

# Stinnett Enterprise



Marketing/Development  
21<sup>st</sup> Century Solutions

Distributor  
Bio Haven® Floating Island Products

Serving  
One Water One Watershed

# Ditch to River and...





... River to  
Ocean

# Naturally Occurring Floating Islands



# Biomimicry ....

## of Natural Floating Islands

- Peat bogs of Northern Wisconsin
- Riparian edge forms a 'matrix'
- Recycled plastics used to form BioHaven®



Nature



BioHaven matrix

# How do they work?



## BioHavens® Concentrated Wetland Effect

- *Basic principles*

1. Inert & Living Surface area for microbial activity
2. Circulation of water through surface area
3. Encourages biological synergies

- **Increases the wetland effect**

- ‘Super’ effective, perennialized treatment
- Multiple Layers of Treatment
- Compelling data suggests islands address causes of fresh water dead zones (Anoxic/Hypoxic conditions)

Formed from plastic matrix  
injected with foam



Any size  
Any shape  
Any buoyancy





Plants attract and sustain insect populations

Plants and insects attract song birds

Plants provide wildlife habitat and aesthetic beauty

Island surface provides wildlife habitat

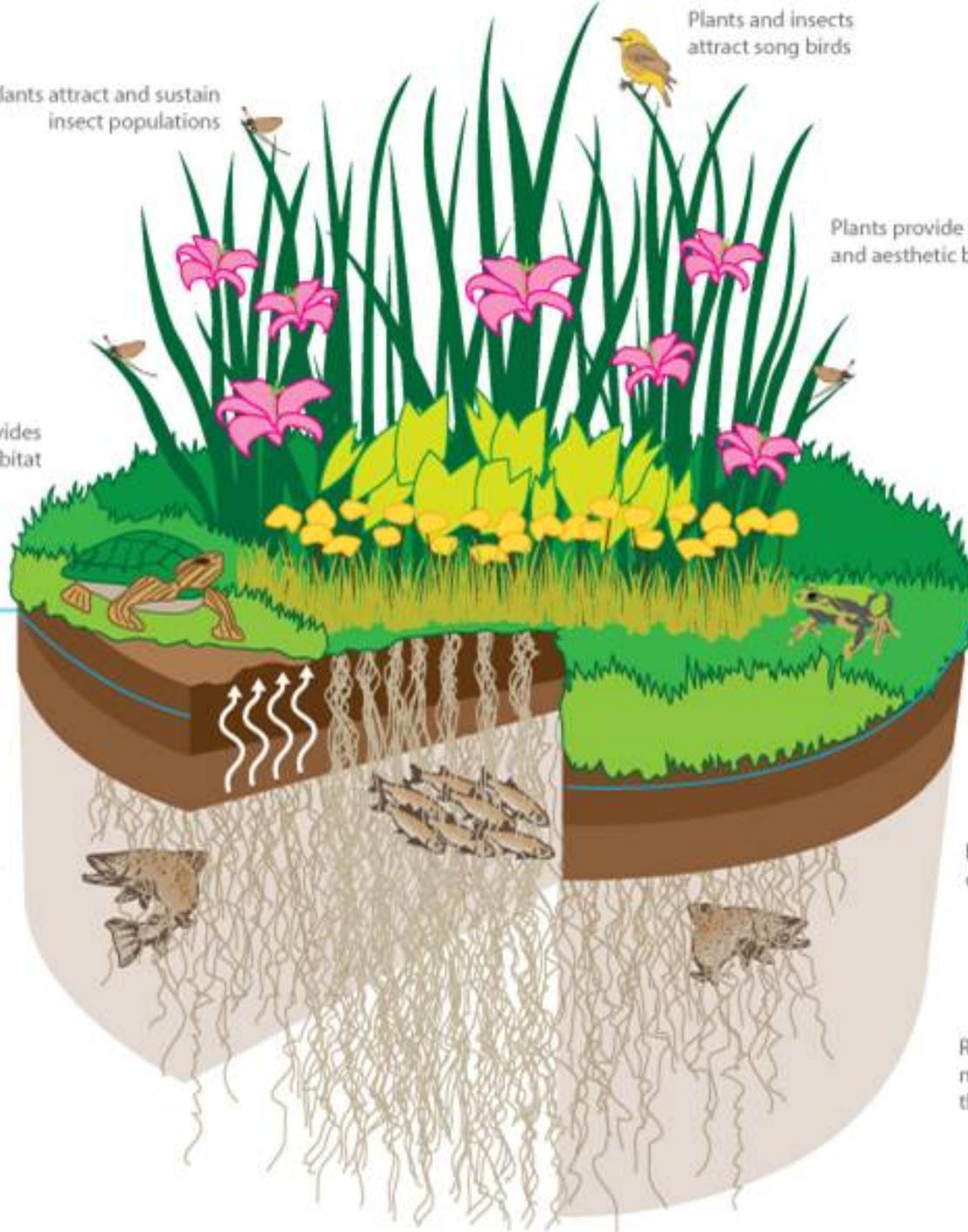
Water Line

Water Line

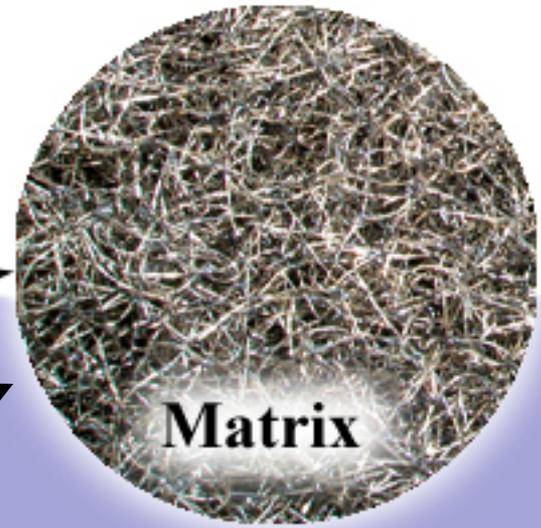
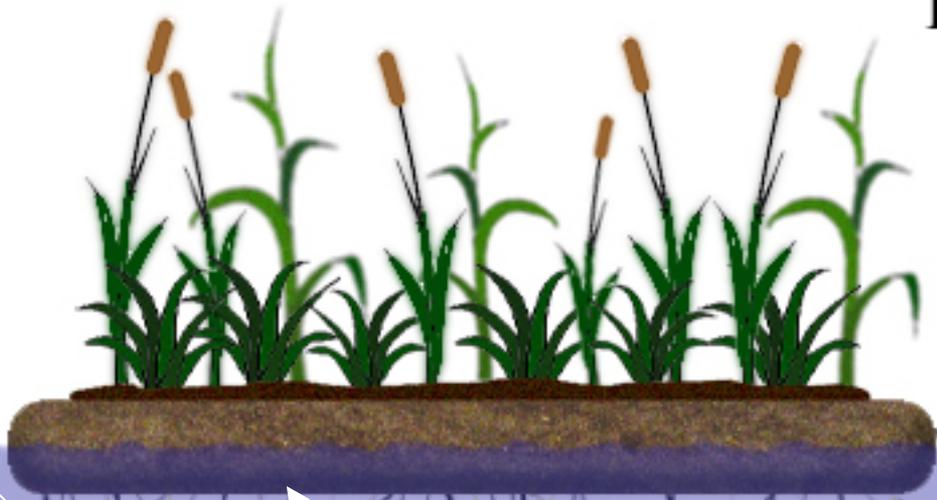
Island material and root systems provide valuable surface area for beneficial microbes to proliferate and pull pollutants from the water

Island shade and roots provide cover and allow fish to thrive

Root systems pull problematic nutrients out of the water through hydroponics



Biofilm covers the island and the plant roots

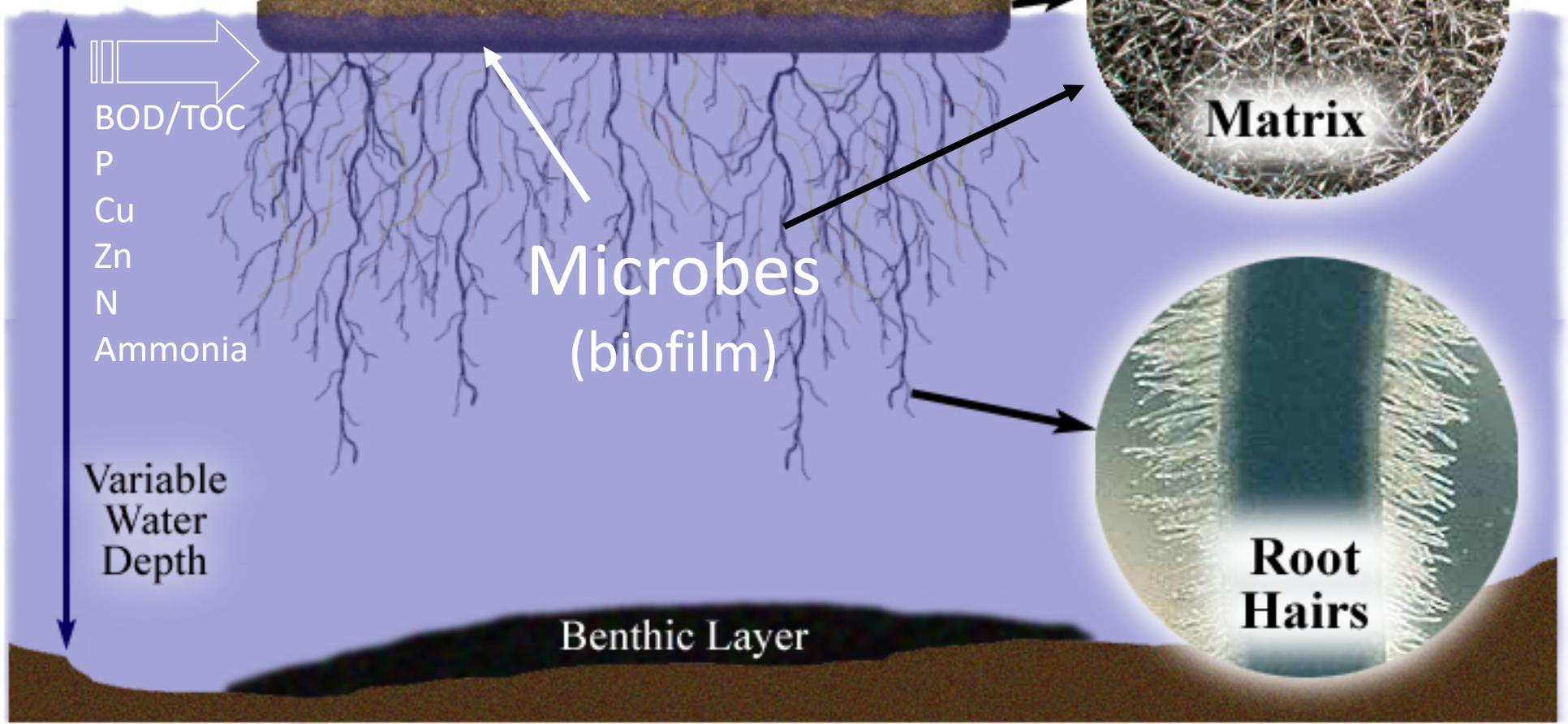


Microbes  
(biofilm)

