



SludgeHammer[®]

nature called. we answered.



**Empowering Nature in
Wastewater Treatment Systems**



We love our lakes - So how do we protect them?





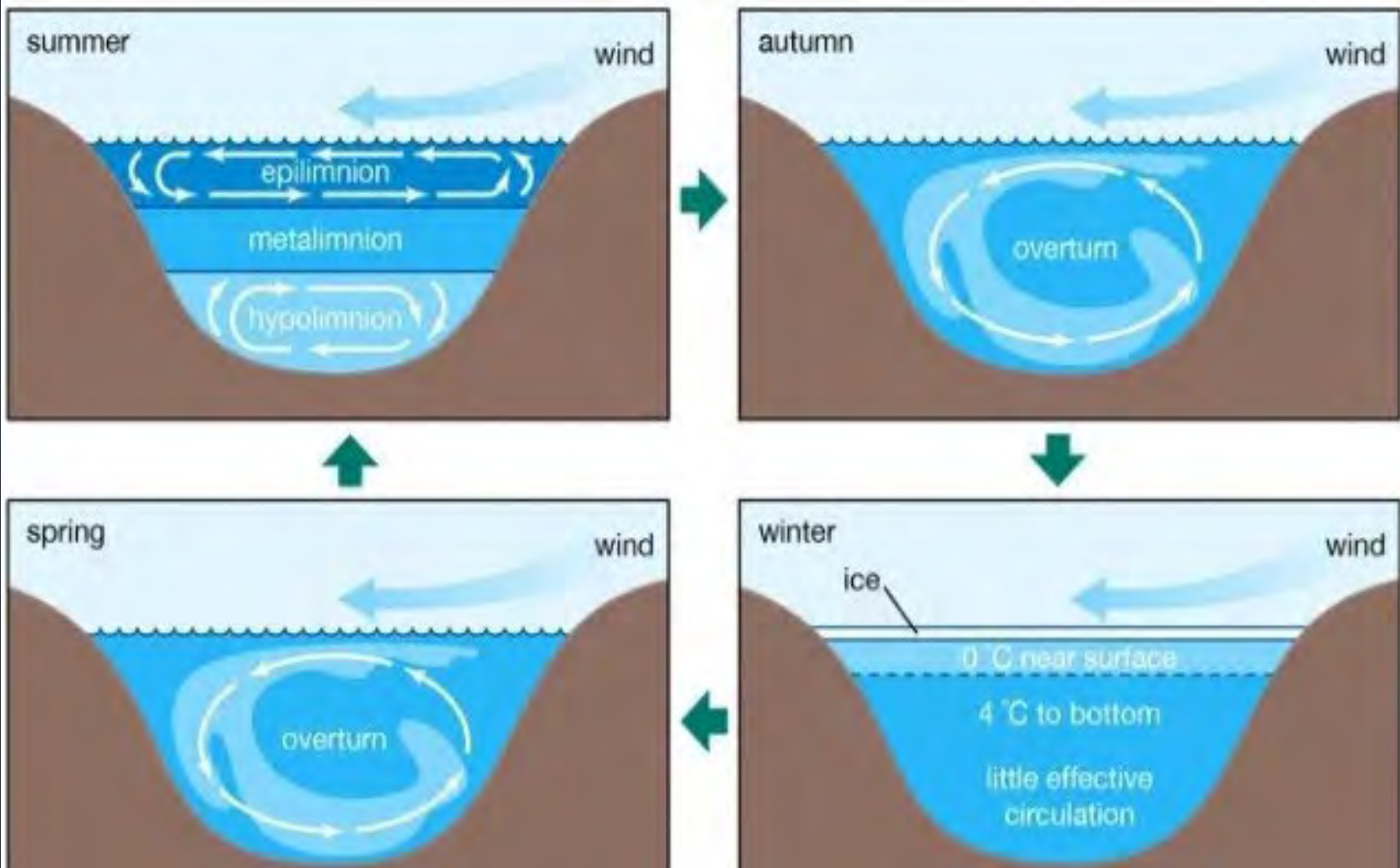
How do you keep a lake like this from becoming

A lake like this!





