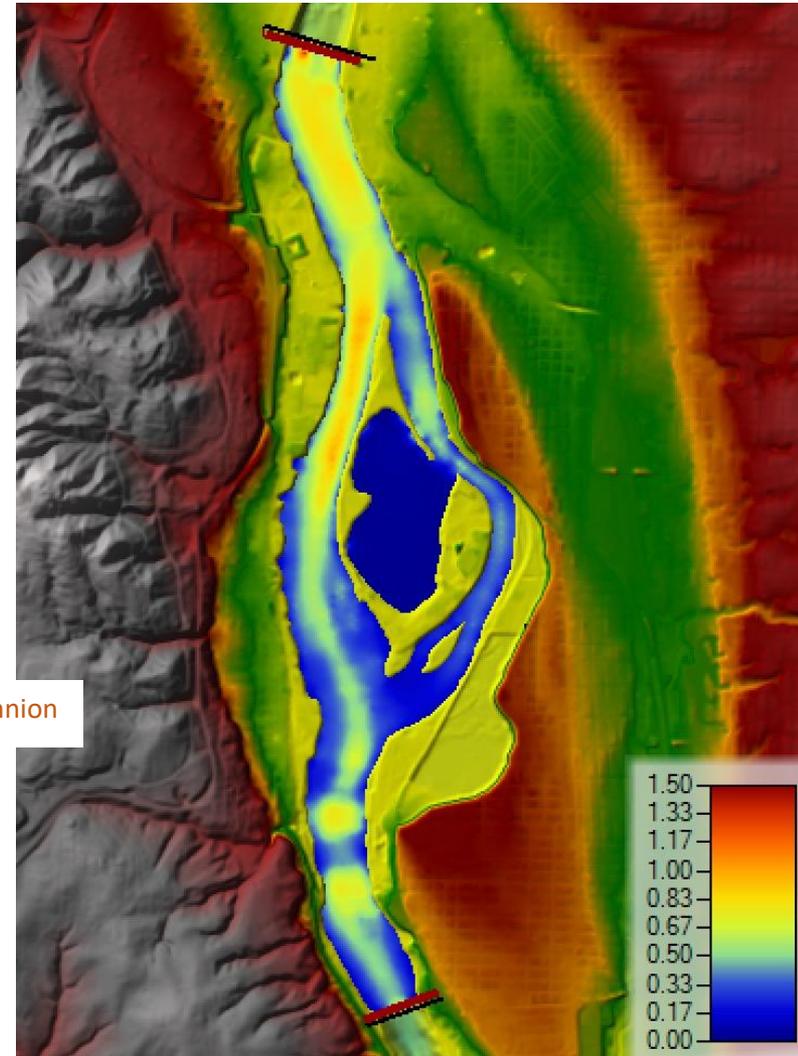
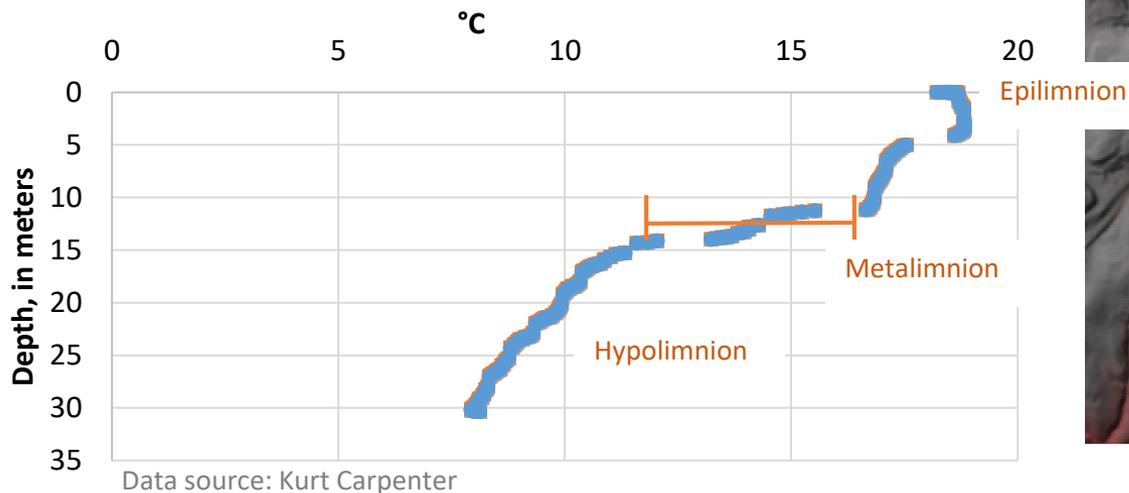


