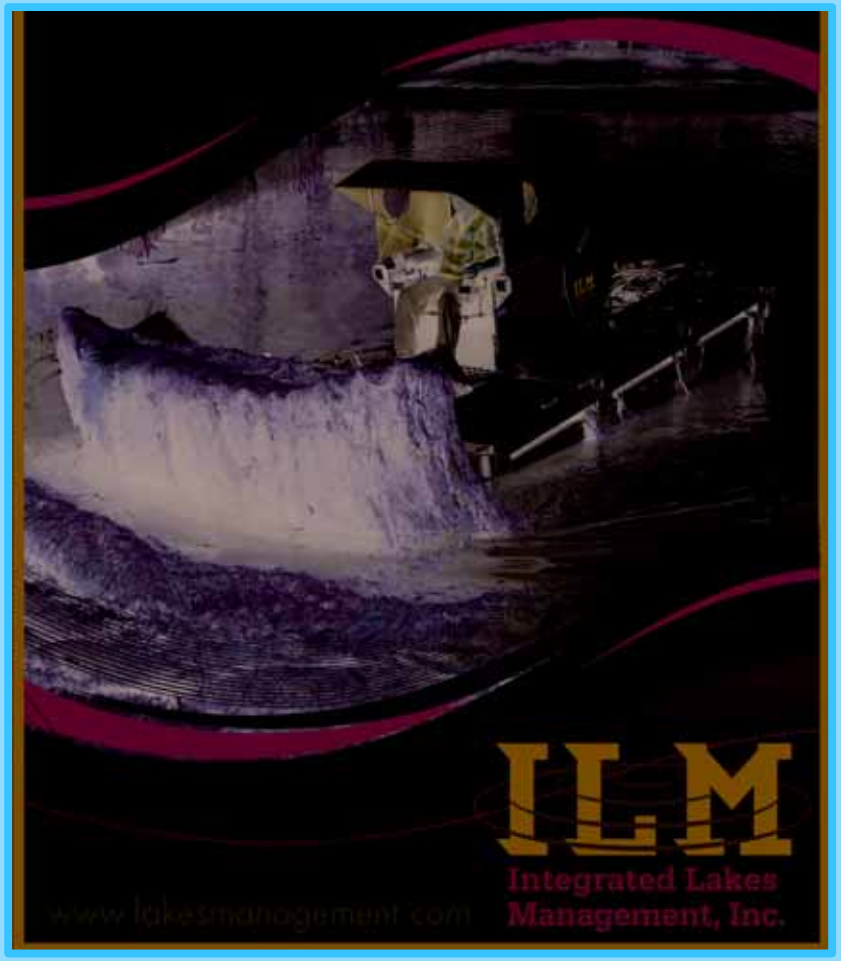
The Use of Bacteria and Enzymes on Pond Water and Sediment in a Controlled Environment

Sandy Kubillus

Integrated Lakes Management

ILM has been in the lake management business for 25 years



Major component in effective long-term lake management is sediment / nutrient removal

Many tools available to use:

*Aeration

*Chemical control

*Biological control

Tools available (continued)

* Nutrient deactivation

* Sediment removal

* **"Sediment digestion"???**

Can't find empirical evidence that products perform as marketed.

* "Our pond has changed from a mucky, smelly mess to a pond we now enjoy swimming in."

* "Has the potential to save you tens of thousands of dollars in dredging costs."

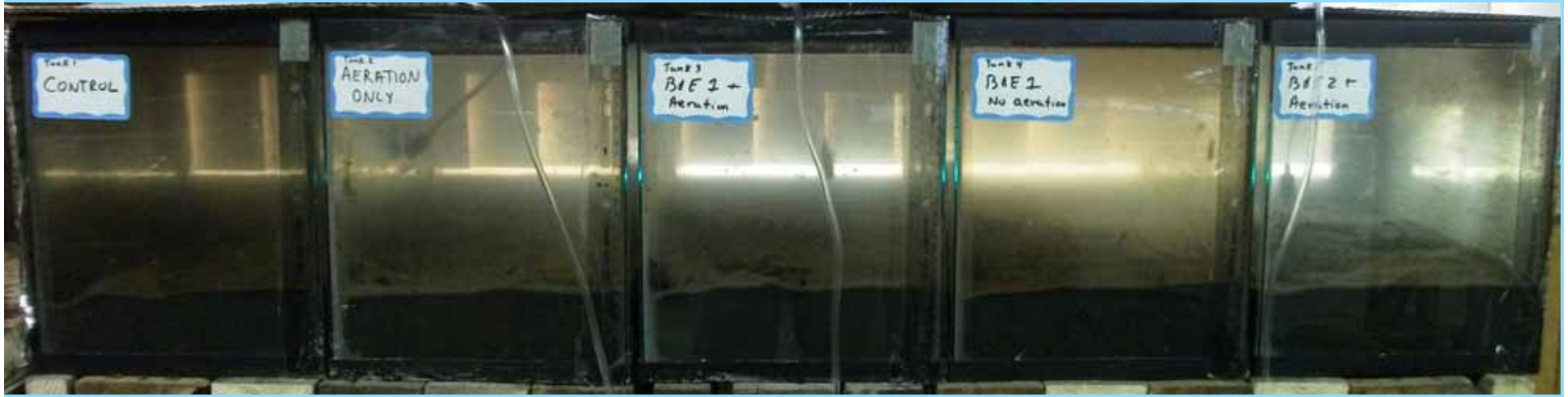
* "Eliminates Excess Sludge & Nutrients to Completely Restore Your Lake, Pond or Lagoon to Crystal Clear Condition."

