

Testing Algae Management Strategies in a Controlled Environment

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Dredging creates muddy water



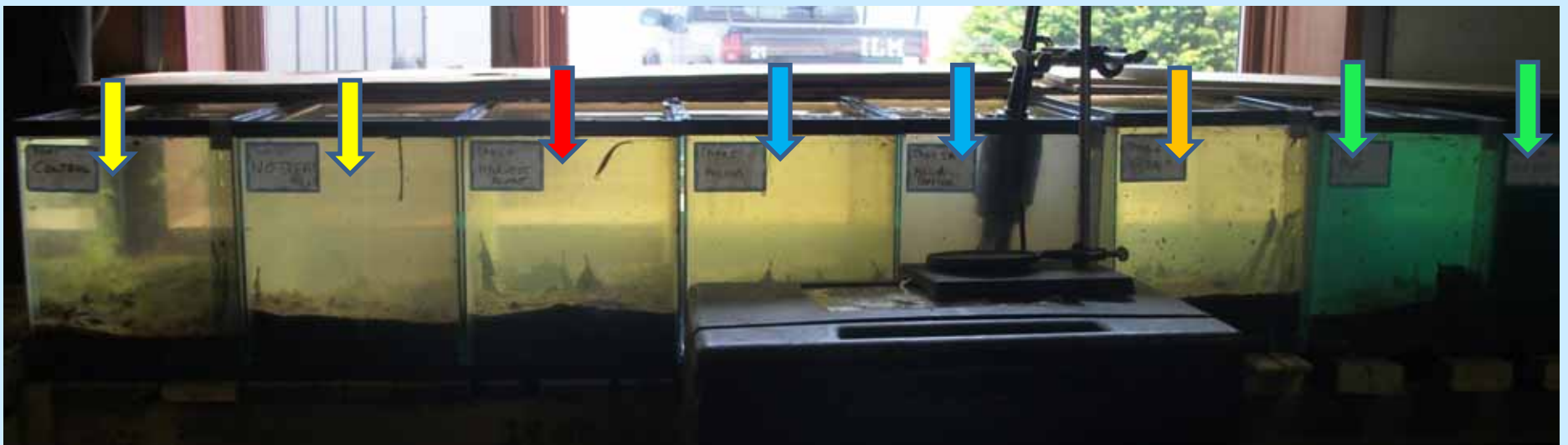
Releasing nutrients.

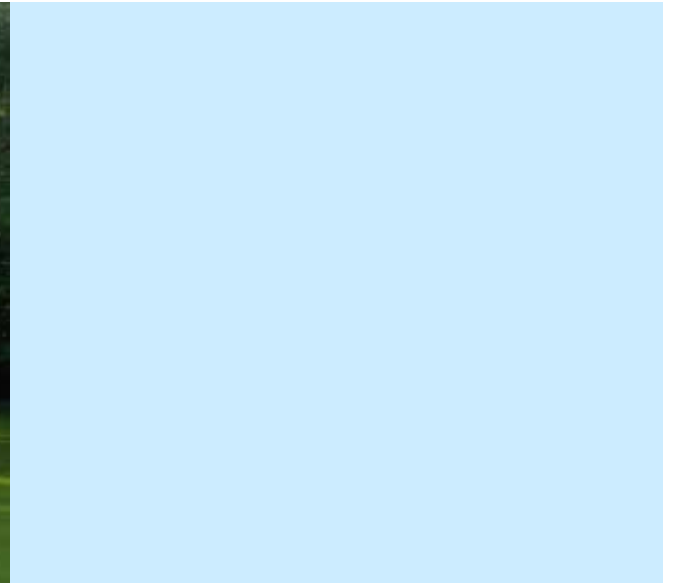


2012 Study

Which algae management method is most effective in nutrient-rich water?

- Use a controlled environment (aquariums):
 - Control (2) new and existing
 - Harvest algae
 - Alum (2) low and high dose
 - Copper sulfate
 - Dye (2) low and high dose