HAB @ Ross Island Lagoon

Desiree Tullos, PhD, PE (OR)

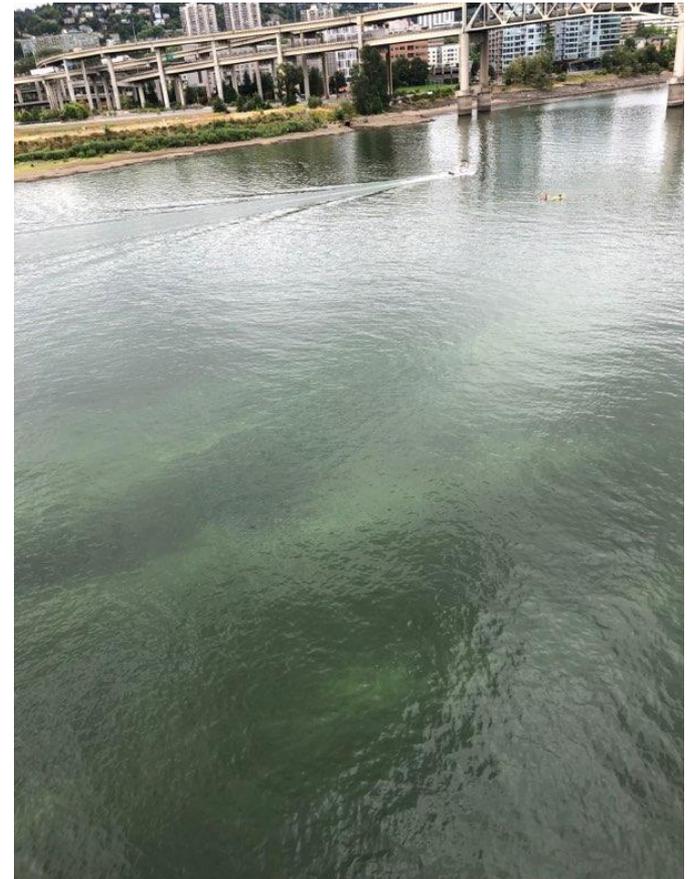
Existing conditions

- Embankment at upstream/south end creates stagnant water that establishes stratification
- Listed as impaired for nuisance algae