* "Up to 50% sludge reduction."

Testimony's exist – must see for ourselves before we can recommend to or use on our clients.

ILM developed a "Test" in a controlled setting to study the effects of Bacteria & Enzymes (B & E) on pond sediment

2/24/11



Control – Air Only – B&E1 – w/air B&E1 – w/o air B&E2 w/air

Parameters tested:

Sediment - Before & after

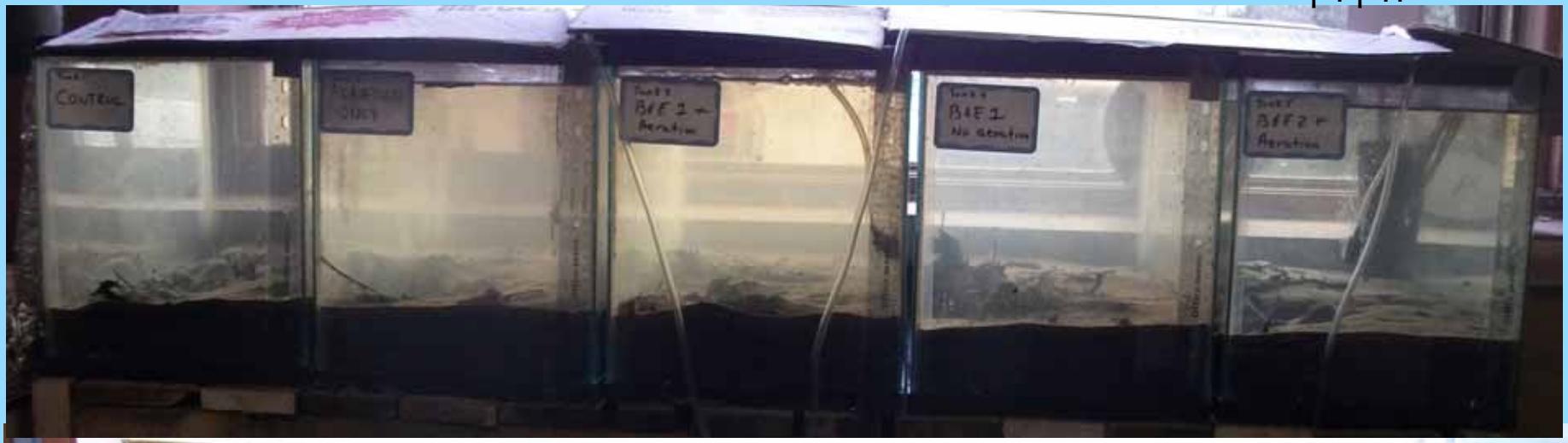
* % solids, total
* Volatile solids, total
* Phosphorus, total
* Kjeldahl nitrogen, total

Water - Biweekly

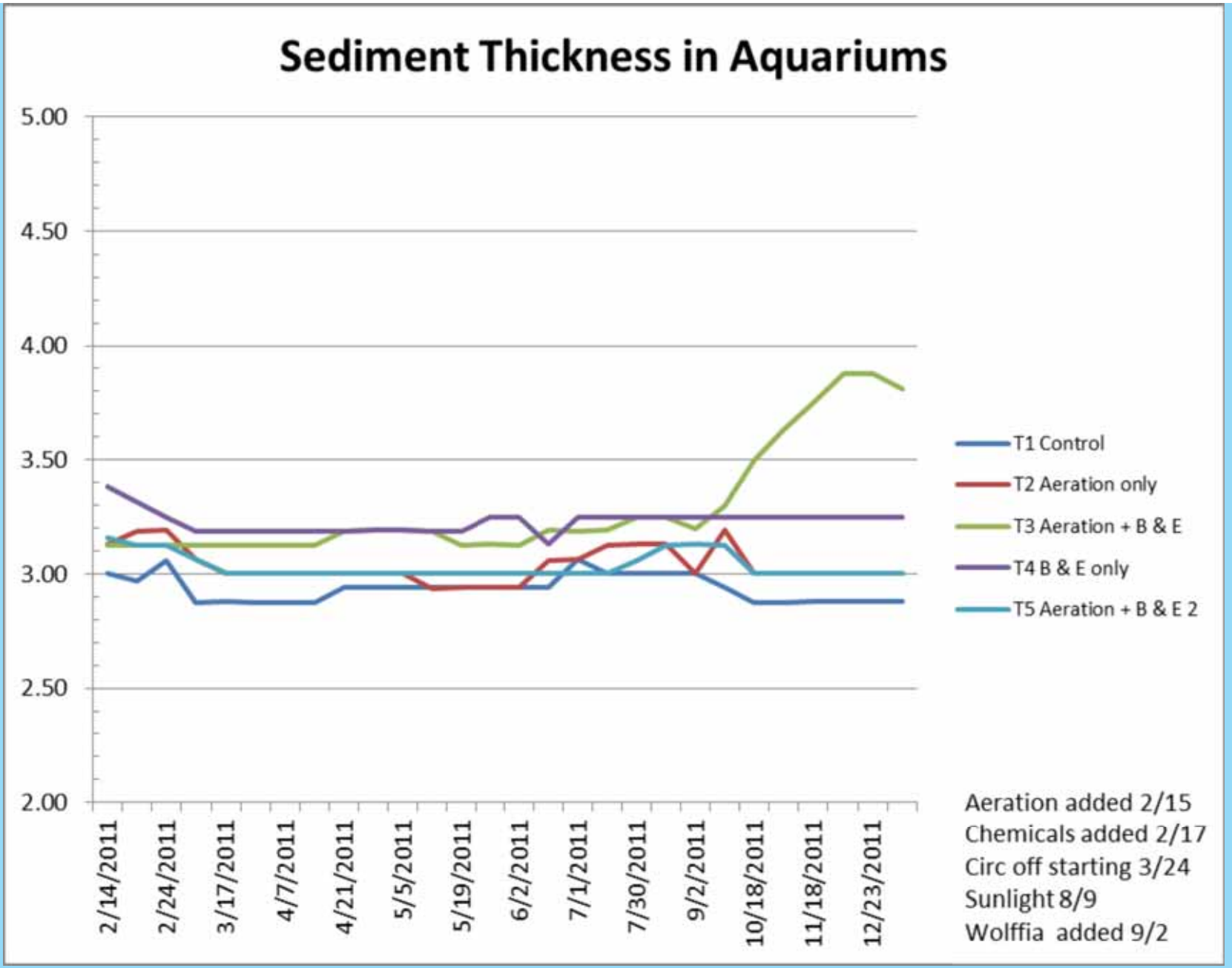
* Dissolved oxygen
* Conductivity
* Temperature
* Orthophosphorus
* Total phosphorus (monthly)
* Sediment level
* Water level
* pH
* Algae growth