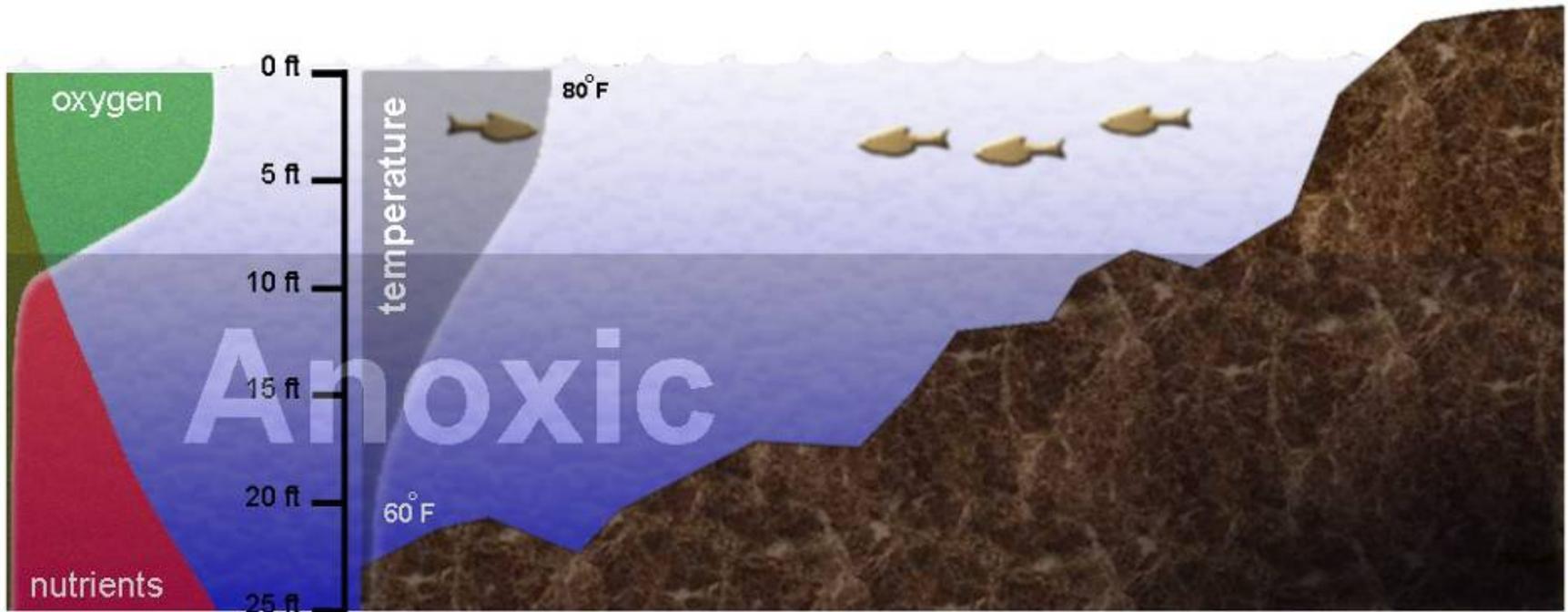
BOD/TOC  
P  
Cu  
Zn  
N  
Ammonia

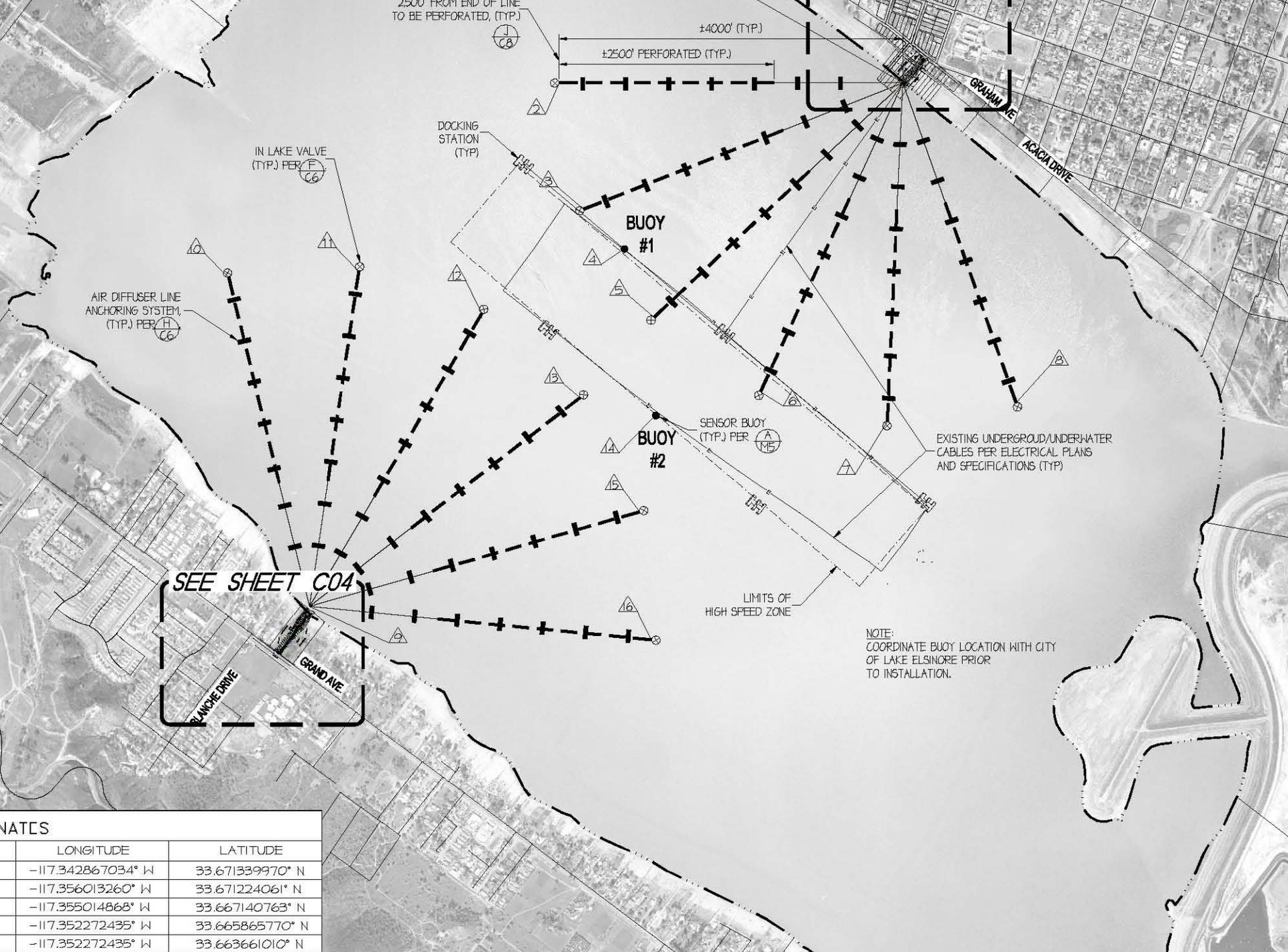
Variable  
Water  
Depth

Benthic Layer



# What happens deep in the lake bottom stays in the lake bottom





SEE SHEET C04

**COORDINATES**

	LONGITUDE	LATITUDE
	-117.342867034° W	33.671339970° N
	-117.356013260° W	33.671224061° N
	-117.355014868° W	33.667140763° N
	-117.352272435° W	33.665865770° N
	-117.352272435° W	33.663661010° N

# Trouble In Paradise

- Dr Horne's recent report detailing the aeration systems effectiveness upon the overall condition of the lake has both bad and good news. We've heard concern in a recent letter from LESJWA to the Regional Water Quality Control Board. There are a number of issues at hand.