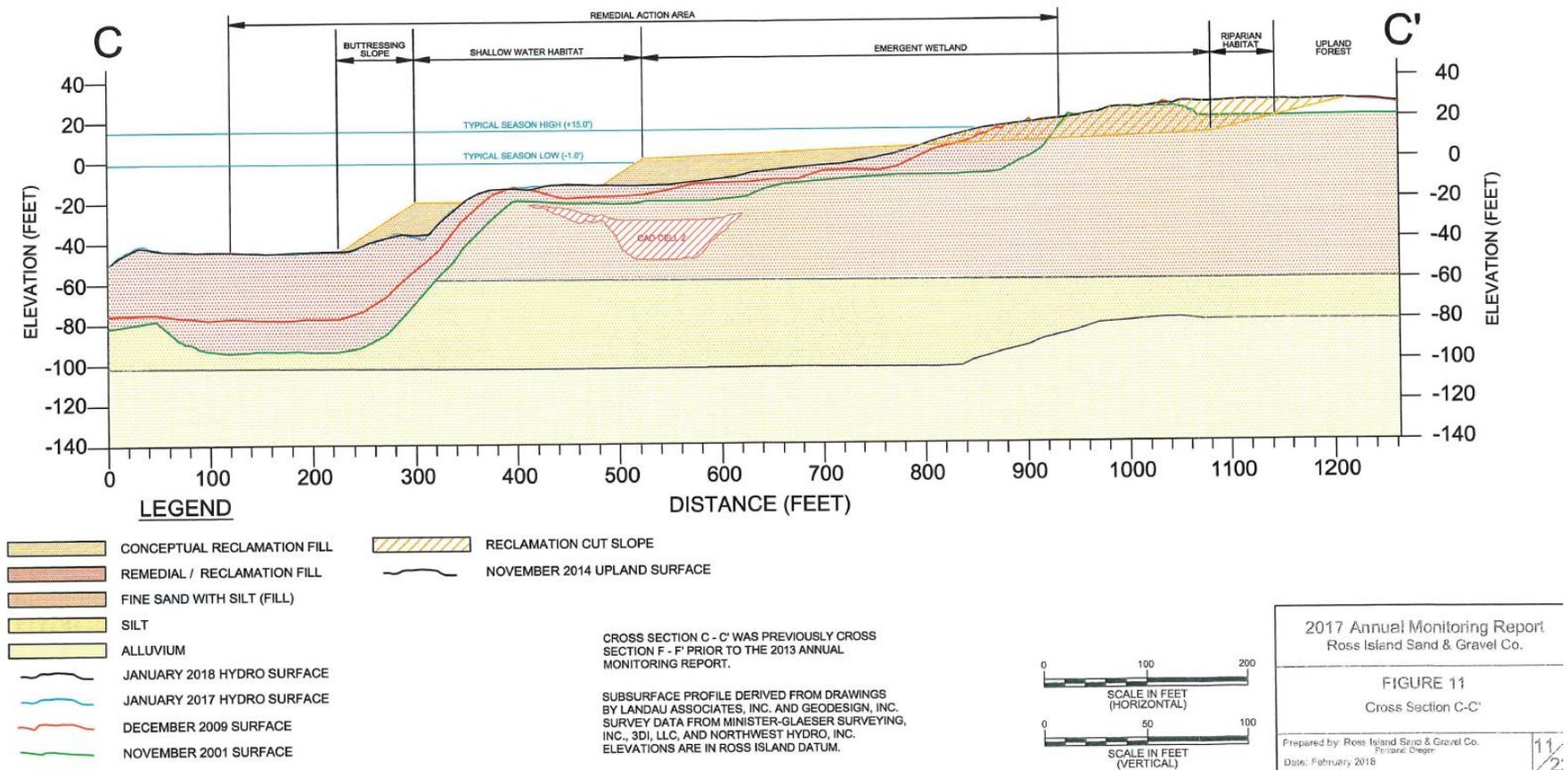
Existing conditions

- Summer HABs that move into mainstem with tide
- Many engaged stakeholders
- No single responsible party