Collected sediment
from nutrient-rich
pond



Setup



Controls

Setup

**Alum – Water Quality Dose vs. Bottom Treatment
Buffer not used to control pH.**



Setup

**Dye –
Regular dose vs. Double dose**



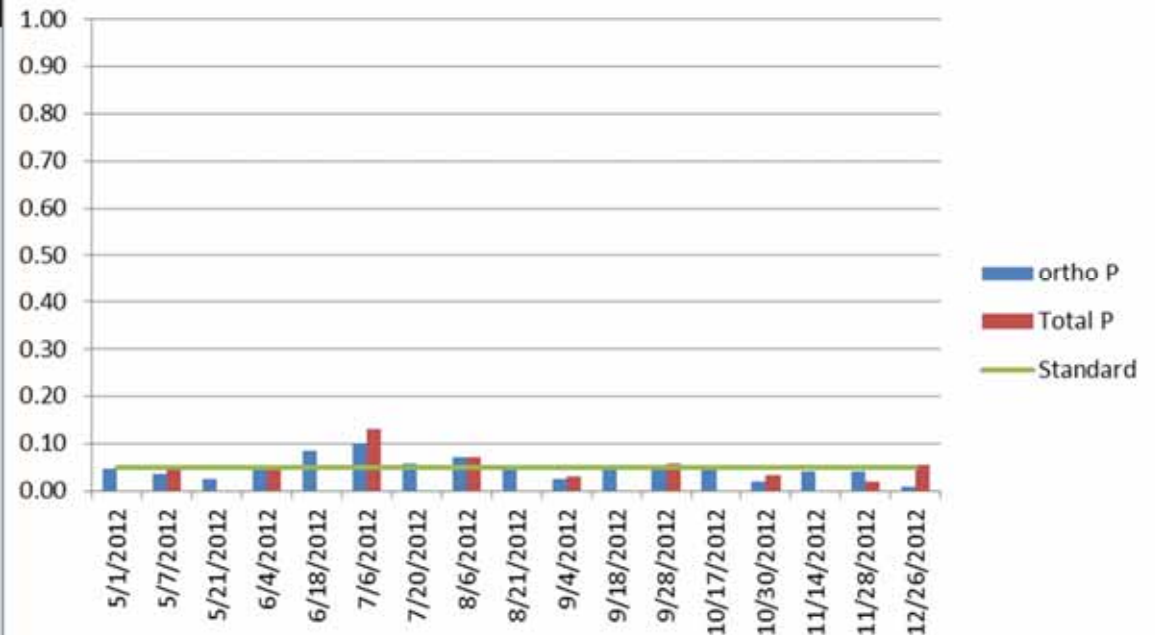
Results – Control – Tank 1

Undisturbed sediment from
2011 study:

- *Cladophora* algae
- Low phosphorus



Tank 1: Control (old sediment)



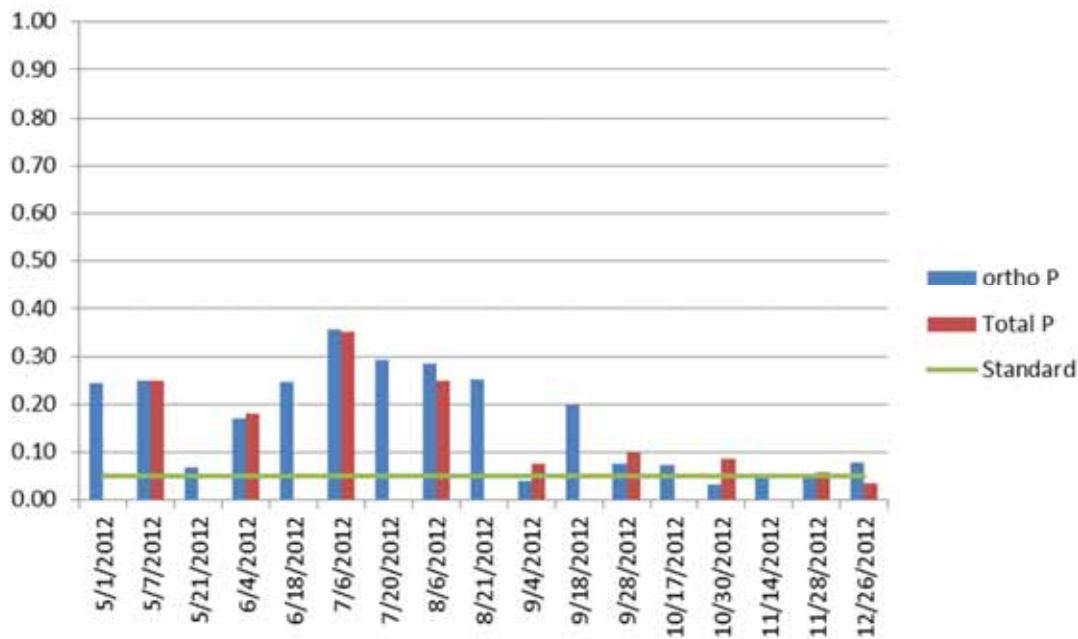
Results – Control – Tank 2

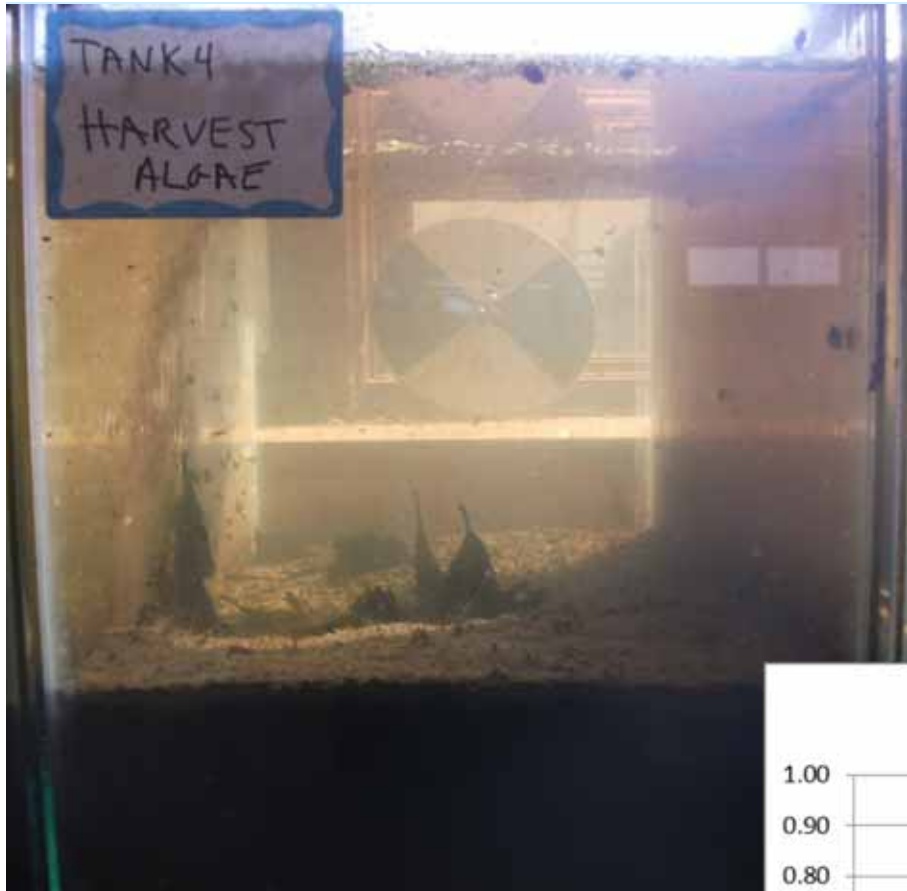
New sediment:

- *Cladophora* algae
- Phosphorus much higher initially than Tank 1



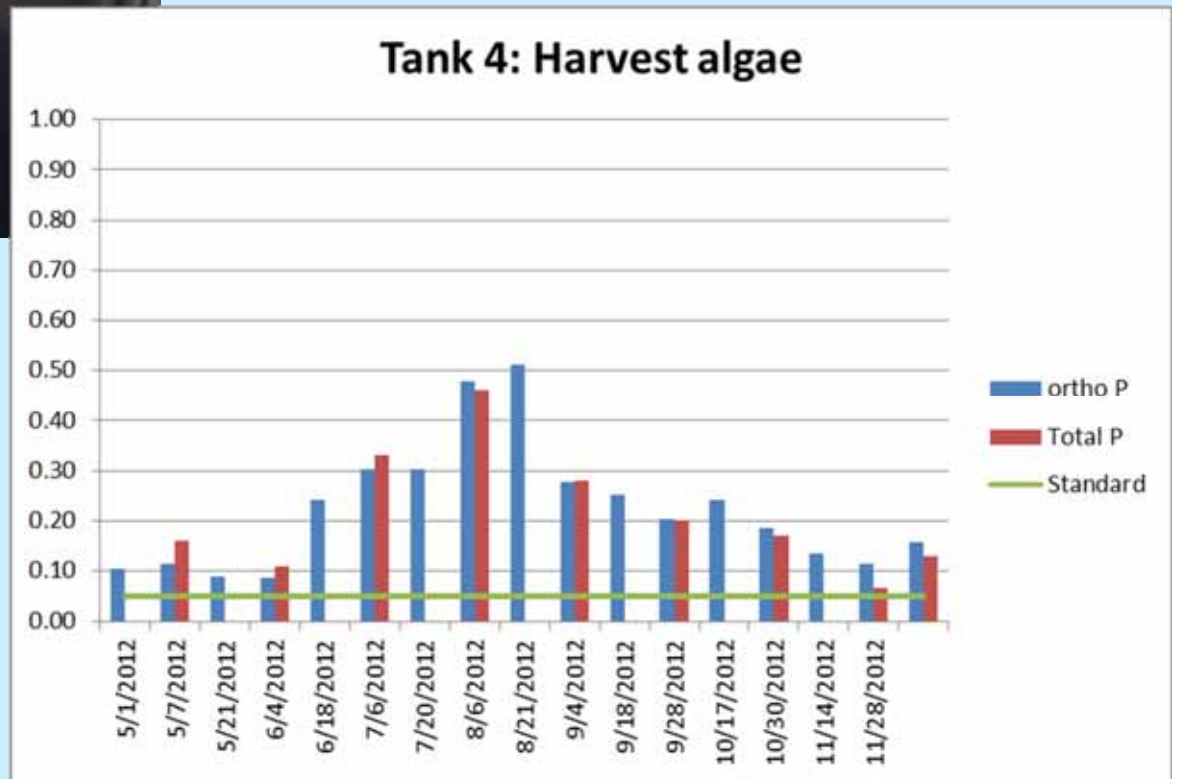
Tank 2: Control (new sediment)