# The Good News

- I believe the way to solve the problems of Lake Elsinore and Canyon Lake is by a multi-faceted approach of applied bio-remediation.
- Every pond, lake and still body of water has issues caused by the accumulation of waste matter and pollutants in the bottom of the water column. In shallow ponds and wetland structures, plants and bacteria can consume these nutrients and create a biological buffer zone. *Instead of suppression these systems use digestion.*

# A New Paradigm

## **Paradise Revisited:**

- Making the bio-remediation available to the troubled areas.
- Developing a biological plan that will satisfy the requirements of the permit.
- Developing a strategy for developing such a plan.

# Paradise Restored

- Lake Elsinore having essentially a smooth sand and silt bottom is lacking significant three dimensional structure which would provide a variety of areas where bio film and algae could proliferate. By adding bio matrix structures to the aeration piping, the lake bottom can be restored to life.

# Bio-Augmentation of the Aeration System

- **A feasibility and design study:**
- **Adding a bio-matrix structure to the aeration system.** The object is to provide multi-dimensional surfaces for the colonization of Beggiatoa bacteria presently found in Lake Elsinore.
- Periphyton will be encouraged to develop in this oxygenated matrix environ.

# “Build It And They Will Come”

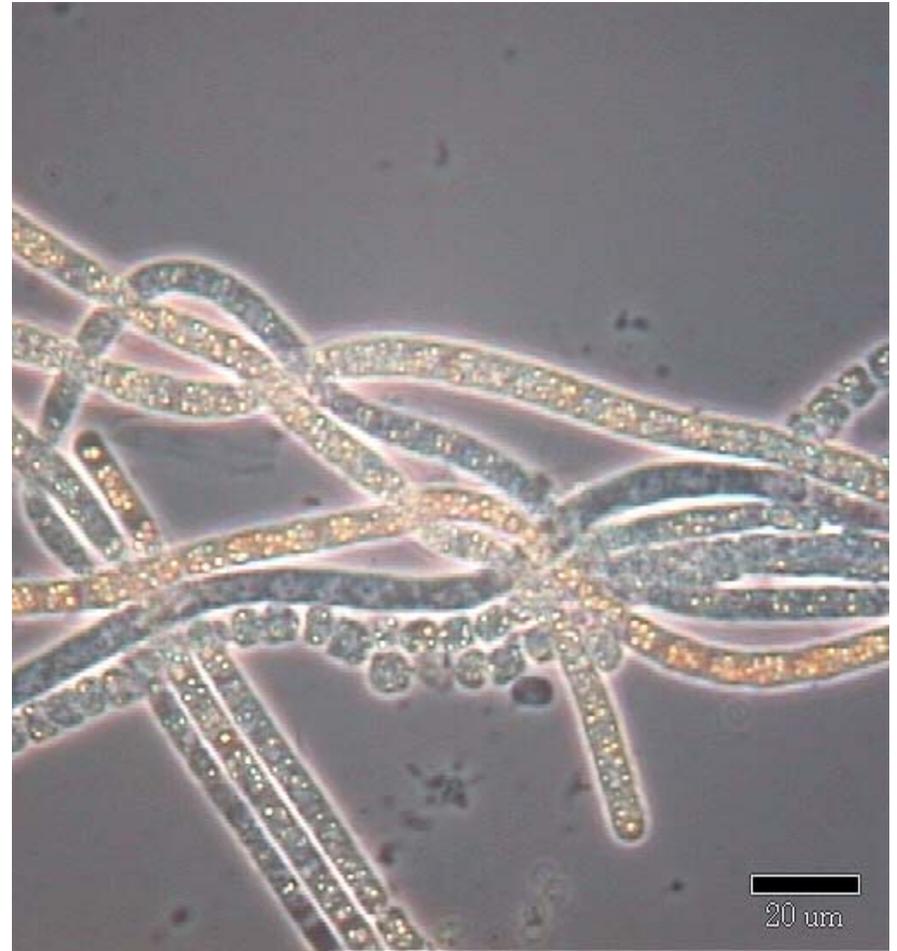
- Dr Horne’s report indicated that the bacteria growing on the Benthic Felt were in much greater numbers close to the aeration pipe. Of course air rises so a permeable Bio-Matrix structure located above and around the pipe would harbor and contribute to an exponential growth of this and other biological elements composing the periphyton.

# Teaming With Life

- As the thriving colonies of hungry, metabolizing bacteria multiply, their food sources such as ammonia will be biologically converted into nitrogen. This is the first step in de-nitrification and should improve the anoxic conditions that lead to eutrophication in the lake bottom. Different elements will be converted by other bacteria, overall creating a more healthy environment for fish.