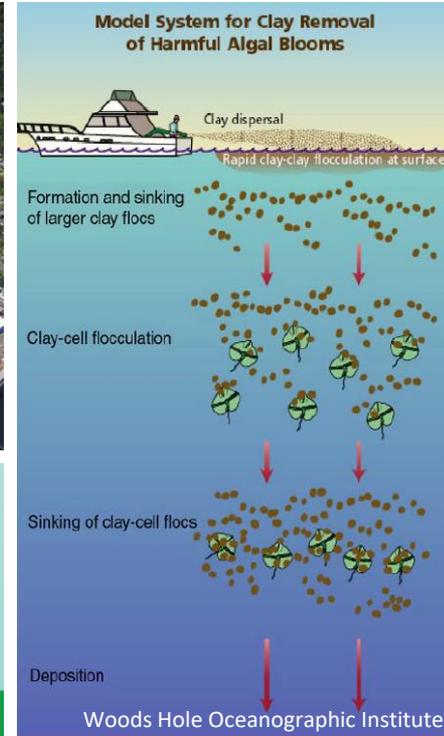
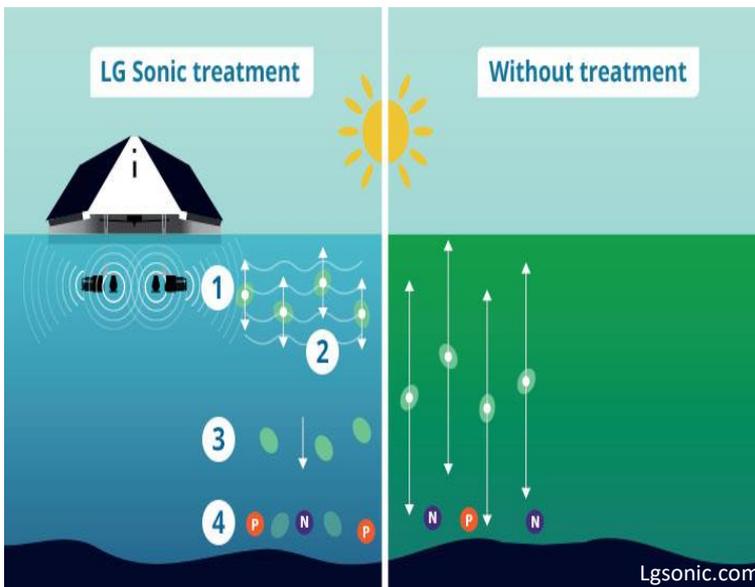


Existing conditions

Added complexities: CAD cells, reclamation plan



Alternatives analysis by OSU students



Recommendation 1

A short term solution is feasible and needed.

Some are well established.

Most promising option: Mechanical mixing

- Approximate cost: \$200,000 capital + \$80,000 annually
- Effectiveness uncertainty: Careful design is needed
- Regulatory uncertainty: none?
- Adverse environmental impacts: minimal

Recommendation 1

A short term solution is feasible and needed.

Some are experimental.

Range of experimental options: nanobubblers, barley straw floats, floating ultrasonic instruments, etc.

- Approximate cost: varies significantly
- Uncertainty in effectiveness: high
- Regulatory uncertainty: high
- Adverse environmental impacts: varies from probably none to unknown

Recommendation 1

A short term solution is feasible and needed.

Some may have environmental impacts.