Results - Harvest Algae

**Never grew algae.
Phosphorus higher than other controls.**

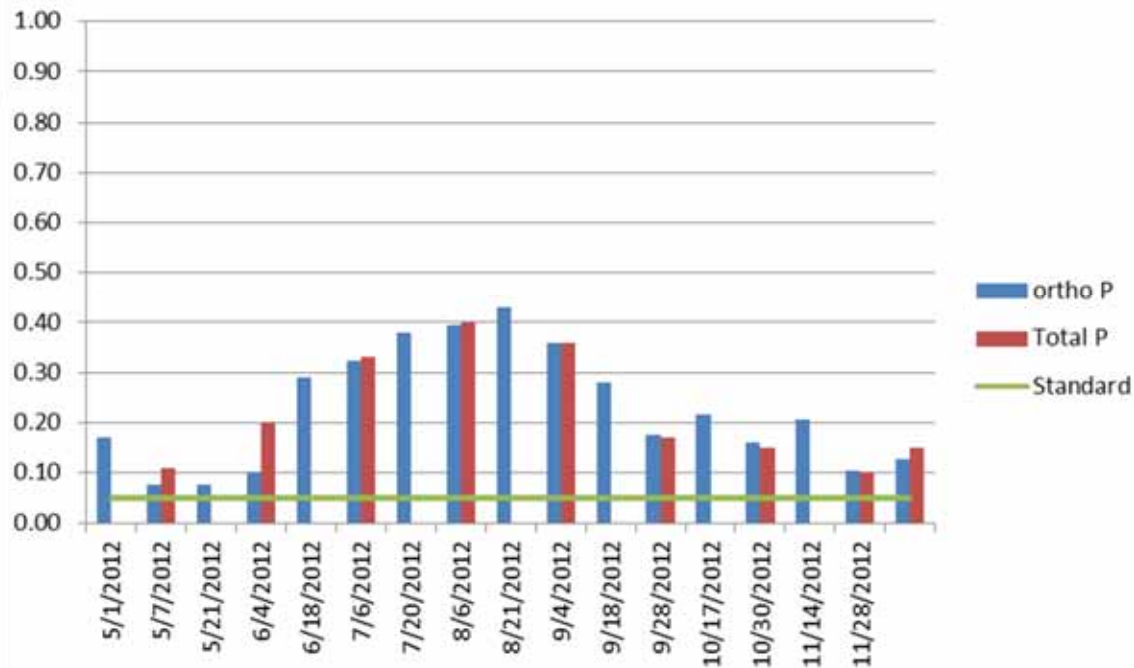




Results – Alum Water Quality Treatment

Did not grow algae
Phosphorus remained high even with multiple alum treatments

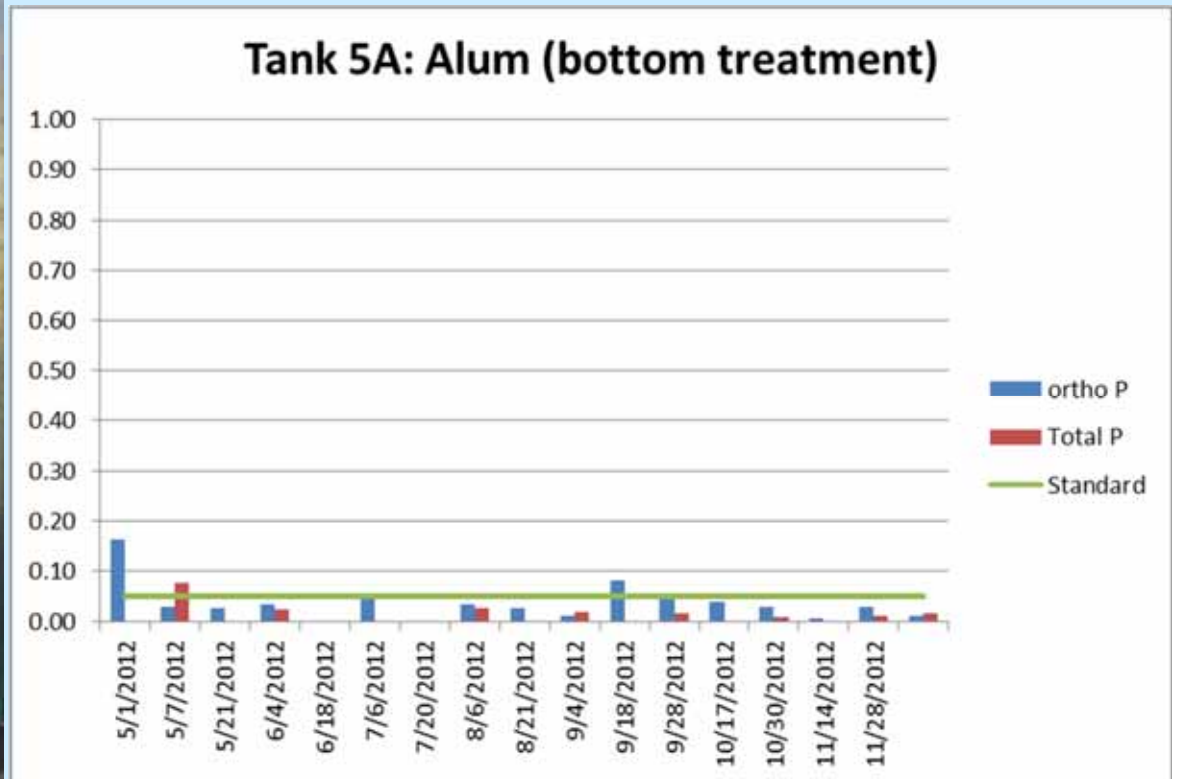