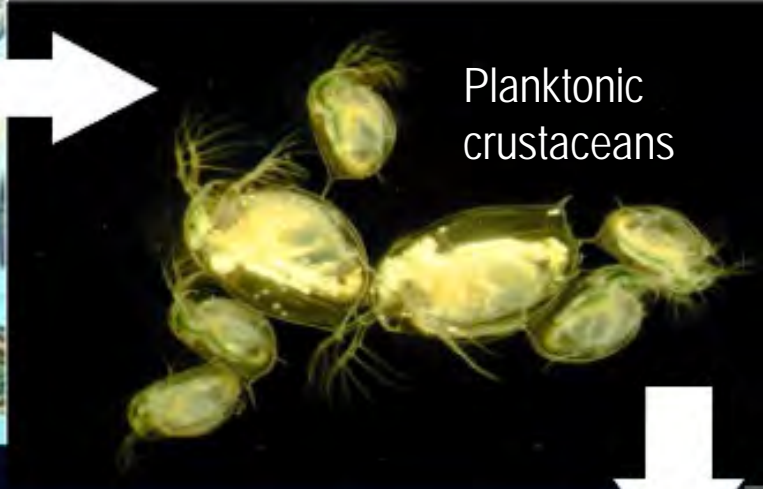
Annual Lake Weather Cycle



Spring Diatom Increase and Aquatic Food Cycle



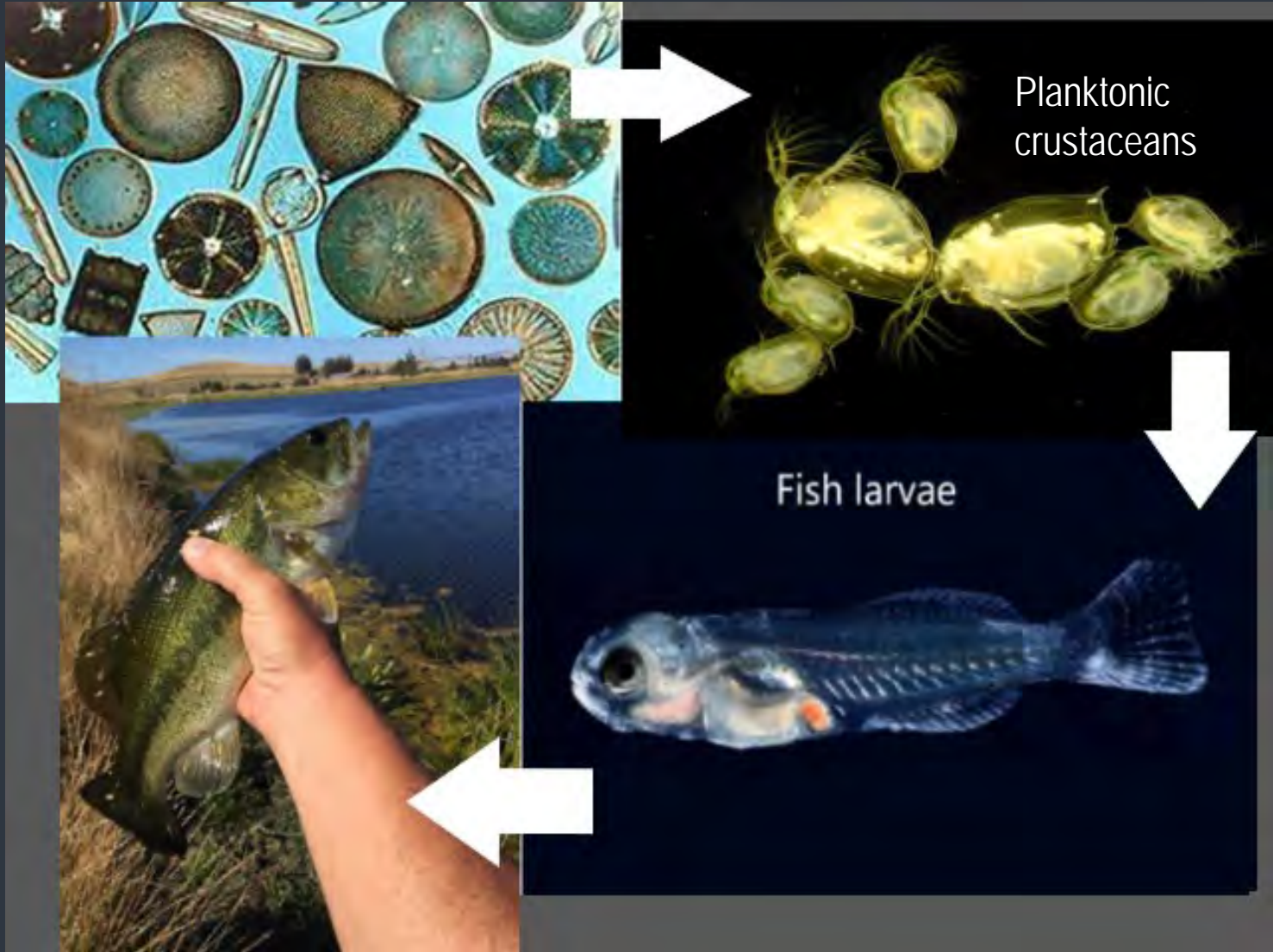
Diatoms



Planktonic crustaceans



Fish larvae





Out of Control Algae



Bacterial Bioremediation



Dr. Wickham Develops the SludgeHammer Blend Bacteria and displays successful soil remediations at the Marine Corps Base Camp Pendleton, Oakland Naval Supply Depot, Chevron Oil and PEMEX.