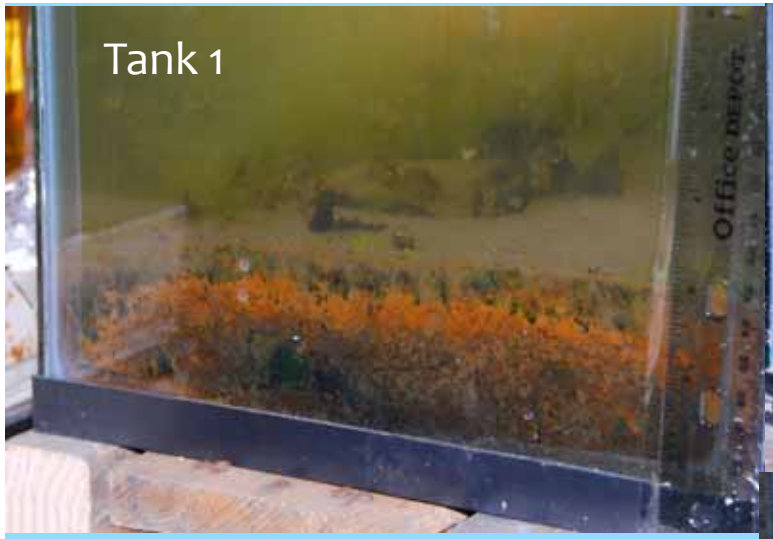
Sediment thickness results

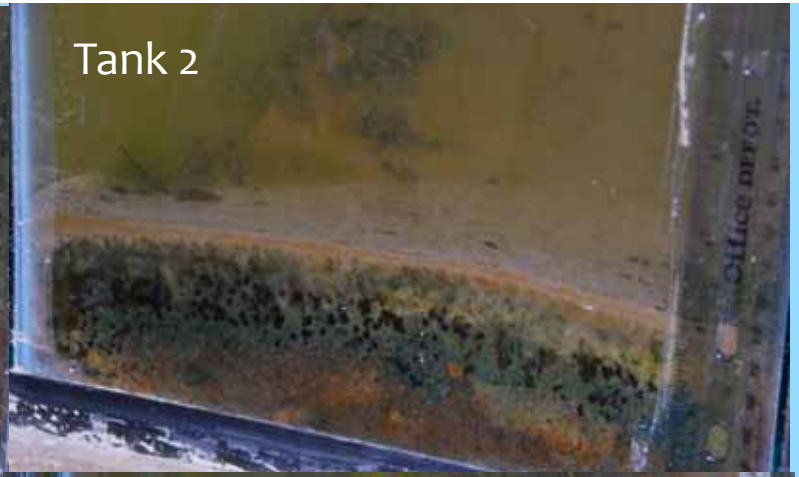
4-14-11



1-17-12

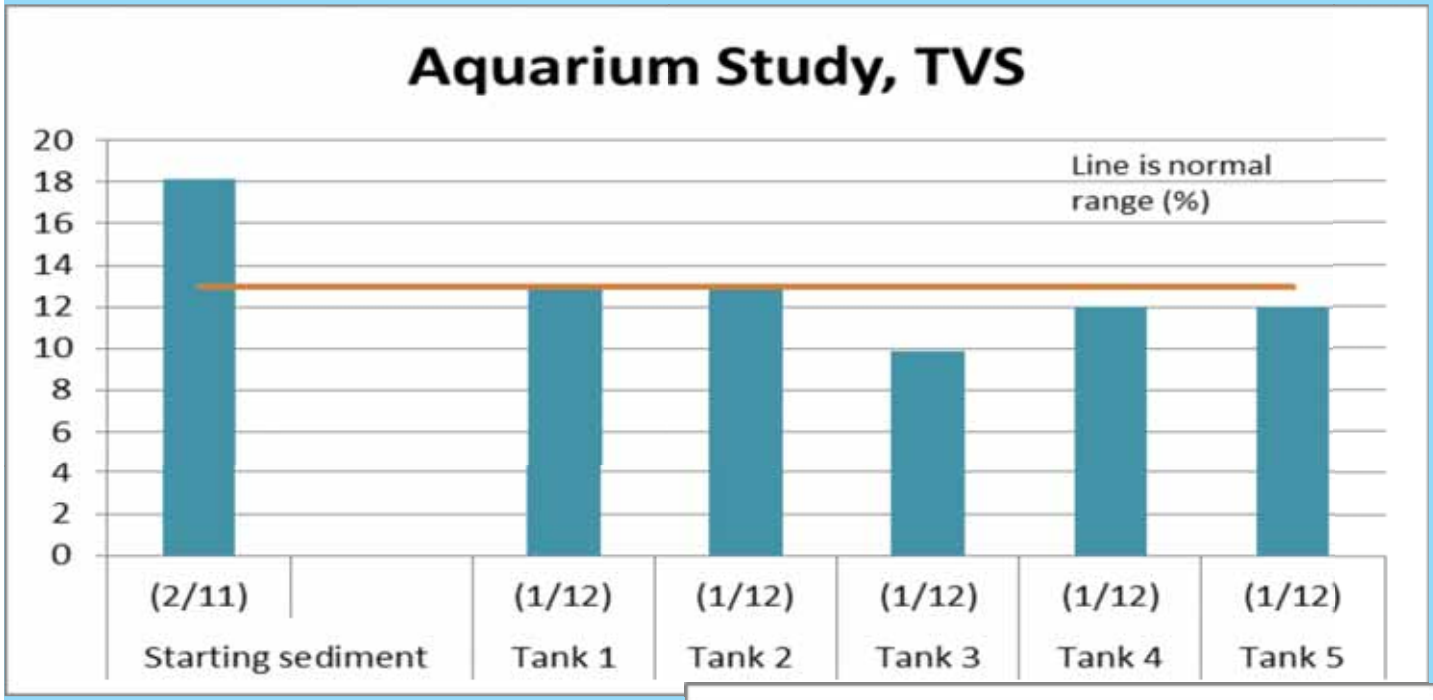

Sediment Thickness in Aquariums
5.00
4.50
4.00
3.50
3.00
2.50
2.00
2/14/2011
2/24/2011
3/17/2011
4/7/2011
4/21/2011
5/5/2011
5/19/2011
6/2/2011
7/1/2011
7/30/2011
9/2/2011
10/18/2011
11/18/2011
12/23/2011
T1 Control
T2 Aeration only
T3 Aeration + B & E
T4 B & E only
T5 Aeration + B & E 2
Aeration added 2/15
Chemicals added 2/17
Circ off starting 3/24
Sunlight 8/9
Wolffia added 9/2