Tank 5: Alum (WQ treatment)



Alum added
5/4, 7/20, 8/6,
8/22, 9/4

Results – Alum Bottom Treatment

Phosphorus remained low.
Developed blue-green algae -
Oscillatoria

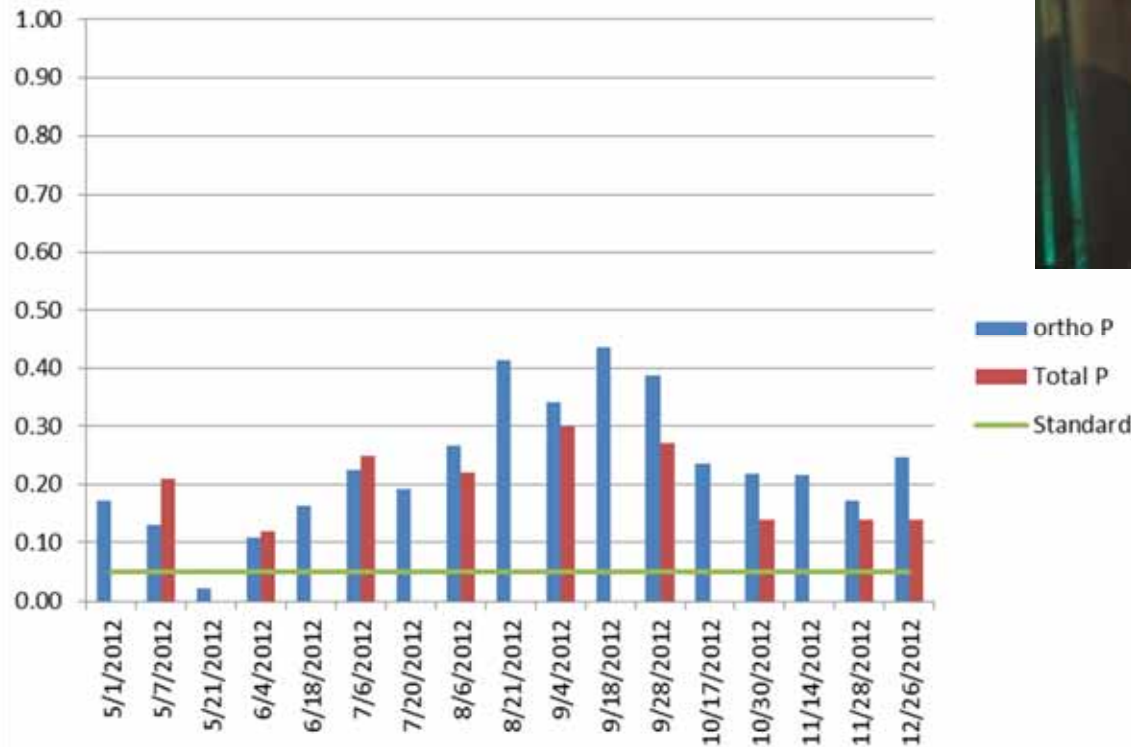


Results – Copper Sulfate

Algae grew on tank walls.
Snails did not survive.
Phosphorus remained high.