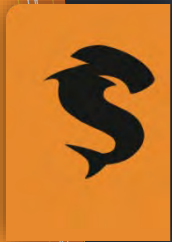
Active Fermentation in Manure Lagoon





Sources of Wastewater Bacteria





Weaknesses of Intestinal Bacteria

Low Appetite for Food



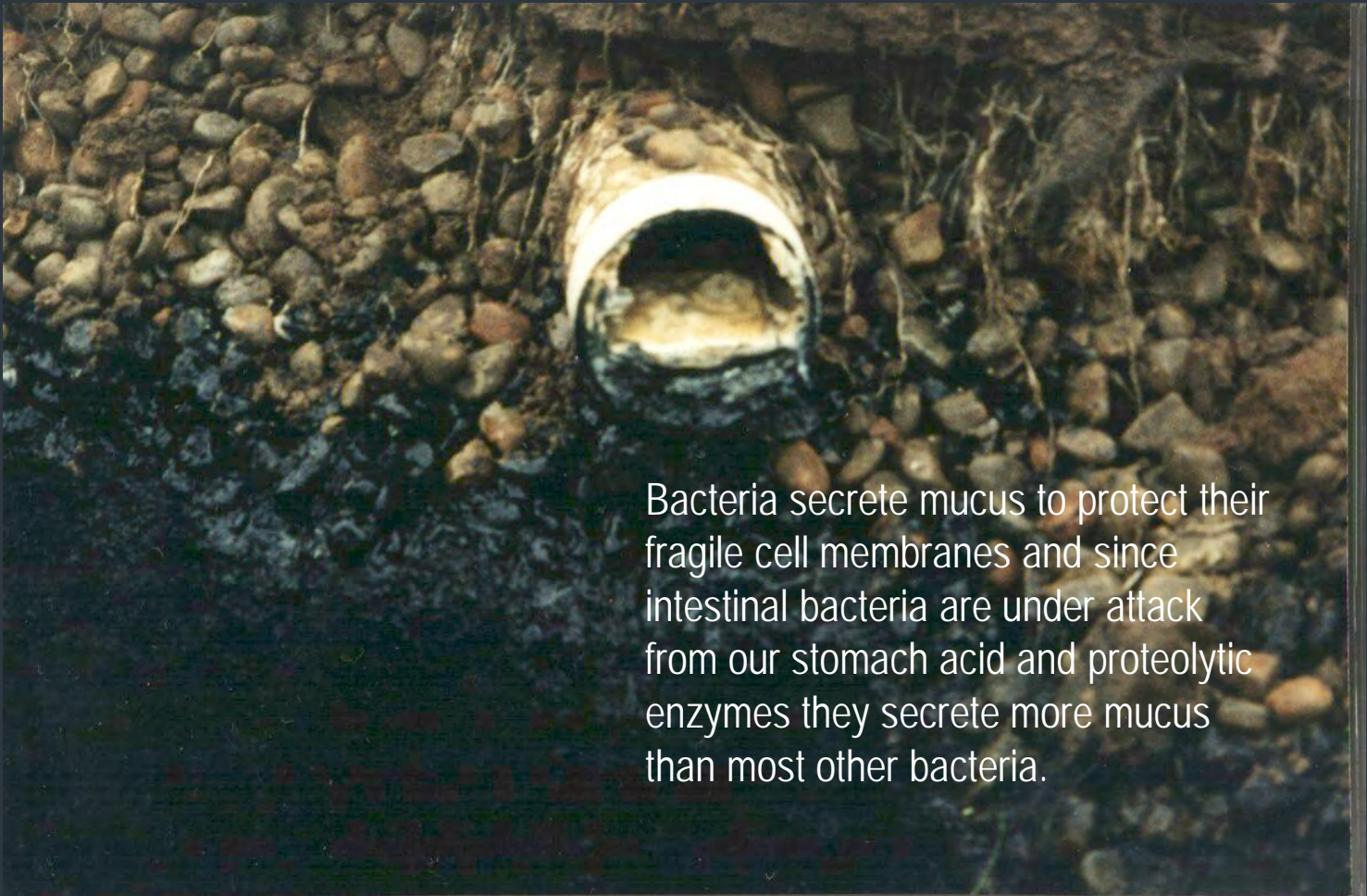
Narrow Temperature Range



Mucus



Why does this matter?



Bacteria secrete mucus to protect their fragile cell membranes and since intestinal bacteria are under attack from our stomach acid and proteolytic enzymes they secrete more mucus than most other bacteria.



Weaknesses of Strict Aerobes



1. Random sourcing
2. Appetite constrained by host dependency
3. Require O_2 - Cannot survive in anaerobic leach field.
4. Cannot ferment
5. Cannot denitrify