Non-feasible option: Alum

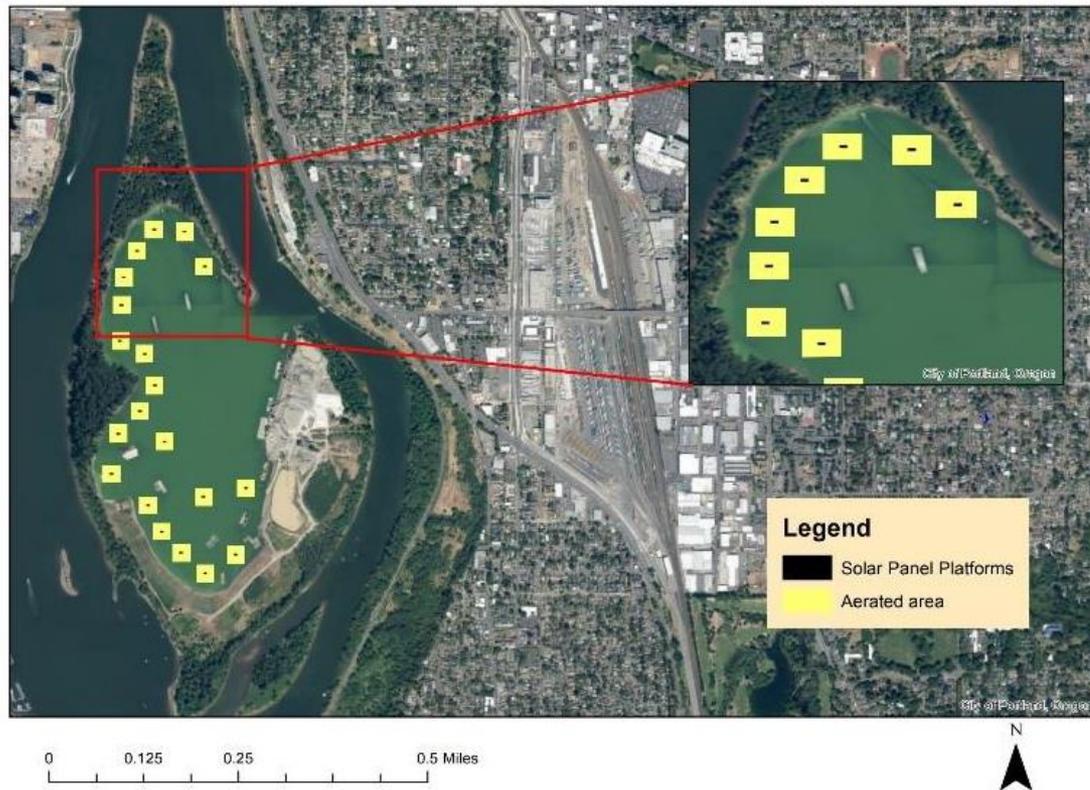
- Approximate cost: ~\$80,000
- Effectiveness uncertainty: More data is needed on internal recycling of P
- Regulatory uncertainty: Aluminum will be a regulated water quality parameter in OR
- Adverse environmental impacts: expected

Recommendation 1

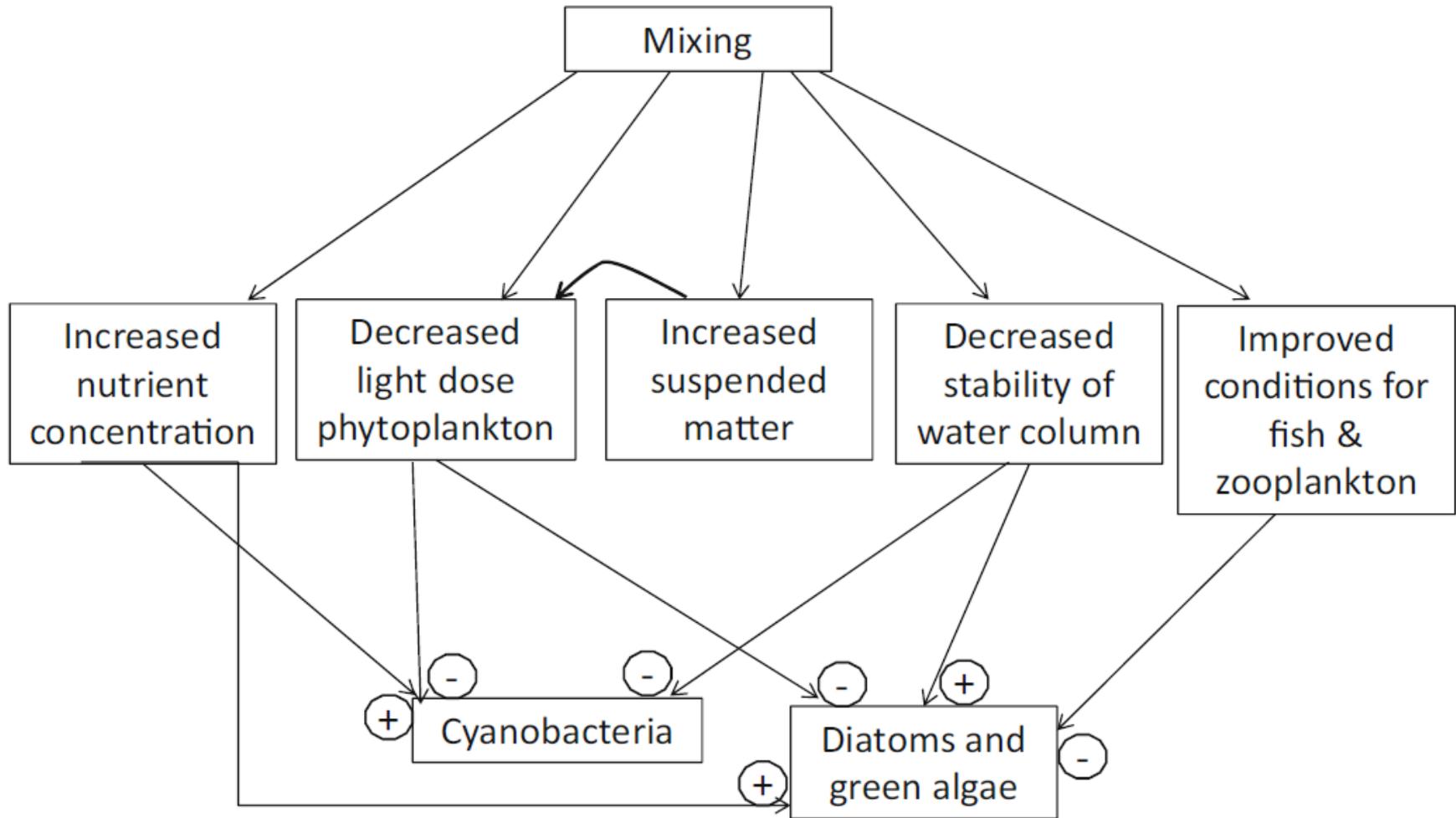
A short-term solution is needed.

