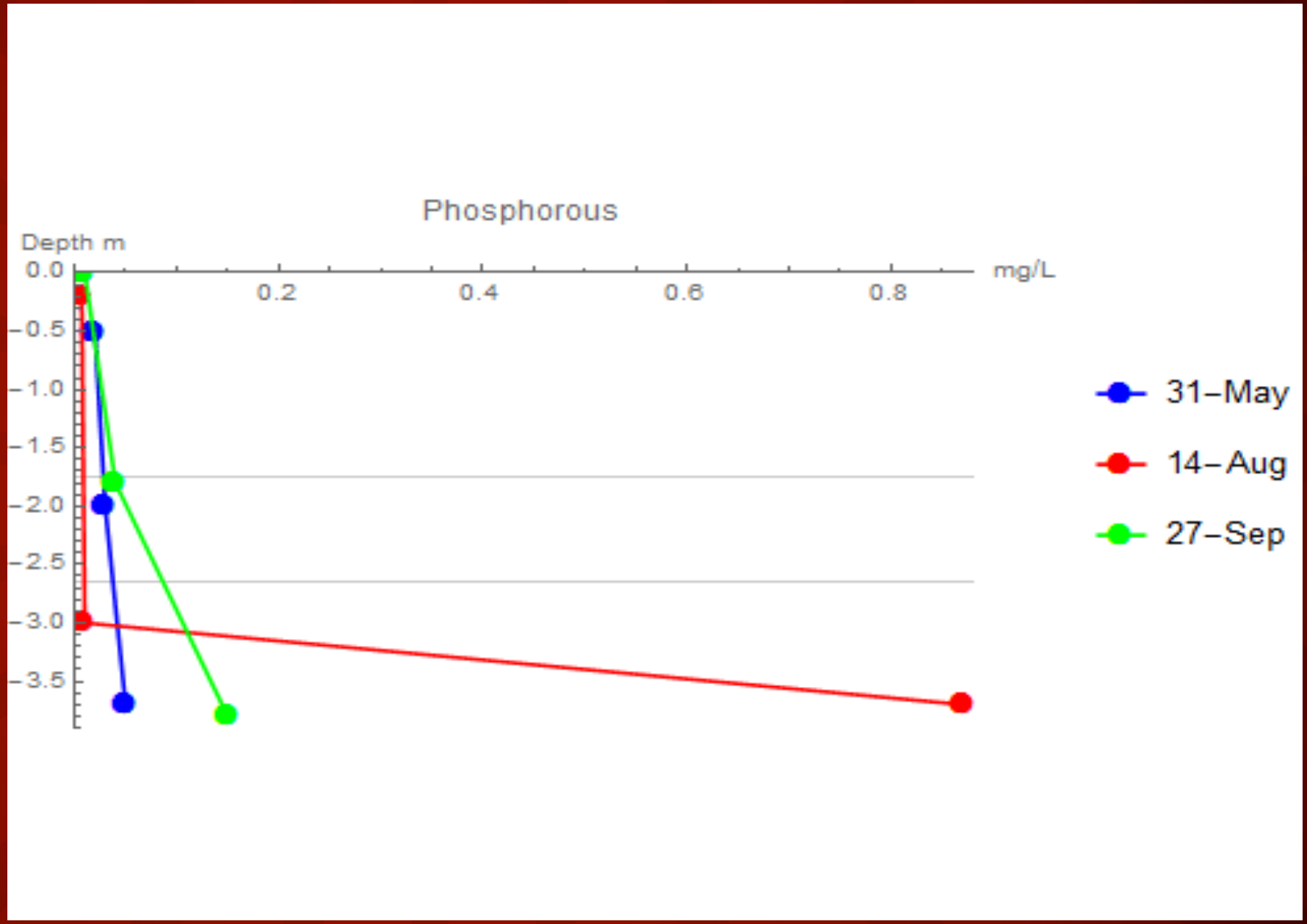


(Jeppesen 1996)