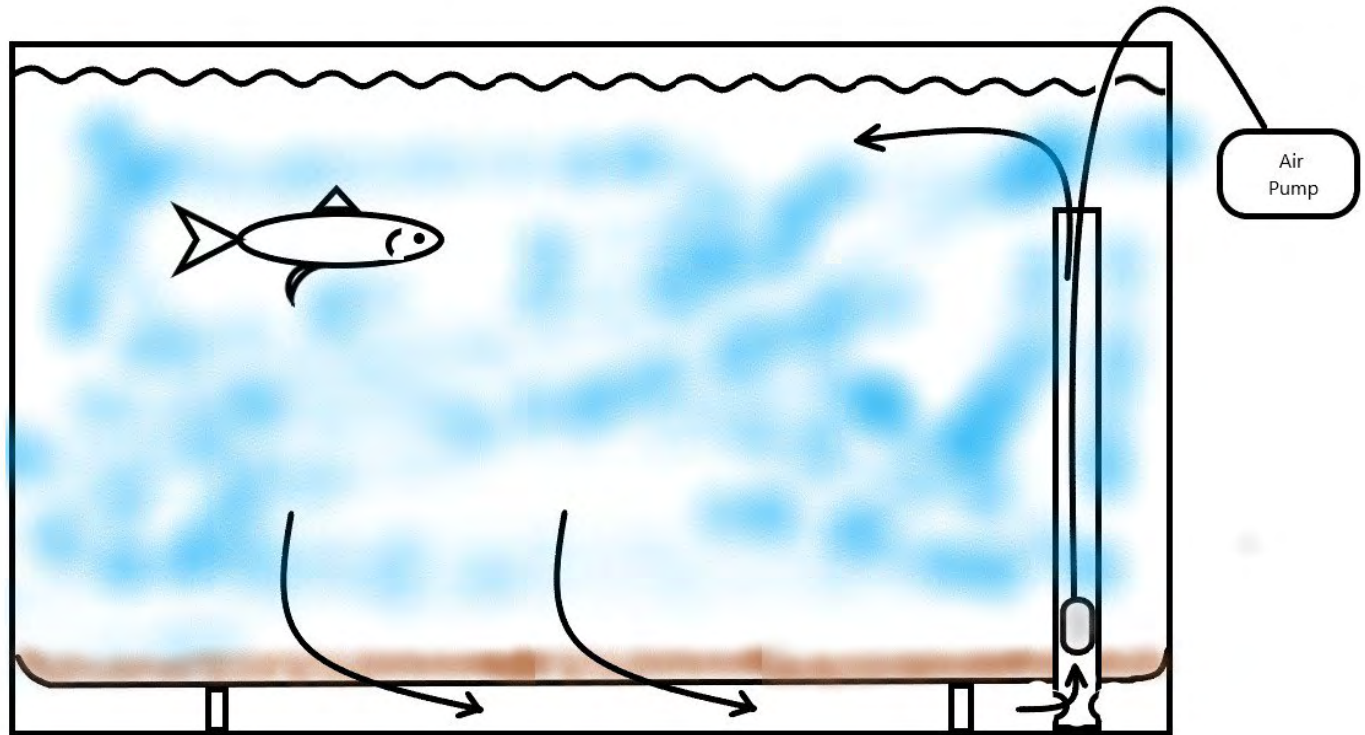
Sludge Hammer Blend Bacteria



- Survive in anaerobic conditions
- When anaerobic they ferment sugars such as muco-polysaccharides
- Denitrifiers when anaerobic
- Operate at low temperatures
- Spore formers are "R" selected
- Produce very small level of biomass
- Robust enough to recover quickly