Aeration mixing is probably the most feasible.

It needs to be implemented carefully.



Recommendation 1



Recommendation 1

Mixing treatment mechanisms

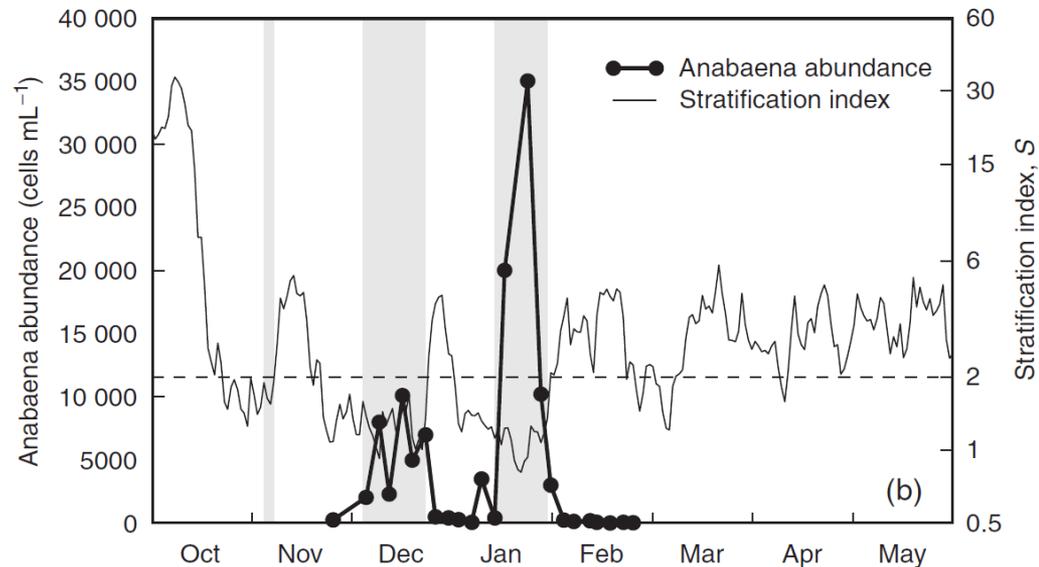
- Decreased stability of euphotic zone
 - modifies competitive balance between buoyant cyanobacteria and sinking phytoplankton – competition for light
 - But to what depth? Epilimnion: ~12m; PAR: ~ 5m
- Nutrients
 - Oxidizes hypolimnion to reduce mobilization of P
 - But... can increase N and P availability by suspending sediments
 - Is mixing enough? Or do we also need management of N:P ratio?
 - Models (e.g. Klausmeier et al. 2001, Huisman et al. 2004) and field experiments should help understand this problem better