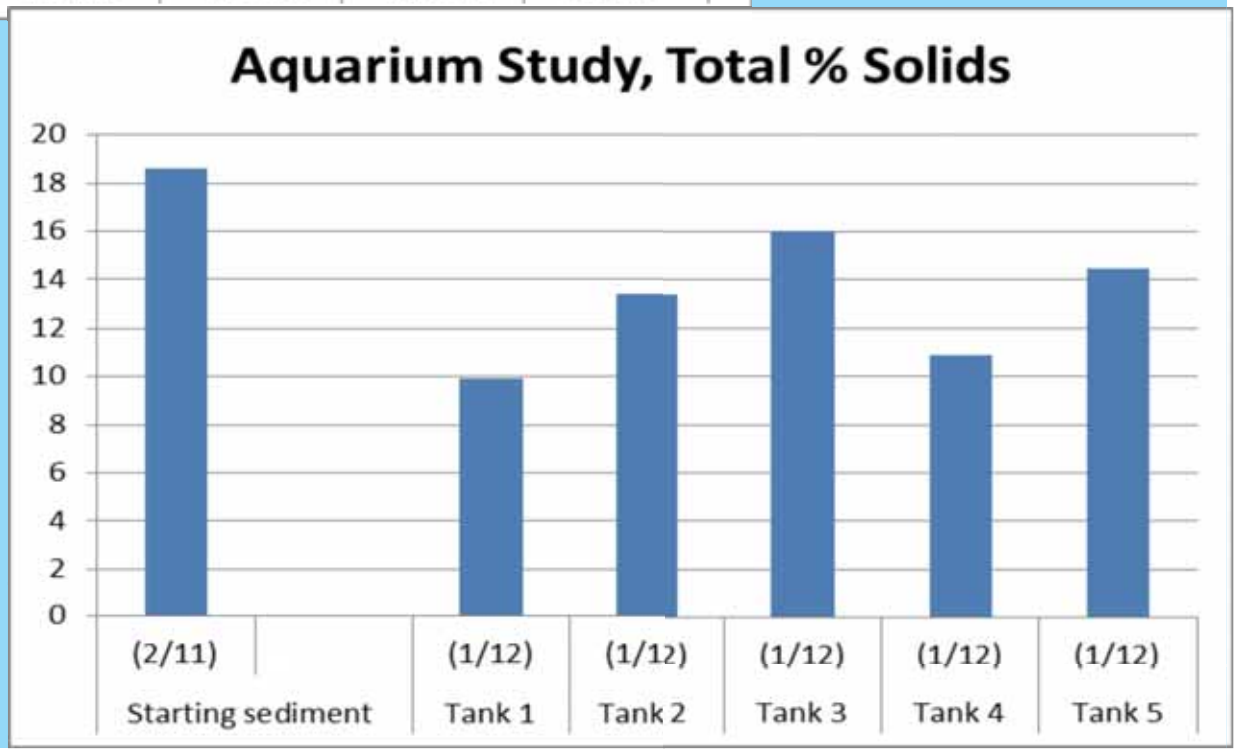


Sediment layering

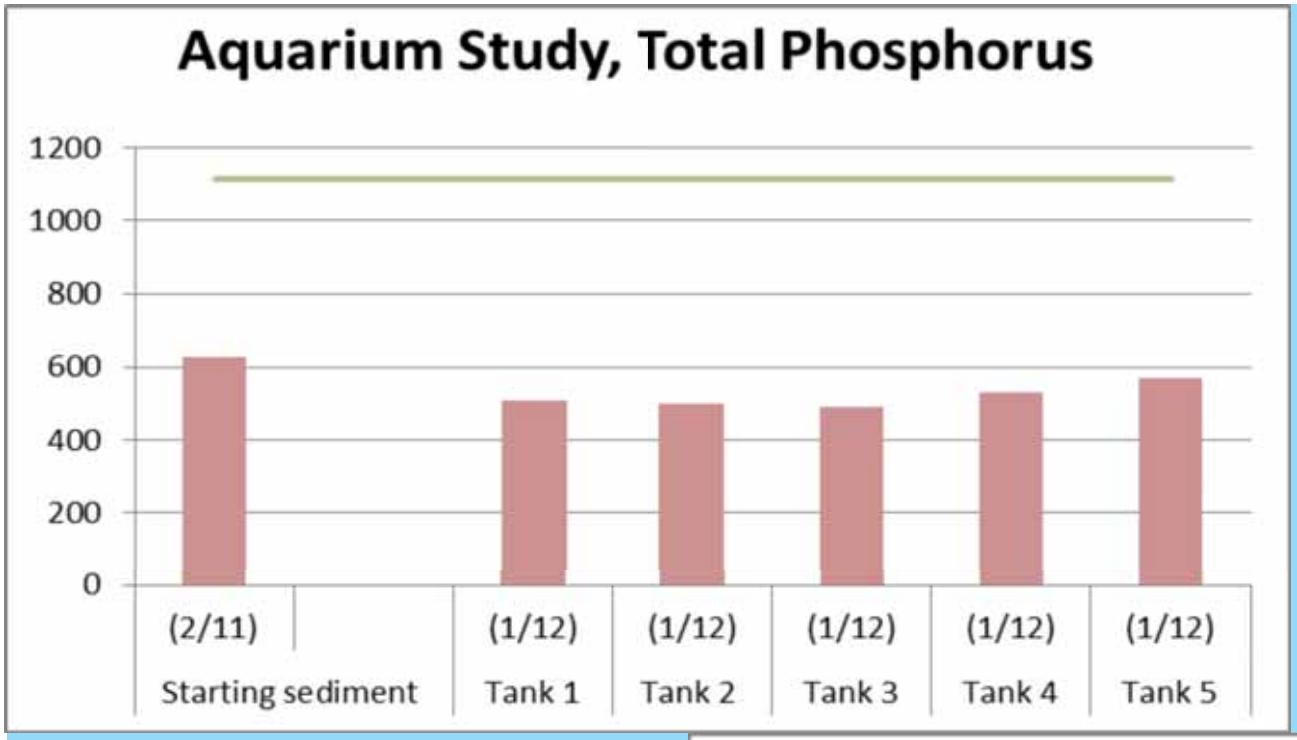
Integrated Lakes Management



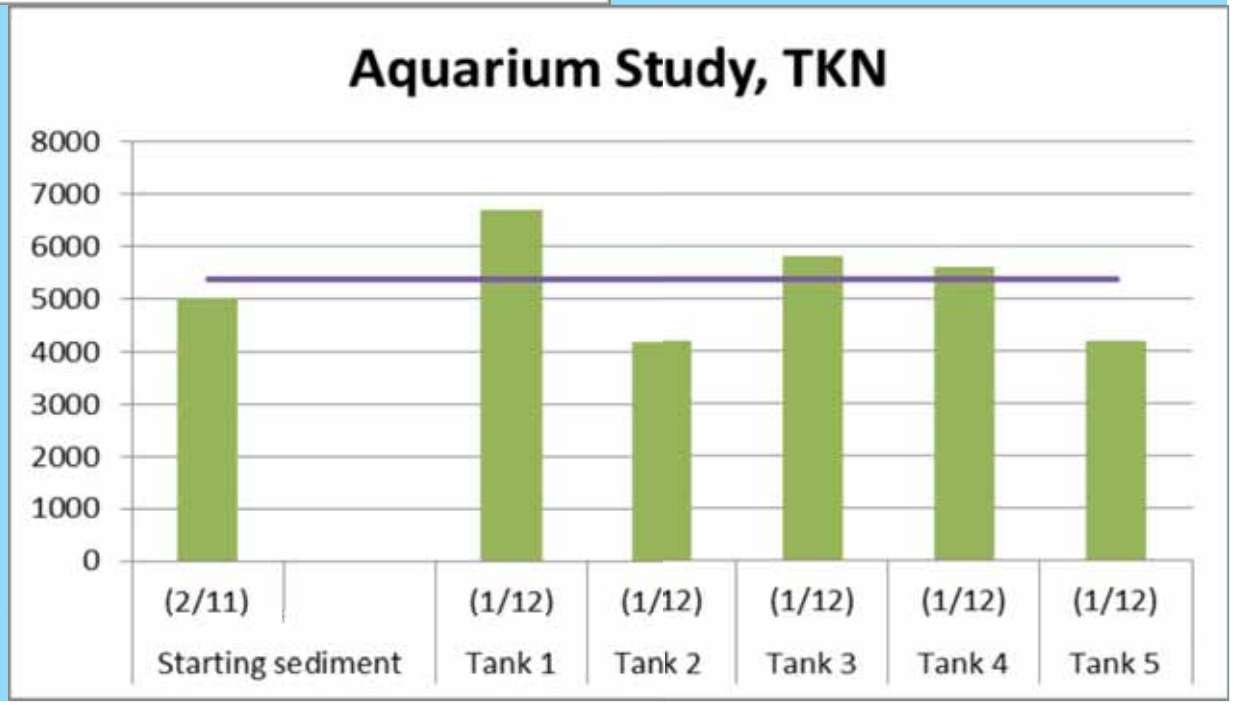
Sediment chemistry



Integrated Lakes Management



Sediment chemistry

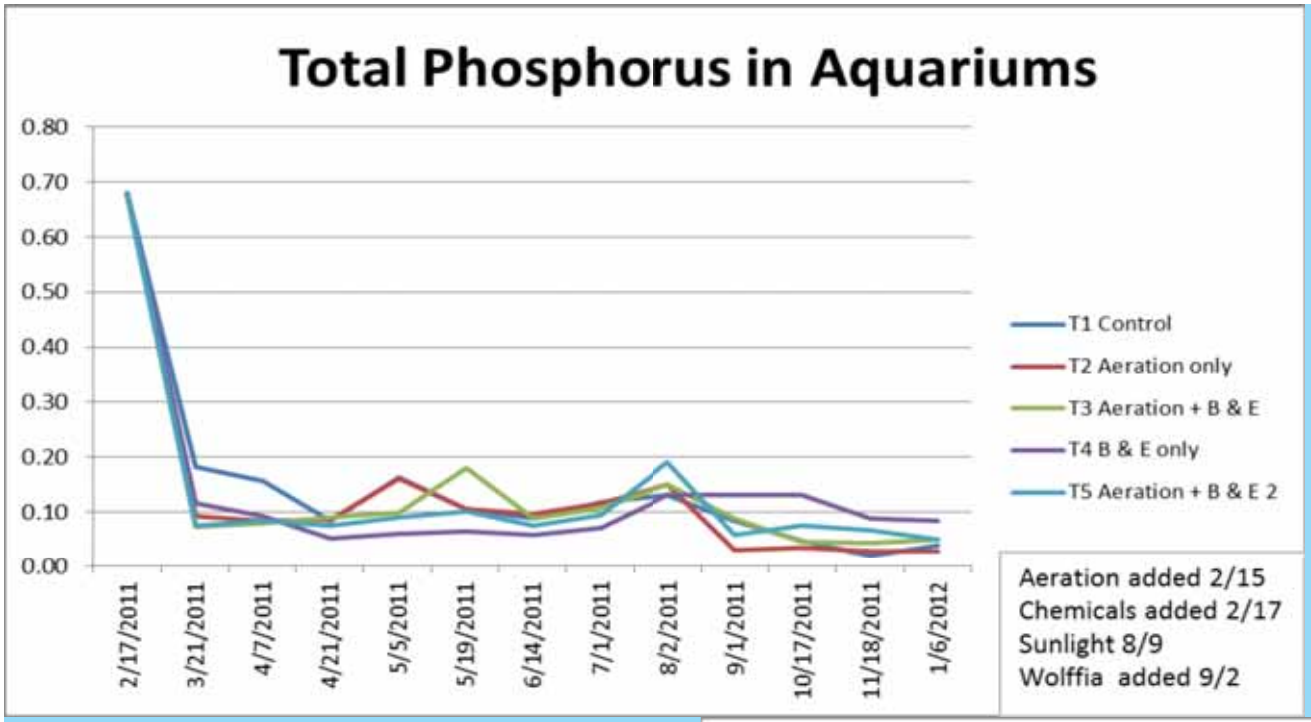


Tanks 1 & 2

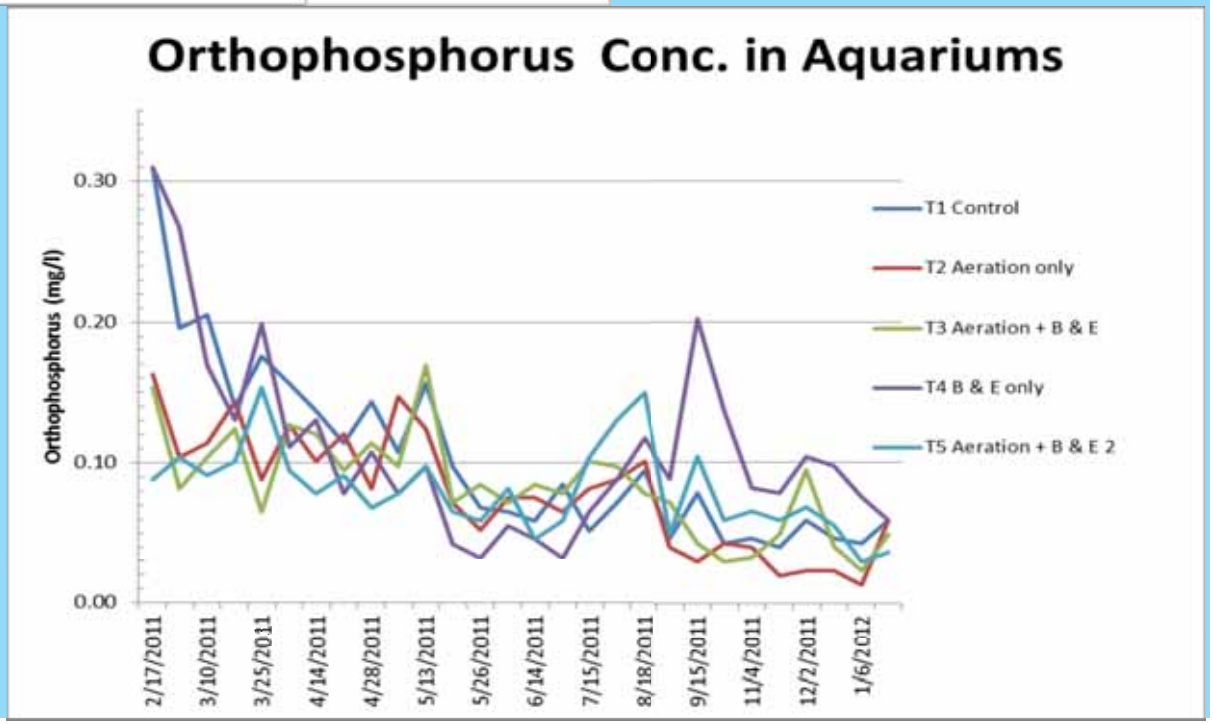
Tanks 3 & 4

Tank 5

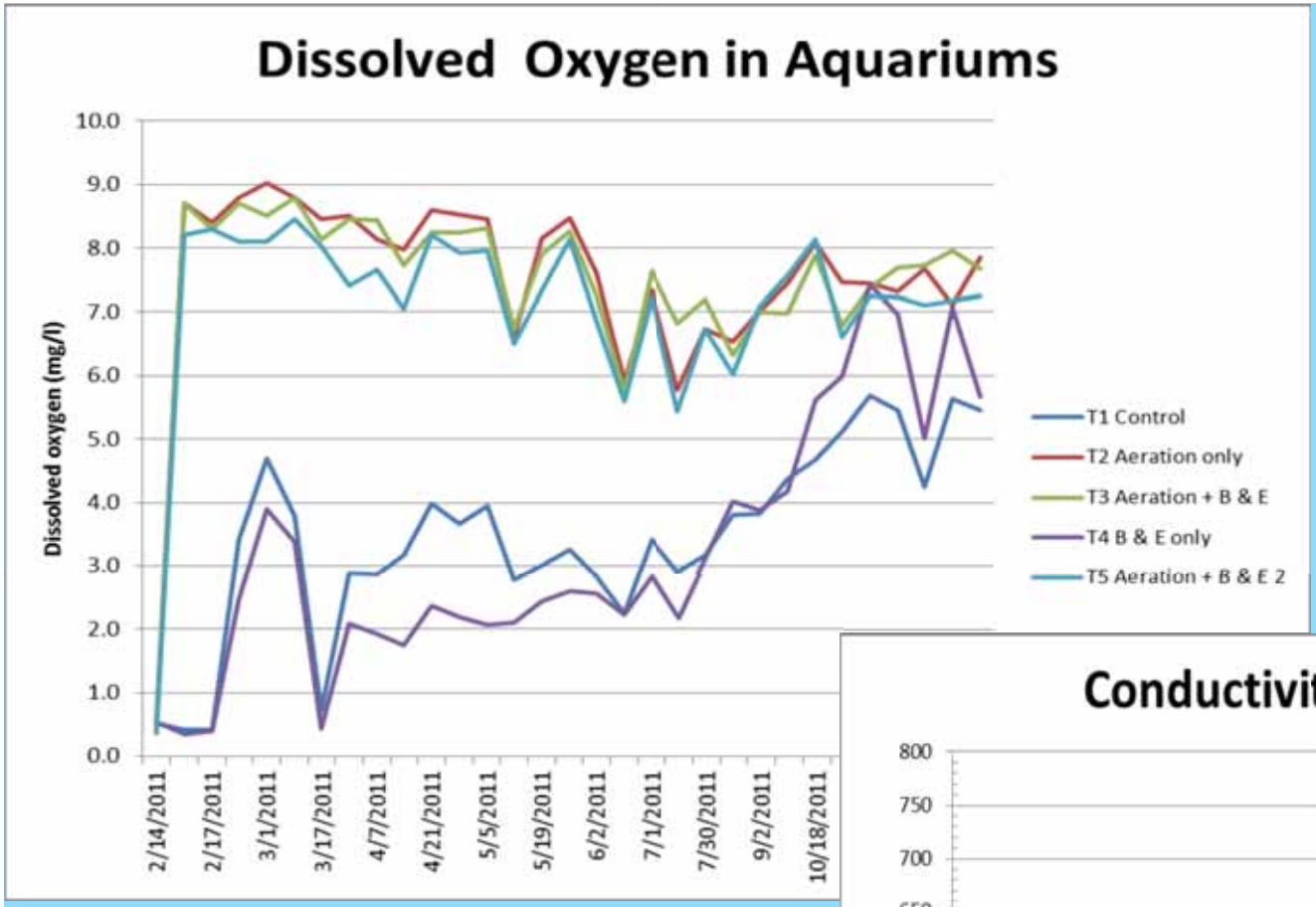
Overhead views

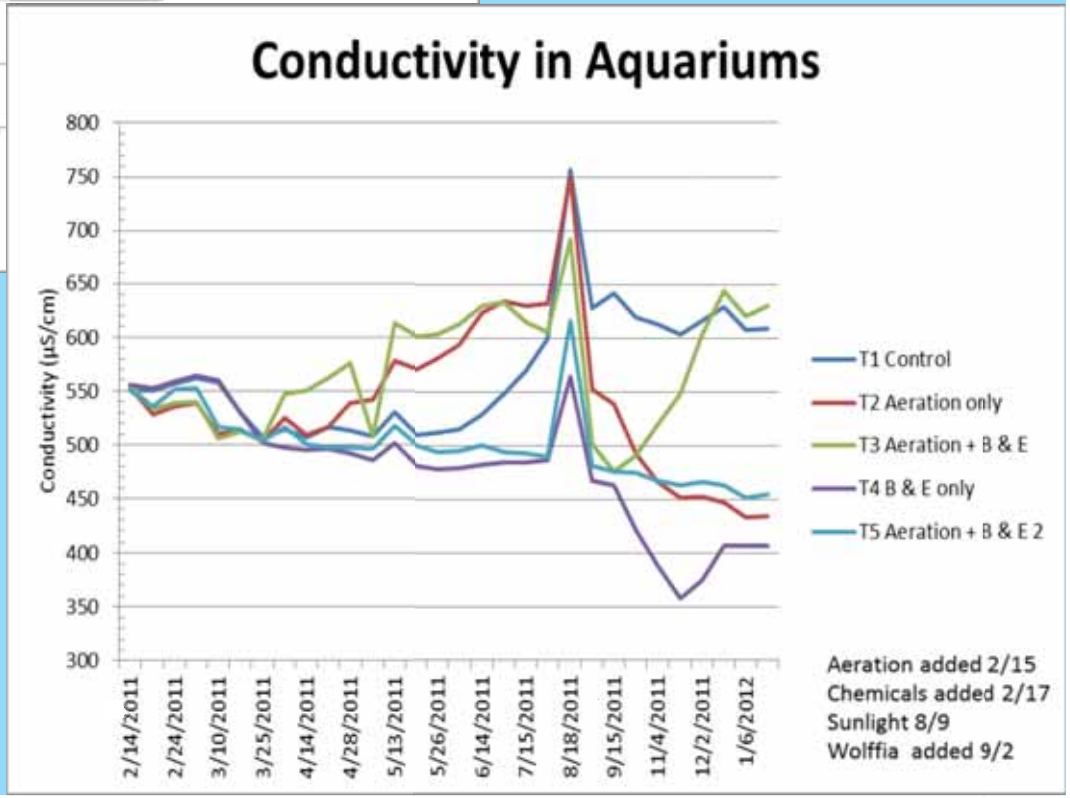