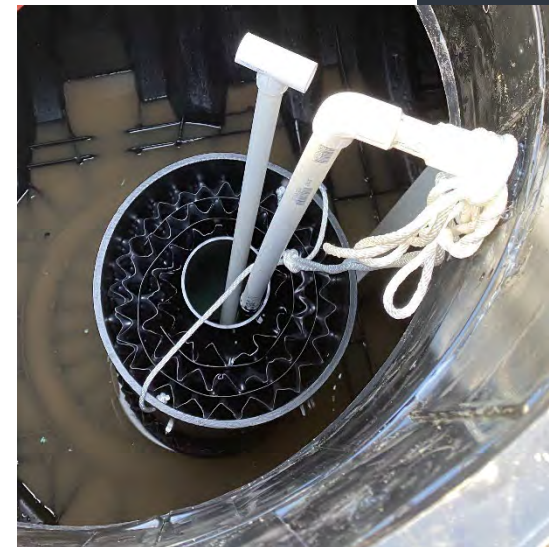
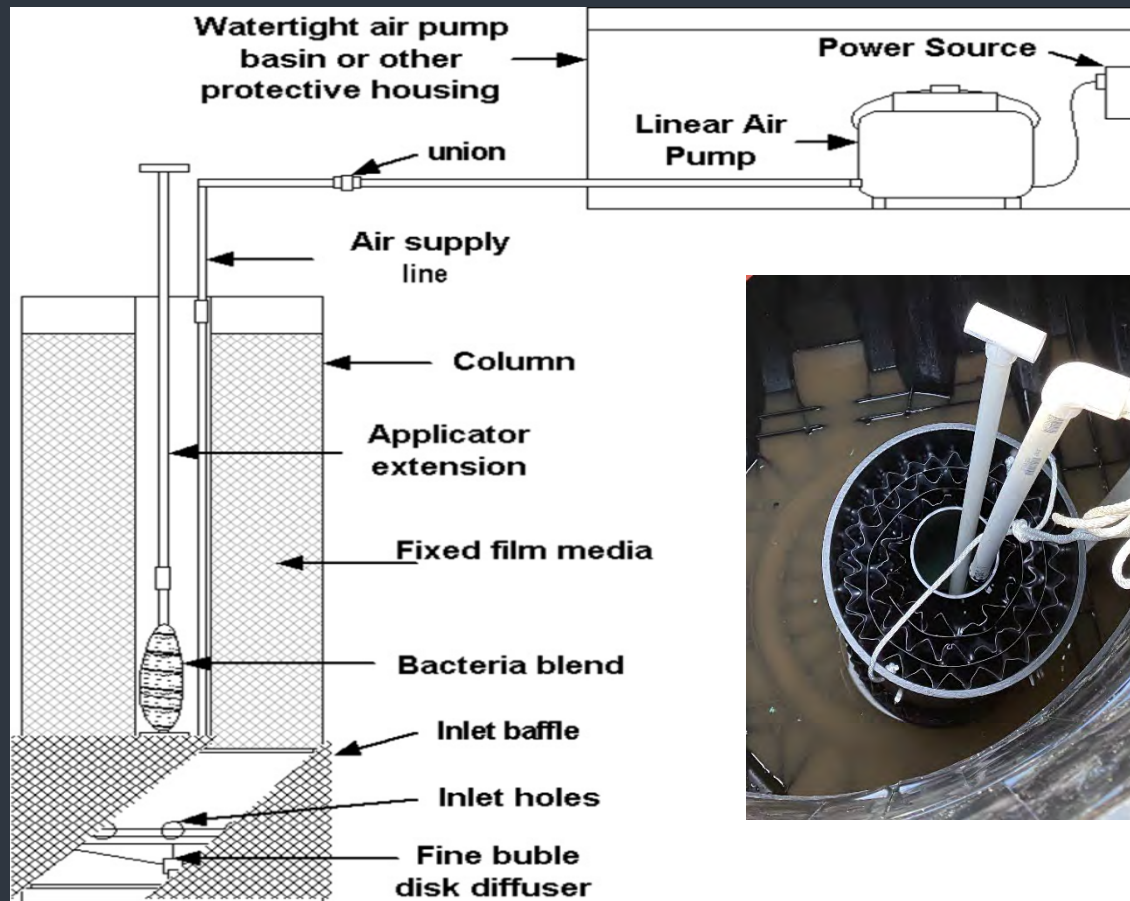


Aquarium Design Principle





The ABG is an aeration device that provides a specific refuge where facultative soil bacteria can be grown inside the tank.





Nutrient control is the key with phosphate being the most important. Aeration may be the best way to keep it in the soil and out of the Groundwater