Phosphorous
At LBCAES

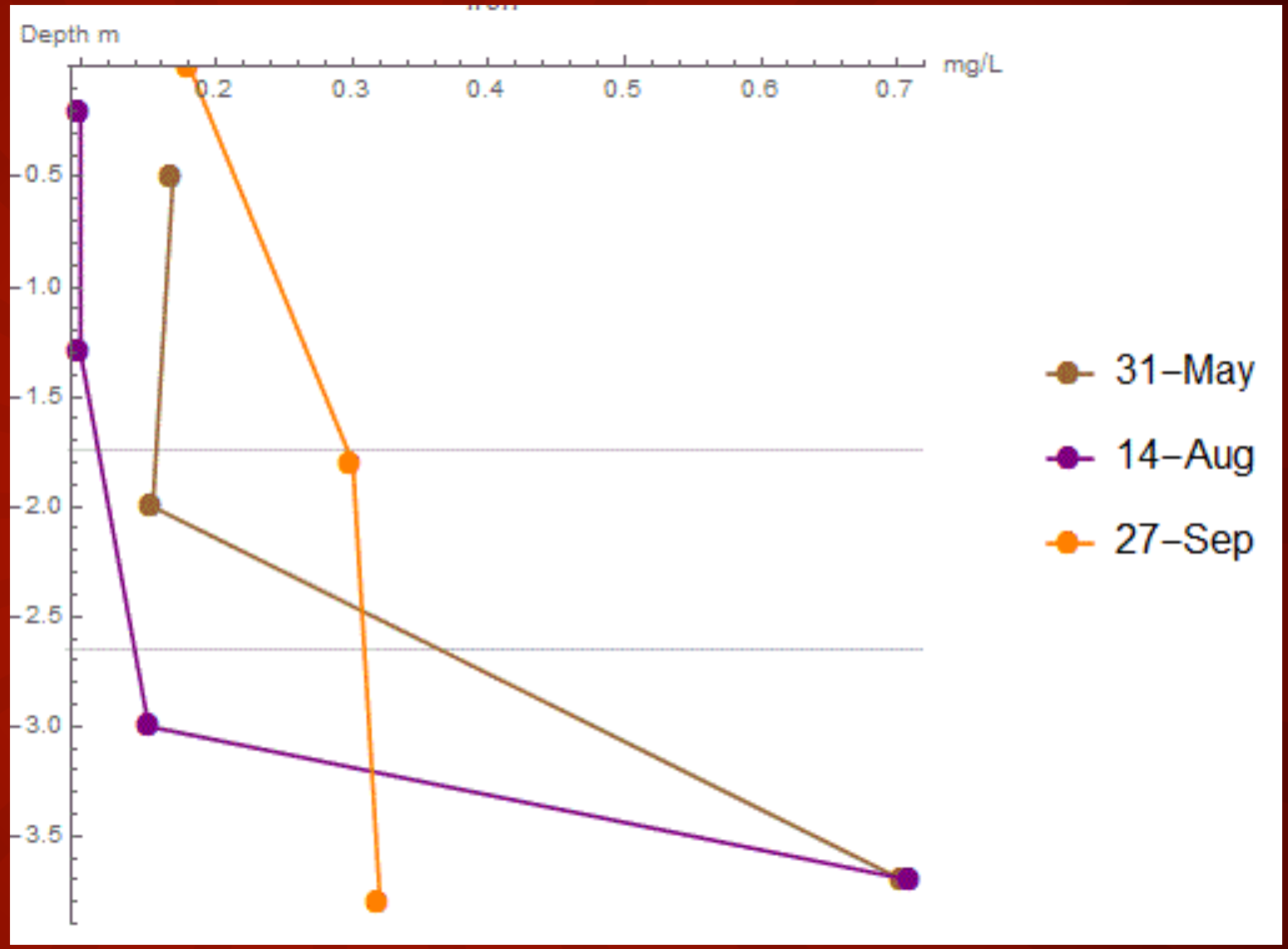
Before & After
2015
Cyanobacteria
Bloom

Internal Loading

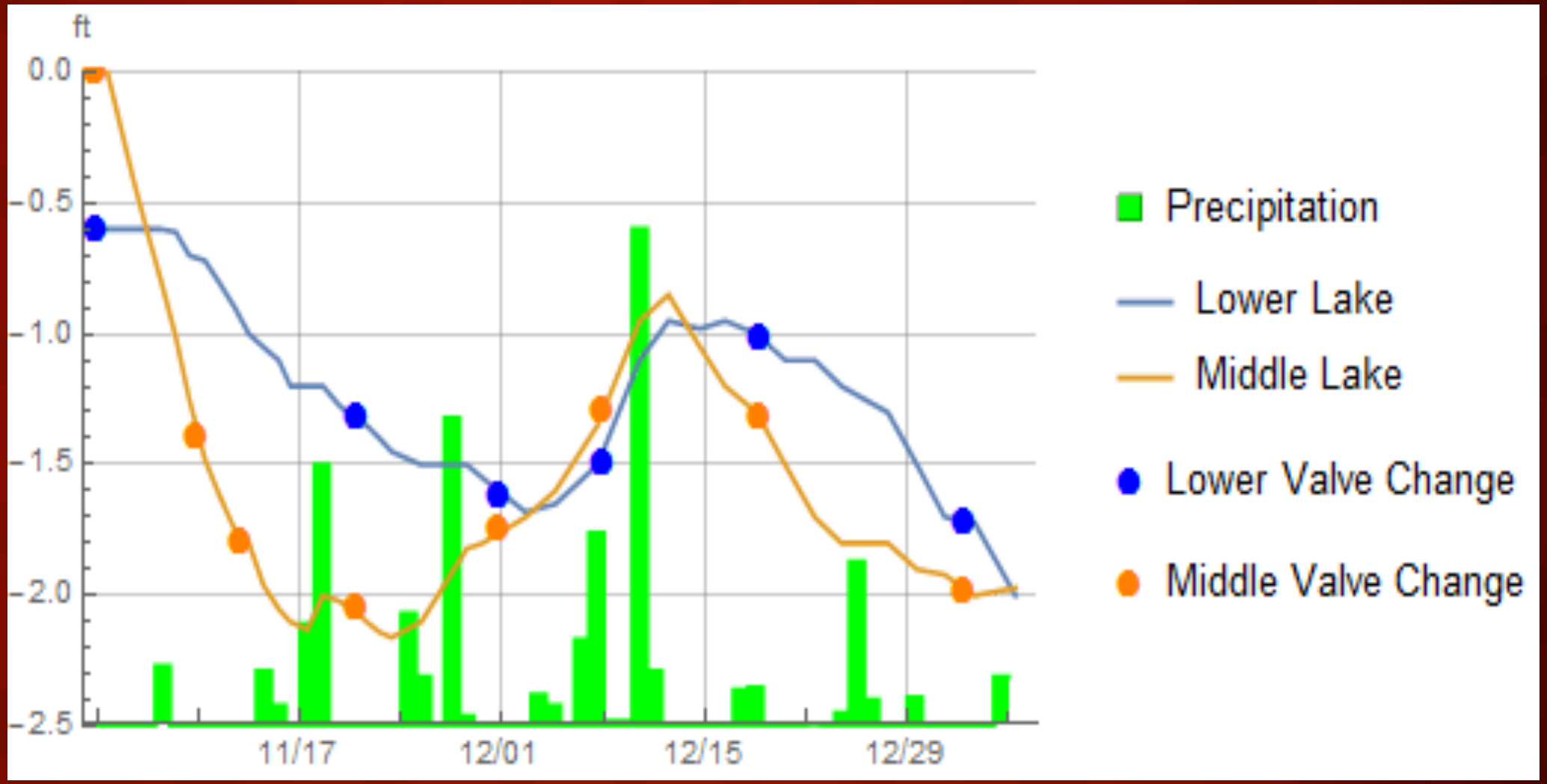


Iron
At LBCAES

Before & After
2015
Cyanobacteria
Bloom



2014-2015 Draw Down Record



WHY WE HAVE A MONITORING PROGRAM

- It is the Laboratory part of learning about our Lakes
- It adds Science to our Everyday Observations
- Every Lake has its own Particular Characteristics and we can view it More Often and in More Places
- Early observation of potential Problem means we may be able to Act rather than React
- With our Data we can collaborate with the DEEP and Professional Limnologists
- And we never know what we may see!

"Island" Observed October 7, 2015