Water Quality



Integrated Lakes Management





Integrated Lakes Management

Results

Aeration vs. no aeration – Tanks 1 & 2:

* Tanks without aeration had a scummy surface.

* Dissolved oxygen was significantly lower until sunlight added and plants and algae grew. Average was 4.1 mg/l lower.

* Tanks with aeration had significantly more evaporation, even with the tanks loosely covered.

Results

B&E1 with and without aeration - Tanks 3 & 4:

* Sediment actually increased in tank with aeration and B&E by 0.7 inches.

* B&E remained floating in tank without aeration.

* Tank 4 developed narrow-leaved pondweed and Tank 3 did not.

* Both had *Cladophora* algae.

* Total phosphorus averaged 0.03 mg/l higher in tank with aeration.

* Conductivity was slightly higher in tank with aeration (88 µS/cm).

Results

B&E1 vs. B&E2 – Tanks 3 & 5 – Both tanks aerated:

* Both had very similar water quality.

* Tank 5 developed a large colony of snails that kept the tank walls clean of algae.

* Tank 3 developed bumpy sediment with black spots.

* Sediment in both tanks developed channels. More prominent in Tank 3.

* Sediment thickness in Tank 5 did not change, but expanded in Tank 3.

Conclusions

SEDIMENT:

* Sediment did not decrease in any tank and increased in one tank.
* Sediment chemistry showed no difference in nutrients and minor changes in total volatile solids.

WATER QUALITY:

* After several months all of the tanks had very similar water quality.
* Light was added on August 9th – six months into the study.
* Water chemistry then changed significantly with plants growing in Tank 4 and algae growing in all tanks.
* Algae grew on the glass except Tank 5 which developed a snail colony.
* Tanks without aeration had a scummy surface.

Future Experiments

* Continue the study to see further changes.
* Add fish – 2 fathead minnows/tank.

* Ideas – questions???