Tank 6: CuSO4

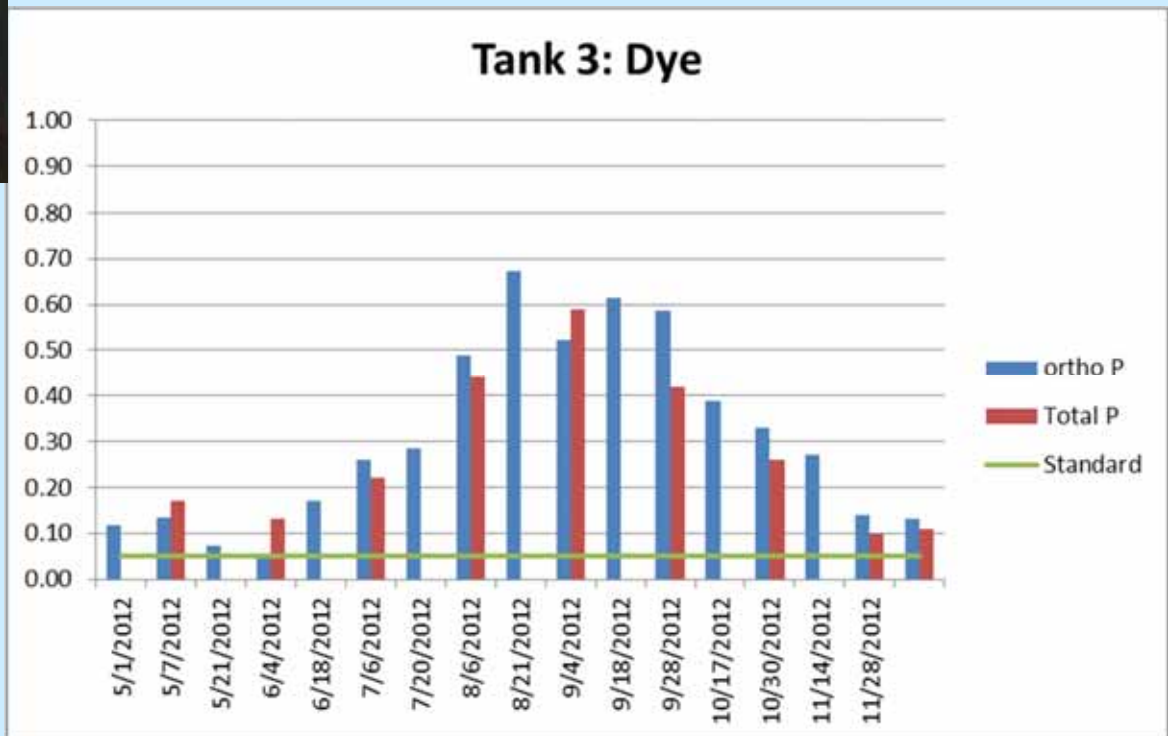


CuSO4 added 5/22,
6/4, 6/18, 7/6, 7/20,
8/6, 8/22, 9/4,
10/19, 11/14



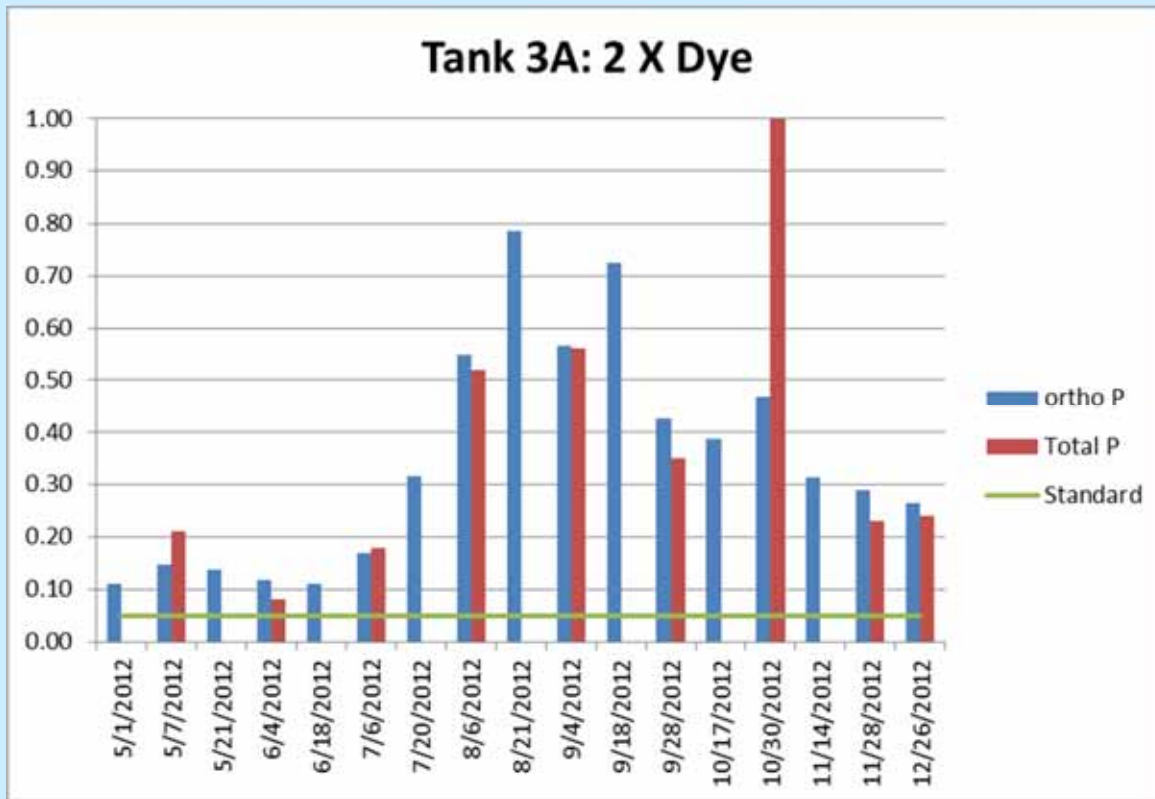
Results - Dye

Phosphorus levels very high.
Developed blue-green algae on sediment (*Oscillatoria*).



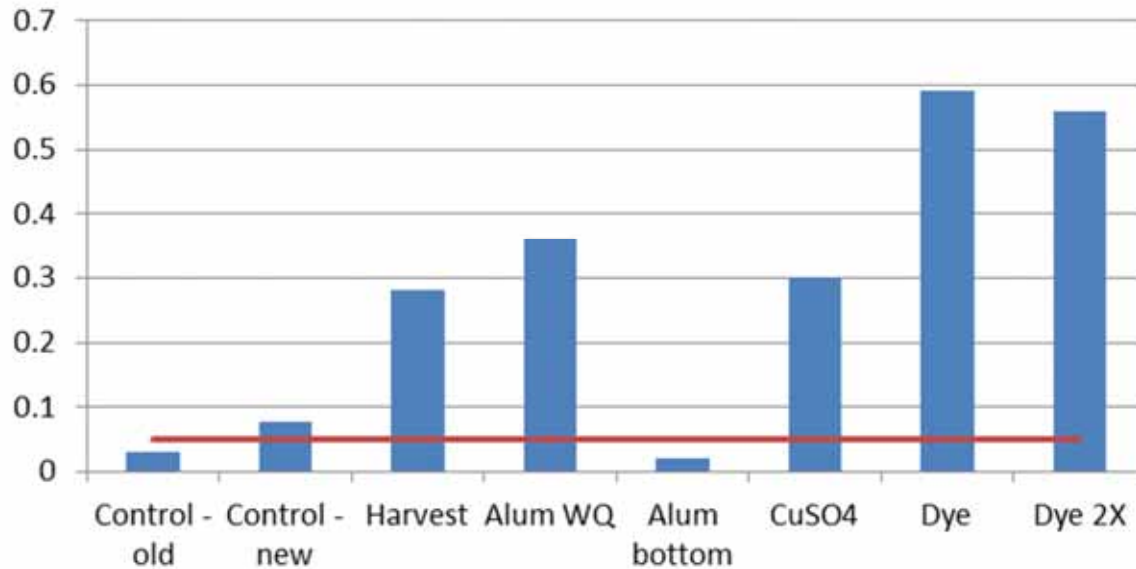
Results – 2X dye

Highest phosphorus levels of group.
Less sunlight due to placement.
Tank developed a leak.
Some algae on back wall.