Lysimeter Soil Samples at Depth
Total Phosphorus readings as mg/l

		Site 3 Conventional Septic/leachfield			Site 1 Single SludgeHammer in septic tank/leachfield			Site 2 SludgeHammer with subsurface drip		
		Depth			Depth			Depth		
Date		6"	12"	24"	6"	12"	24"	6"	12"	24"
Baseline	11/12	1.19	1.59	0.5	0.15	0.14	0.12	0.13	0.14	0.47
	12/13/2004	1.95	NS	1.63	0	0	0	0	0	NS
	1/5/2005	2.96	3.23	1.89	0.12	0	0	NS	NS	0
	1/10/2005	NS	3.78	1.58	0.06	0	0	NS	NS	0
	1/26/2005	5.12	NS	2.81	0.09	0	0.11	NS	NS	NS
	2/8/2005	6.7	NS	3.56	0.06	0	0	NS	NS	0
	2/14/2005	6.97	7.06	4.5	0.09	0.05	0.07	NS	NS	0.57
	2/21/2005	7.96	8.06	5.22	0.08	0	0	0.08	0	0
	2/28/2005	7.05	8.51	5.28	0.27	0.07	0.32	0.09	0.25	0.08
	3/7/2005	6.28	NS	4.29	0.09	0.06	0	0.09	0	0.05
	avg	5.62	6.13	3.42	0.10	0.02	0.16	0.07	0.06	0.10



Clean Water instead of
nasty septic effluent is the
key to keeping lakes
healthy!!



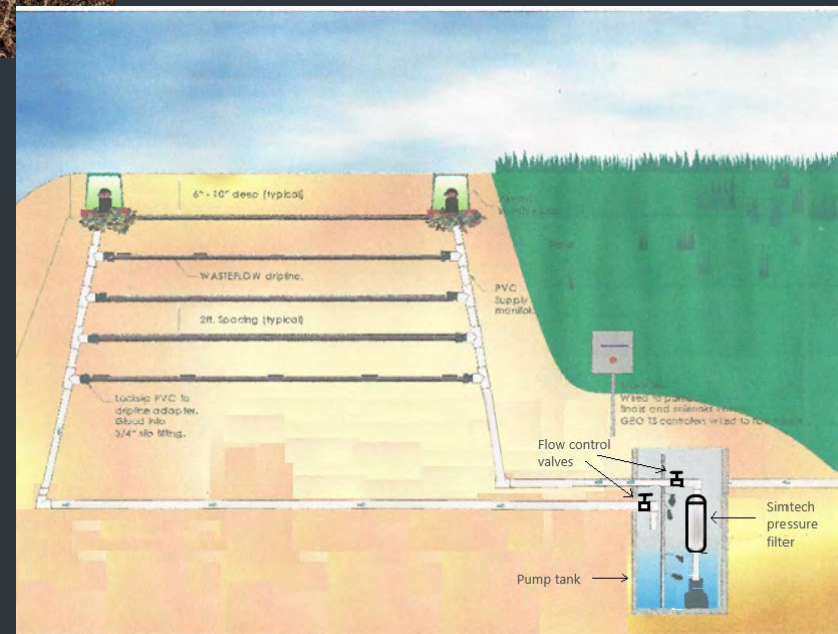


GeoFlow Subsurface Drip Irrigation



Nitrogen and Phosphate
Directly taken up by
Vegetative Growth

Enriched organic
environment of discharge
point increases nutrient
absorption and biological
treatment even in winter.





Conventional Leach Trenches

- Effluent released closer to aquifer
- Effluent released below living soil
- Absorptive surface is anaerobic
- Soil is saturated, moving down by gravity
- Septic effluent is nasty and stinks
- Nitrates contaminate aquifer
- Phosphates move through soil to lakes
- Large areas are needed for trenches
- Rectangular configuration is restrictive
- Mounds are required on many properties
- Water is wasted
- Trees need to be eliminated

ATU/Drip Irrigation

- 2-3' increase in groundwater separation
- Effluent is placed in biologically active soil
- Effluent is always aerobic
- Soil is unsaturated and effluent moves up
- Effluent is clean and odor free
- Nitrates are taken by vegetation
- Phosphates absorbed by soil
- Footprint for required surface area is smaller
- Drip field can be shaped to property
- Mounds can be eliminated or minimized
- Water is reclaimed and replaces potable
- Trees can be part of the disposal system



Lush drip-irrigated lawn with SludgeHammer effluent along Lake Charlevoix





Digt Excavation converts pump- and-Haul tanks to Drip at Lake Cora



sludgehammergroup ltd
Lake Cora



Small Side-Yard drip field on Mullet Lake





Tiny yard next to private lake near Traverse City



Trees can now be part of your disposal system.