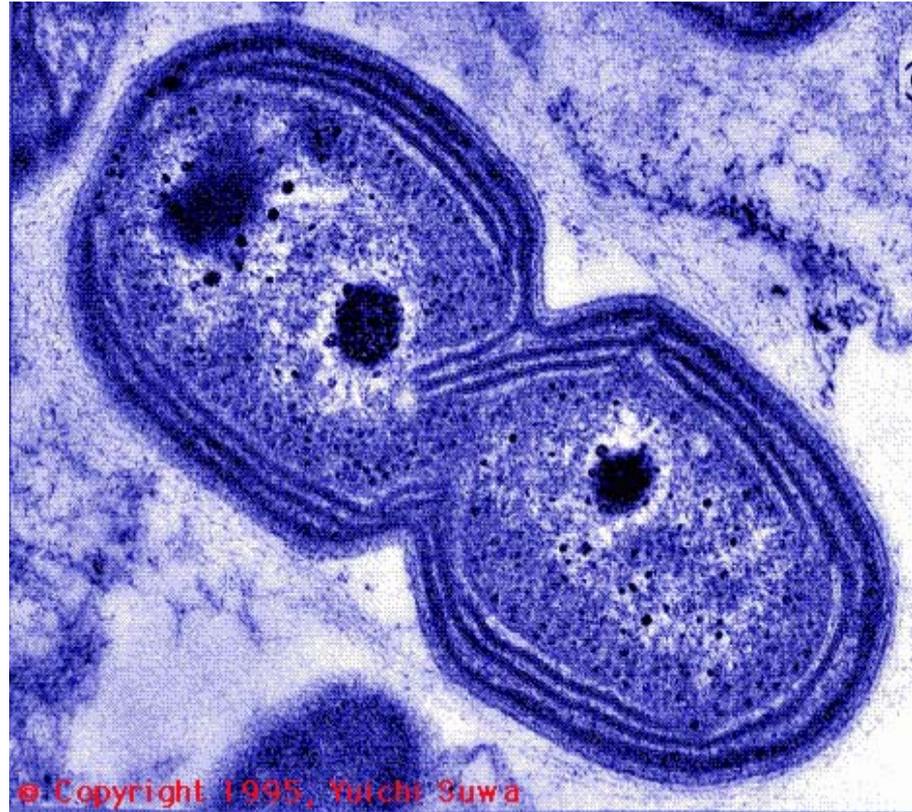
# Beggiatoa

- All strains of freshwater *Beggiatoa* demonstrate the ability to grow heterotrophically in the presence of oxygen, yet this growth tends to be limited by the lack of catalase in *Beggiatoa* species.

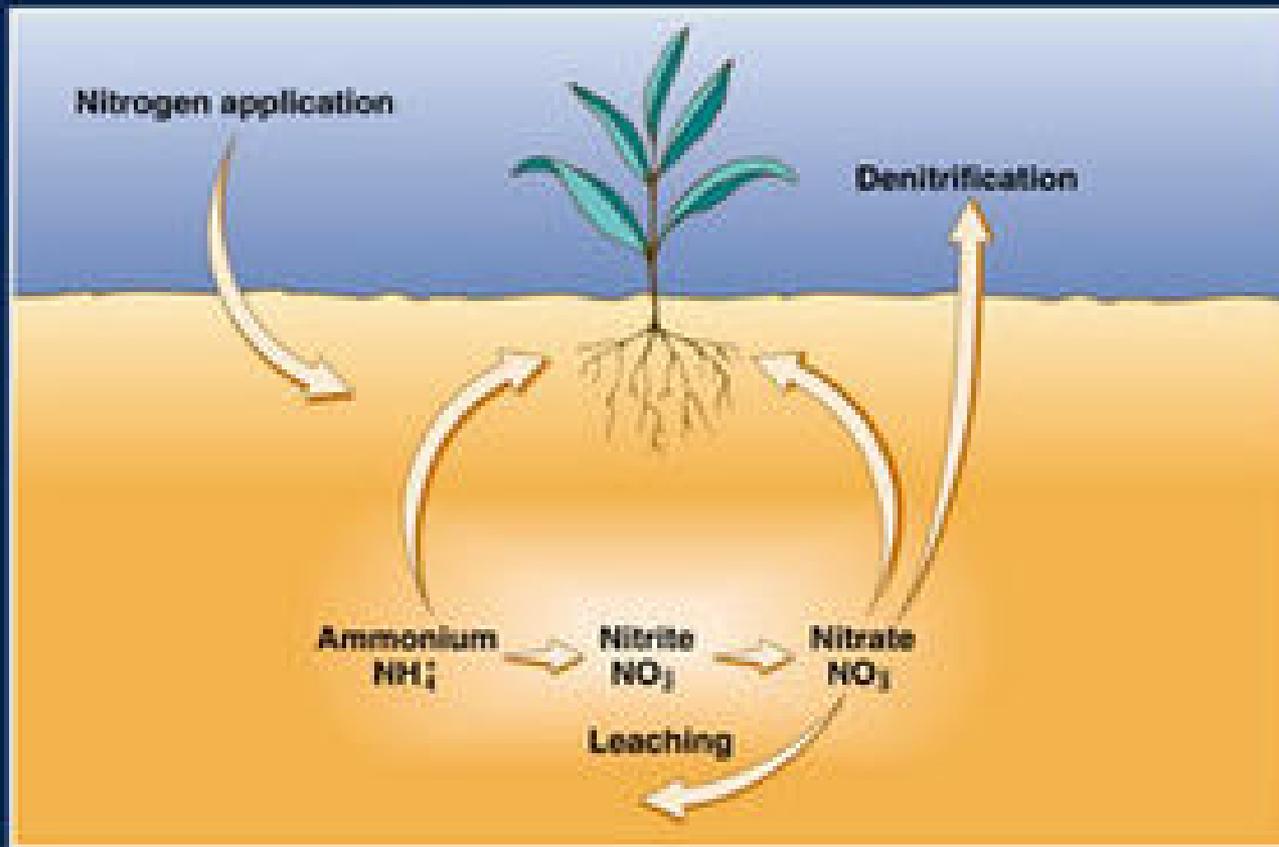


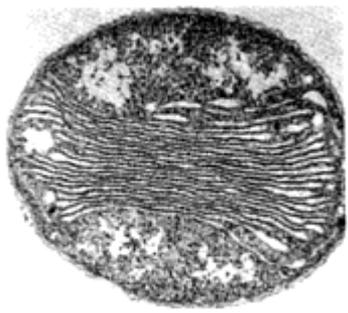
# Nitrosomonas

- *Nitrosomonas* is a genus of ammonia-oxidizing proteobacteria. They are important players in wastewater treatment plants, where they get rid of excess ammonia by converting it to nitrite.