Results Summary - Water

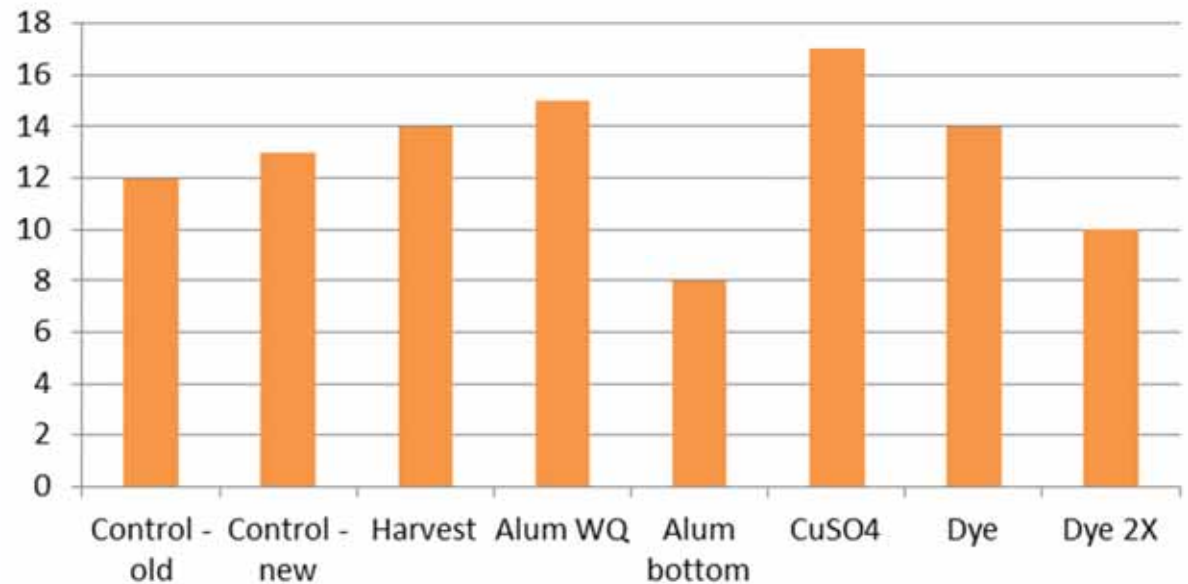
Total Phosphorus All Tanks on 9/4/12



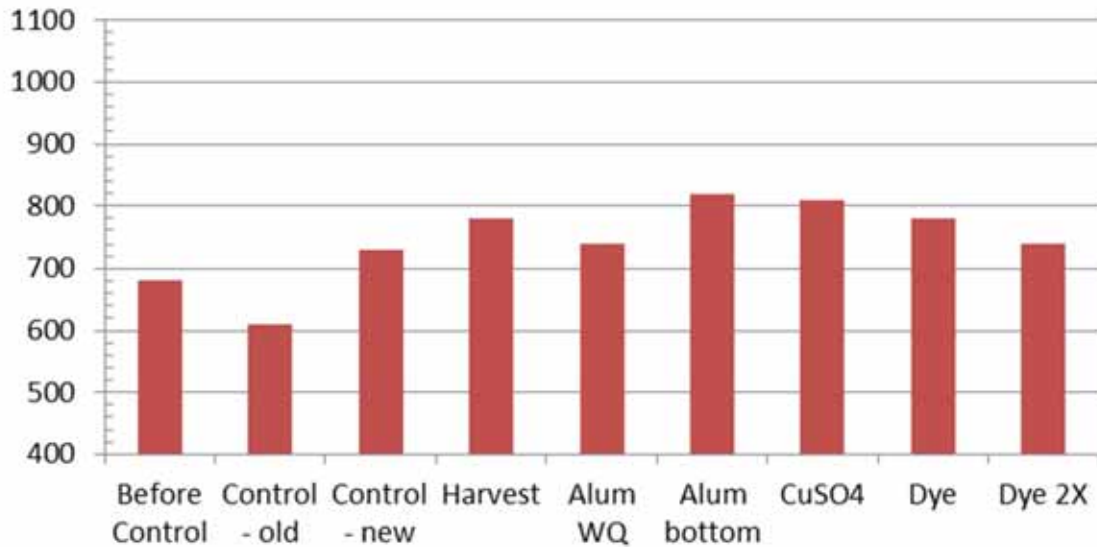
Total phosphorus highest in dye tanks and lowest in Alum bottom & old control.

TOC lowest in Alum bottom.

Total Organic Carbon (water)



Total Phosphorus in Sediment

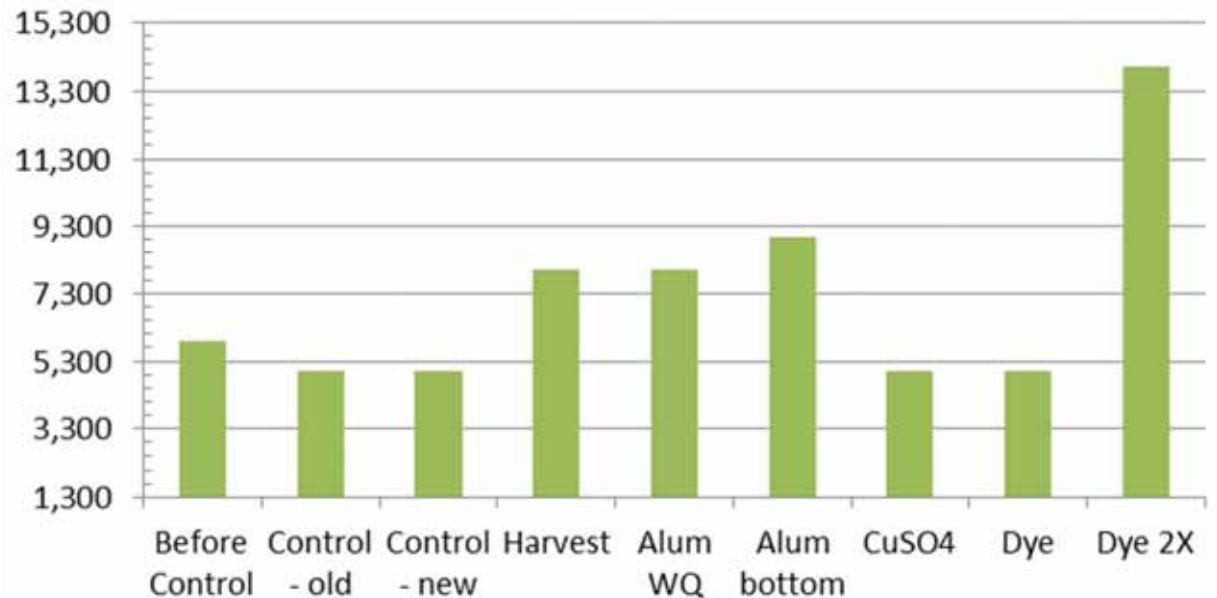


Results Sediment

Total Phosphorus – All tanks are within the ‘normal’ range for IL sediment (IEPA, 1996).