Recommendation 2

A long-term solution is feasible and needed,
but more complicated.

The HAB is fundamentally a hydraulics problem.

The long-term solution ultimately addresses the hydraulics.

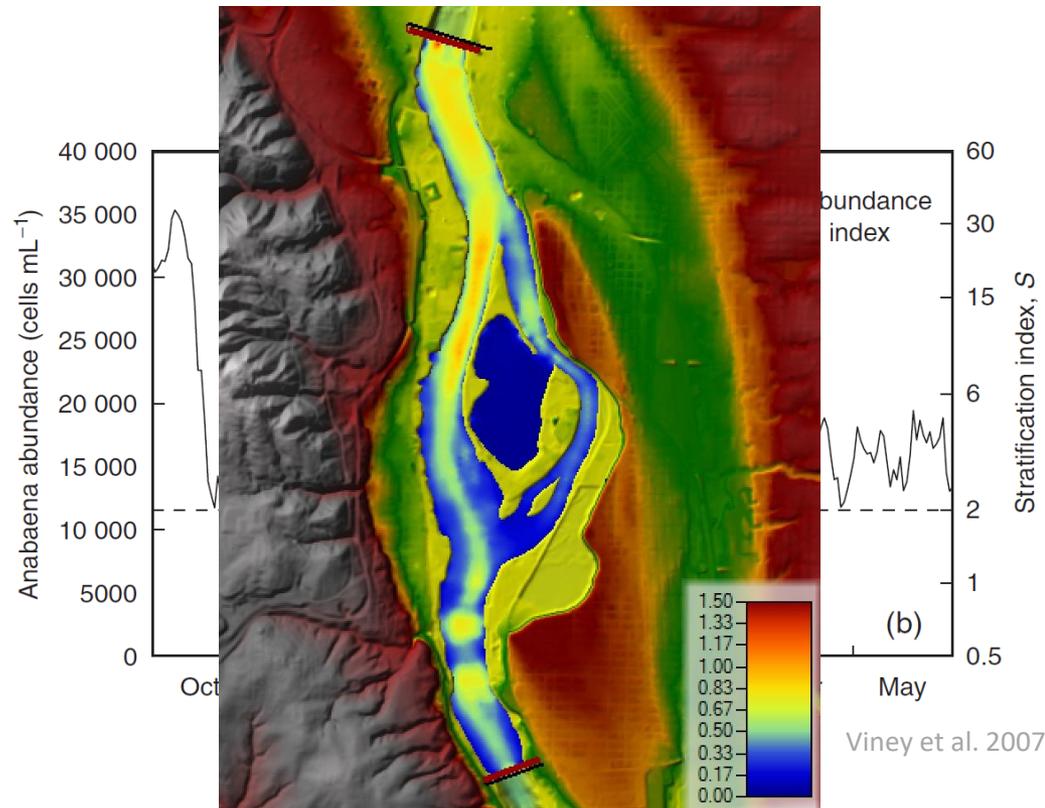


Recommendation 2

A long-term solution is feasible and needed,
but more complicated.

The HAB is fundamentally a hydraulics problem.

The long-term solution ultimately addresses the hydraulics.