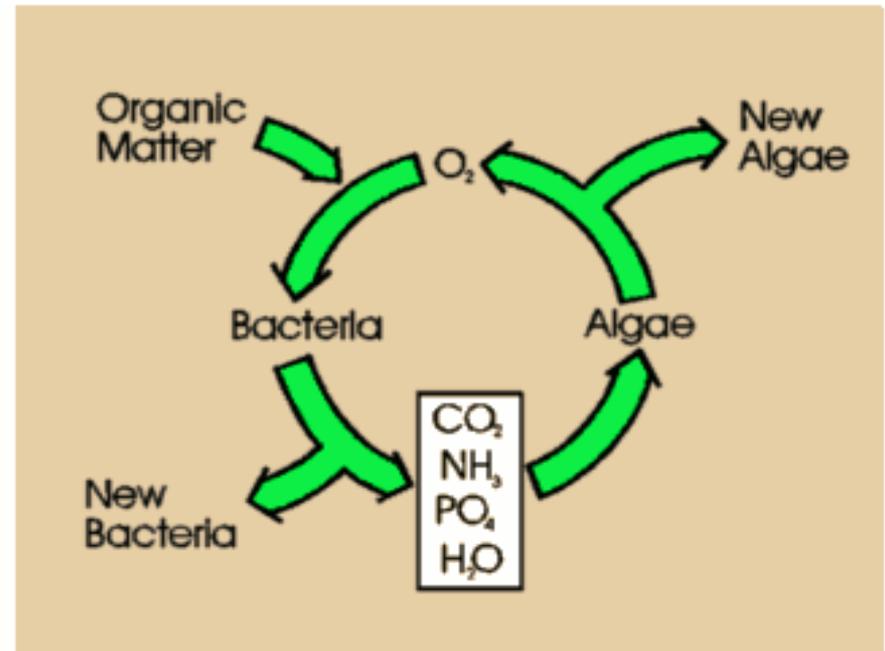
# *Nitrification process*





# Microbe Mechanics

- *Nitrosococcus* has been isolated in oceans and other aquatic environments worldwide and plays an important role in the aquatic nitrogen cycle. By oxidizing ammonia, they convert organic waste to carbon dioxide and water.

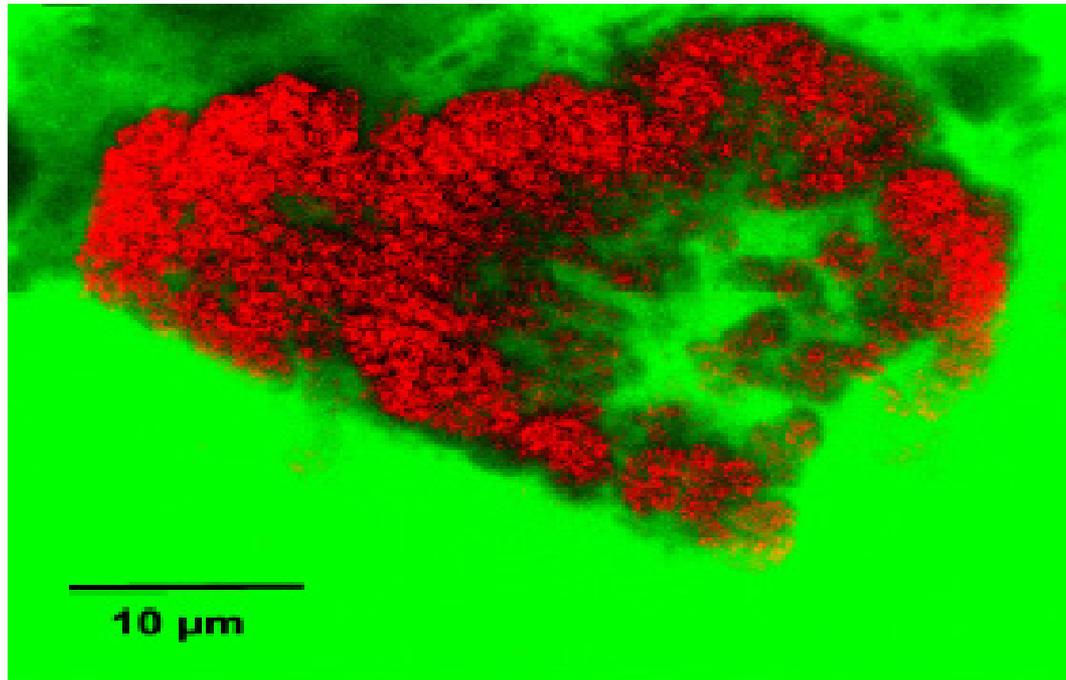


*Nitrospira marina*, *N. moscoviensis*, *N. sp.*

NCBI: [Taxonomy](#) Genome

### Description and Significance

*Nitrospira* are nitrite-oxidizing bacteria that are important in marine habitats. In aquariums, for example, if the ammonia/nitrite/nitrate cycle is thrown off, the ecosystems suffers and fish can get sick or die. Therefore, nitrite-oxidizing bacteria as well as the other bacteria in this system are important for healthy marine ecosystems. In addition, *Nitrospira*-like bacteria are the main nitrite oxidizers in wastewater treatment plants and in laboratory scale reactors, not *Nitrobacter* sp., as was previously thought.



# A Practical Design Study

- SE has setup a Huddle collaborative work space online to share information with the supplier of the bio-matrix “Floating Islands West” as well as to seek feedback and input from other qualified individuals. The use of the biomatrix as a submerged embodiment is following the primary function of providing a multi-dimensional structure for the growth of Peirphyton.

# Healthy Lake Bottom Habitat

- Catfish and other bottom grazing fish will be happy to find housing covered with rich bio food inside and out. The units will be easily accessible for grazing and habitat.
- These fish “will work for food” and it is my belief they can do maintenance on a regular basis so there may be no need for further maintenance.