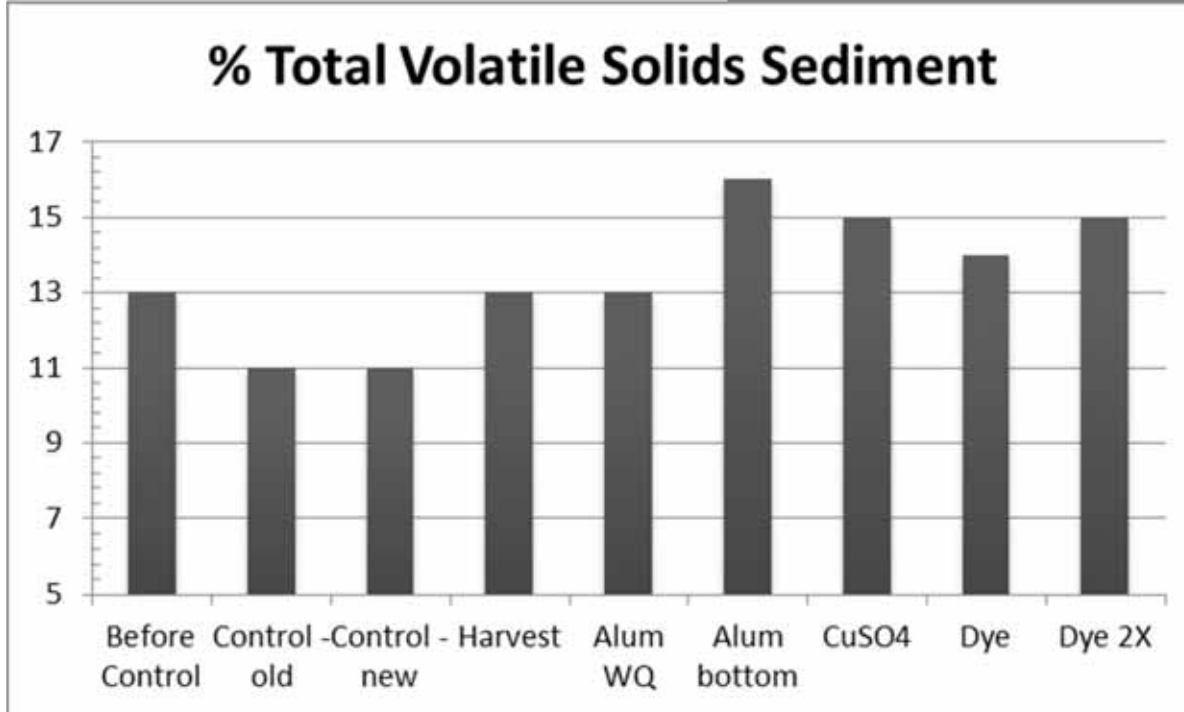
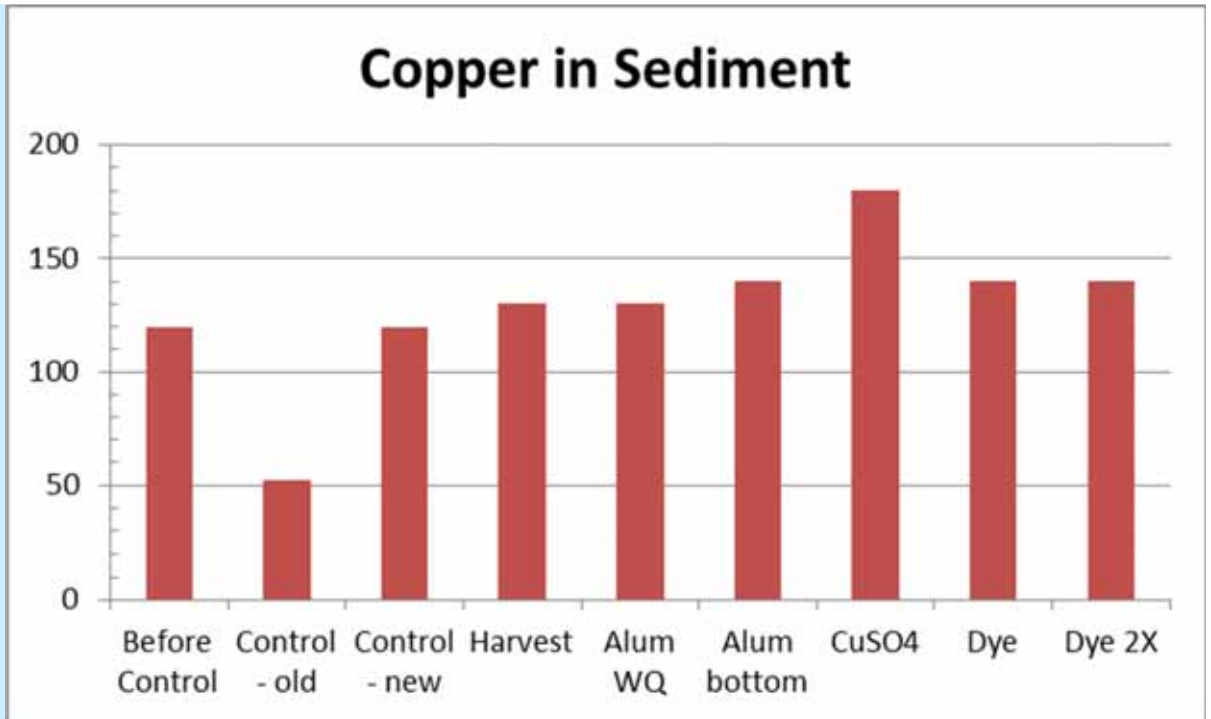
Tanks with TKN above 5,350 mg/kg are ‘elevated’, Dye 2X is ‘highly elevated’ for IL sediment

Total Kjeldahl Nitrogen in Sediment



Results - Sediment

Copper above 100 mg/l is 'elevated'.
Highest in CuSO4 tank.
Lowest in 2011 tank.



TVS is 'elevated' above 13% in last 4 tanks.

Results - continued

- Blue-green algae scum formed on sediment in harvesting, alum, CuSO₄, and dye tanks.
- Micro life (*Daphnia*, *Rotifers*) observed in tanks without chemicals (new sediment, harvest, alum-water quality).
- Tubificid worms formed in tanks with micro life.



Conclusions

- Snails had a strong influence on the amount of algae growing on the tank walls.
- Phosphorus levels much higher than expected.
 - Dye tanks had very high phosphorus.
- Low dose alum had no effect on phosphorus.
- Alum bottom sediment flock lasted several months, then blue-green algae (*Oscillatoria*). Tank also had no micro-life for a long time, pH took 2 months to recover.
- Copper sulfate had no effect on *Oscillatoria* on sediment or *Rhizoclonium* on tank wall.
 - Killed snails
- Placement of tanks in front of window affected results.
 - Affected temperature and algae growth.

Further Research

- Look for ways to encourage natural systems to limit nuisance algal growth.
 - Conditions for snails
 - Sediment stabilization
 - Study water movement effect on algae growth

Questions?

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