The Visconti's on Mullet Lake already had a gorgeous landscape mound. SludgeHammer gave it water and nutrients.





From Waste to **WOW!**
SludgeHammer Office's
Own sustainable garden
shows how technology
can create beauty.





This clean, treated effluent grew some amazing pumpkins this year at Pond Hill Farms





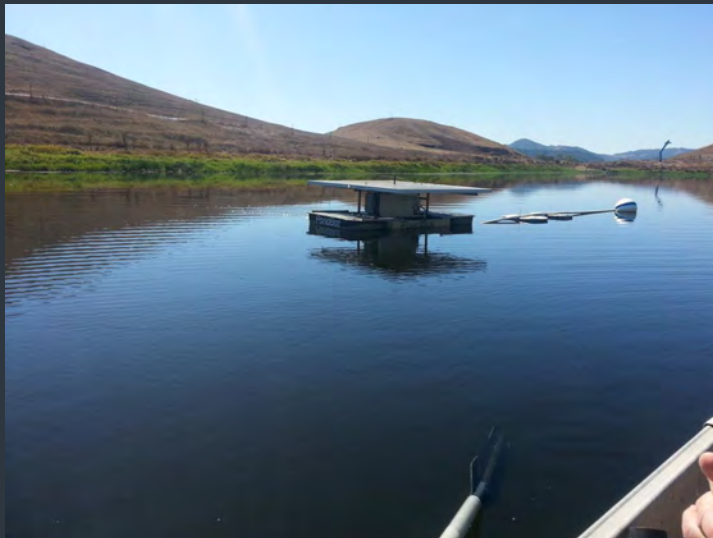
What about Lakes that already have blooms?

PondBot added to Pea Soup lake



Solar powered pond treatment unit

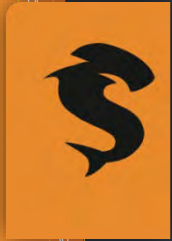
Pond water without algae



PondBot restored Reichardt's riparian zone by eliminating the algae bloom and Lo and Behold - The first fish ever caught from the pond!!!



Experimental DockBot - Algae control for lakes quietly sitting under your dock!



DockBot under Brooks Lake Dock



Pushing bacteria out into the lake with air



Sitting off shore along a small pond





Phosphate Adsorption Media

POWDER



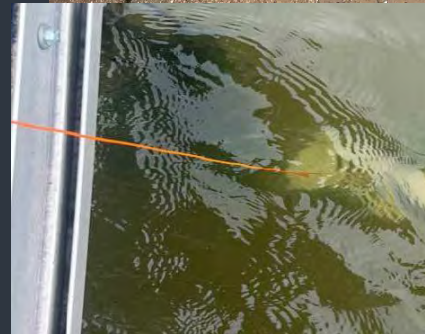
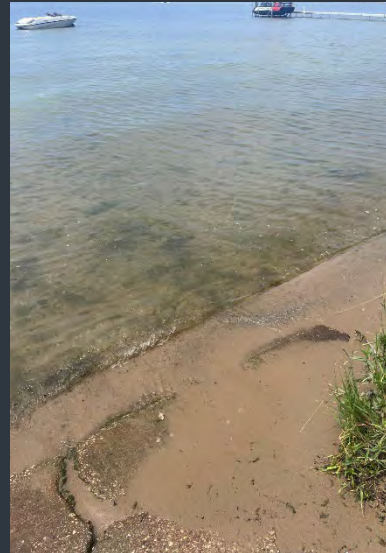
SMALL



Silver Lake Biochar Installation



June 10 – Installation with
Secchi disc at 32"



August 11 – Secchi reading at 48" and
visible clearing throughout the lake.