# Periphyton In The Everglades

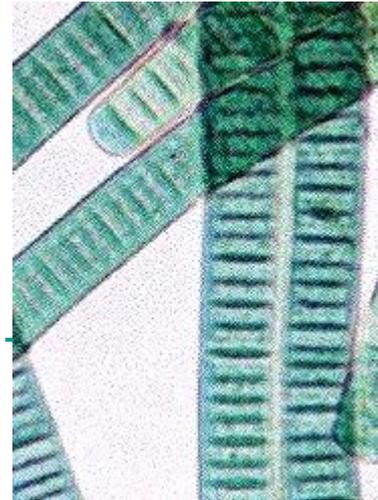




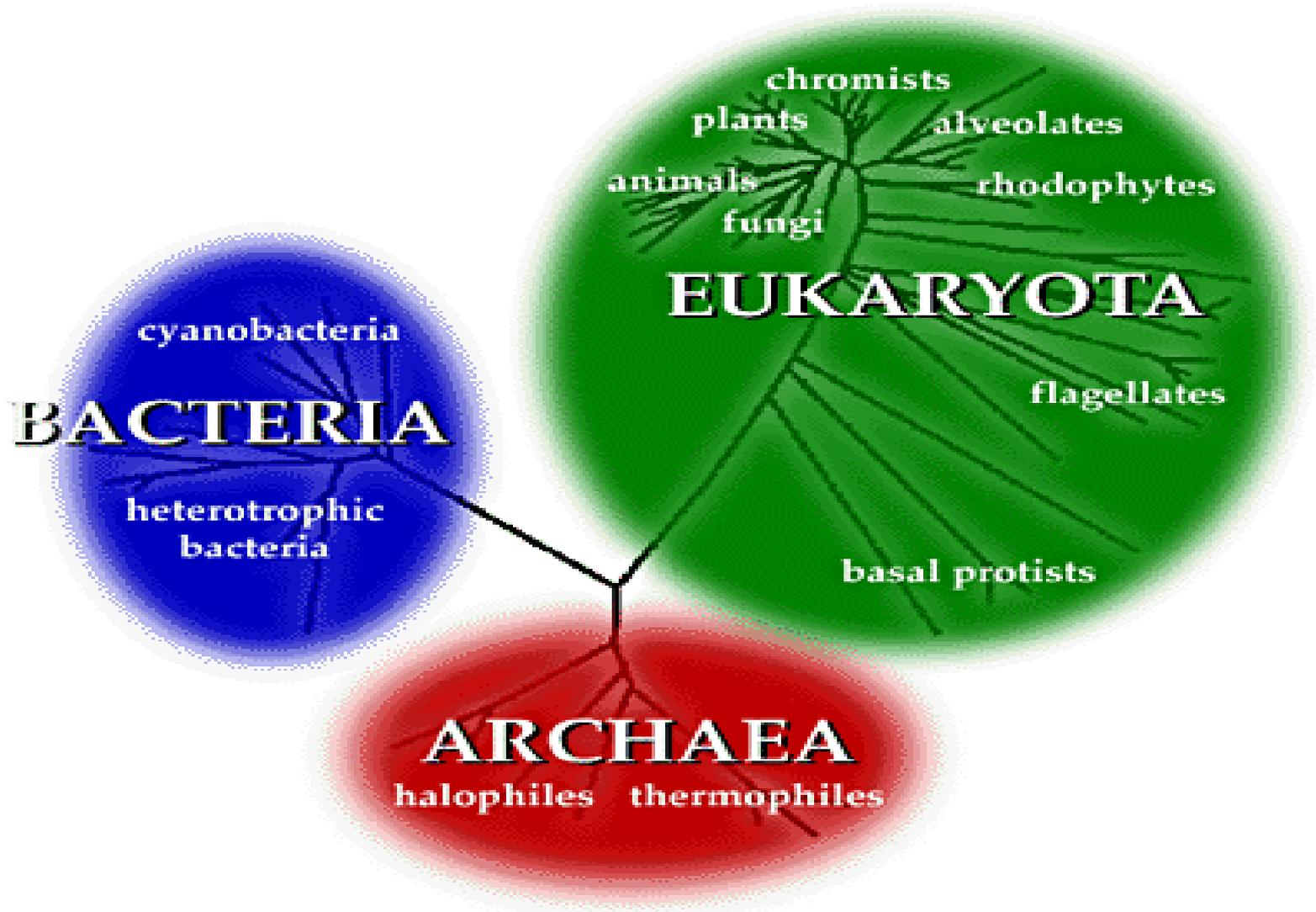
**Periphyton** - a broad organismal assemblage composed of attached algae, bacteria, their secretions, associated detritus, and various species of microinvertebrates

# Introduction to the Cyanobacteria

Architects of earth's atmosphere



# Bio-Diversity of Life



# Form Follows Function

- **Design Considerations:**
- Structures need be modular and scalable.
- Installation need be simple & methodical.
- Maintenance need be cost effective.
- Design to be robust yet simple & effective.
- Design & function symbiotic with lake life.
- Structures to be low profile low impact.

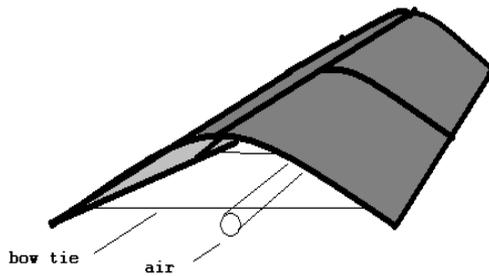
# Development of The Design

- **Specific elements of the design:**
- An anchor/guideline system will add control to the installation and launch of the units plus alignment with the aeration pipes. This same system can be used to retrieve the bio-matrix units to the surface.