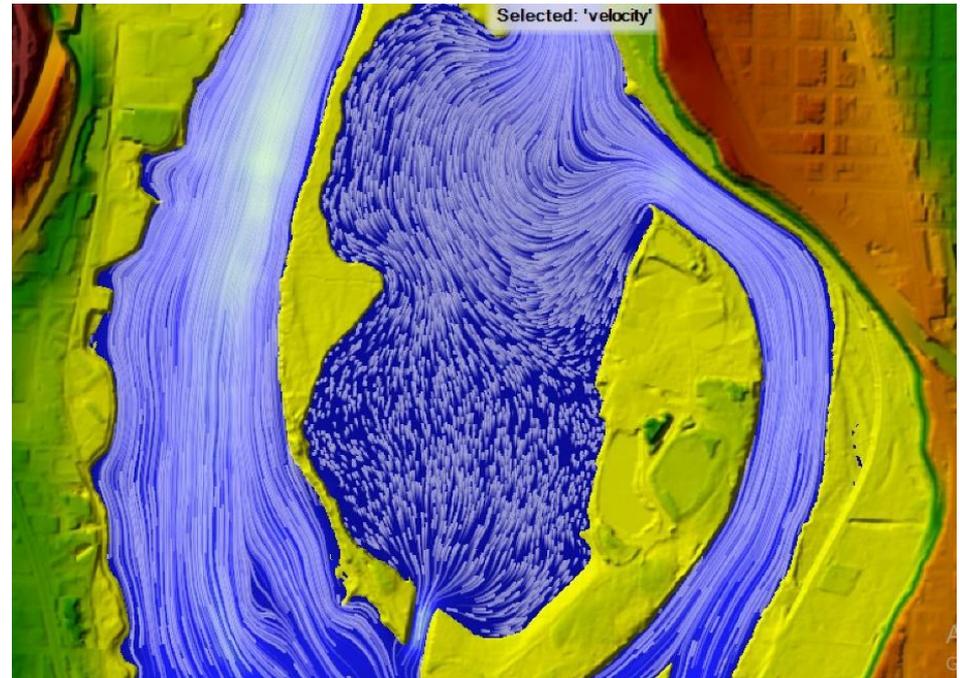


Recommendation 2

A long-term solution is feasible and needed,
but more complicated.

Why it is complicated

- The lagoon is BIG (~9600 ac-ft).
- Mixing likely requires both river flows and tidal pumping
- Uncertainty around mixing depths needed
- Over-constrained



Recommendation 3

Further data and modeling are needed.

- Short term: Better understanding of contributing factors and solution feasibility.
 - Depth of euphotic zone in spring and summer
 - Basic data on soil pH and P in soils.
 - N and P concentrations in fill materials (as recommended by ODEQ in 2001)
- Long-term: Better understanding of hydraulics.
 - 3D modeling needed for detailed design of hydraulic solution

Recommendation 4

Leadership and coordination are needed.

- Agencies have data and authority that aren't being utilized to address this issue.
- Focus group of experts should prioritize activities in the lagoon
 - hydraulics and modeling of rivers, **microbiology of cyanobacteria**, water quality, aquatic habitat for T&E+ species, regulatory authority and flexibility, and facilitation
- Oregon Solutions process underway.

Recommendation 4

Key considerations for this dynamic system

- Avoid solutions that fix short-term problems but create longer term and potentially irreversible problems
- Ask hard questions:
 - Is the Reclamation Plan still the right vision?
 - Does the nexus with Portland Harbor inhibit long-term solutions at RIL?

Conclusions

Like nearly all HABs...

- A short-term solution is needed.
- A long-term solution is needed.
- More information is needed.
- Leadership & coordination are needed.



But all of these are feasible with the right team and resources.

Many thanks.

Especially: Students of BEE 446/546, Willie Levenson, Theo Dreyer, Kurt Carpenter, Petra Visser, BES streamlining team, BES, DSL, ODEQ, James Holm, Todd Jarvis/Lynette deSilva, and many others.



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