# A Look At The Design Elements

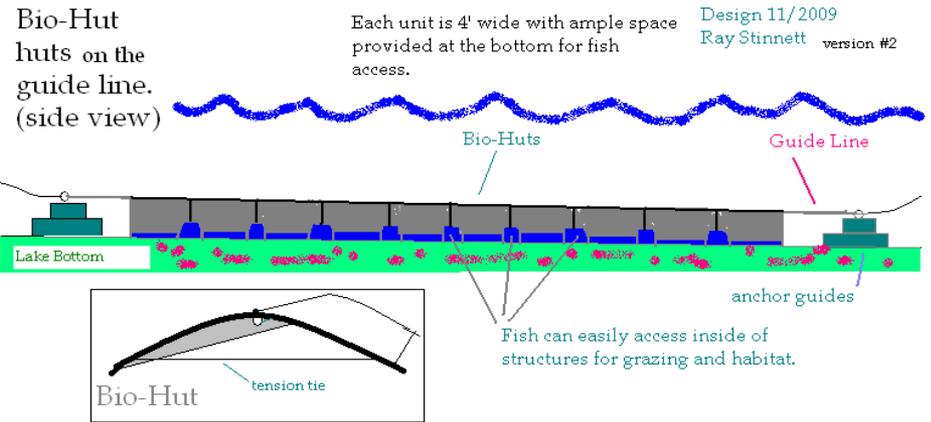
**BioHut...**  
 tensile bow structure  
 PVC ribs wire tied to  
 biomatrix mats

design:  
 10/2009  
 Ray Stinnett



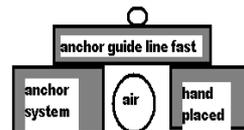
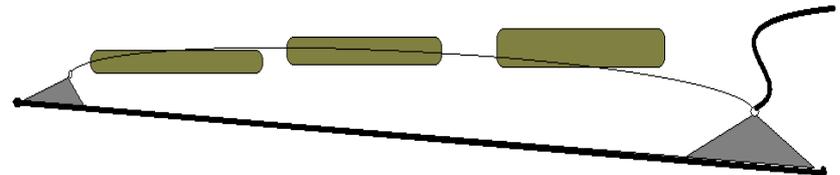
Ship flat with ribs  
 mounted then string bow  
 at site.  
 Diameter of PVC depends  
 on bendability to the  
 size of the bow.

Note: Height and width is  
 somewhat adjustable by  
 variation of the tie length.



Multiple islands on a common guide line end anchored straddling the air pipe.-  
 each mat has a pvc pipe spine and line guide fastened to it's back.

Release guide line  
 and islands float to  
 the top for  
 maintenance.

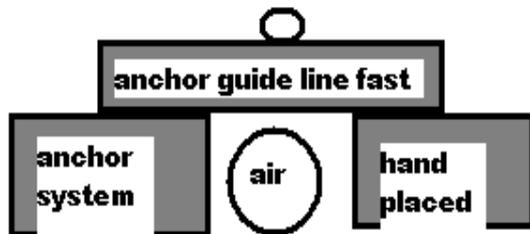
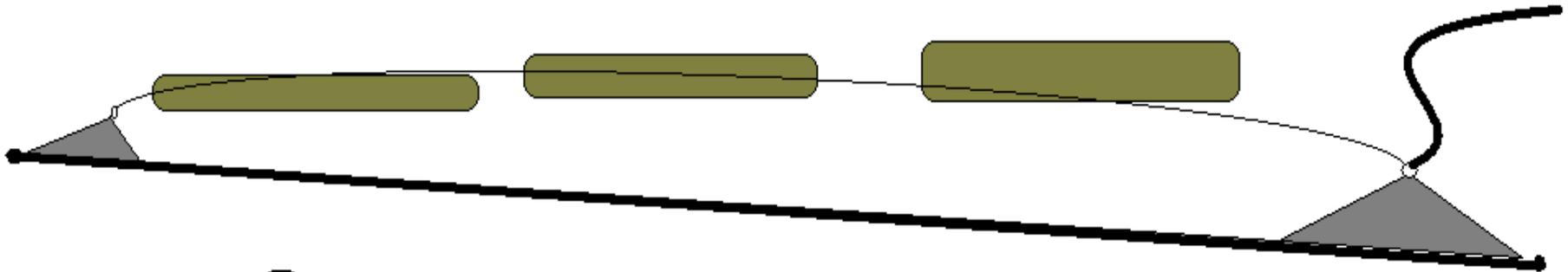


custom made buttress anchor and line guides .  
 lower into place with boat crane and have diver place over  
 pipe and align guides.

# Anchor Guide Line System

**Multiple islands on a common guide line end anchored straddling the air pipe.-  
each mat has a pvc pipe spine and line guide fastened to it's back.**

**Release guide line  
and islands float to  
the top for  
maintenance.**

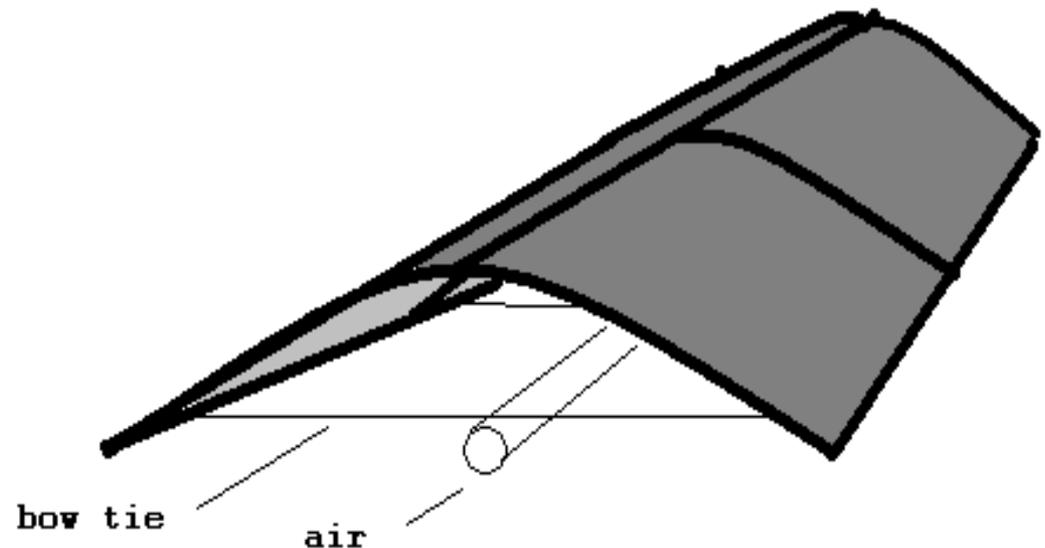


**custom made buttress anchor and line guides .  
lower into place with boat crane and have diver place over  
pipe and align guides.**

# Bio-Hut Tensile Structure

**BioHut...**  
tensile bow structure  
PVC ribs wire tied to  
biomatrix mats

design:  
10/2009  
Ray Stinnett



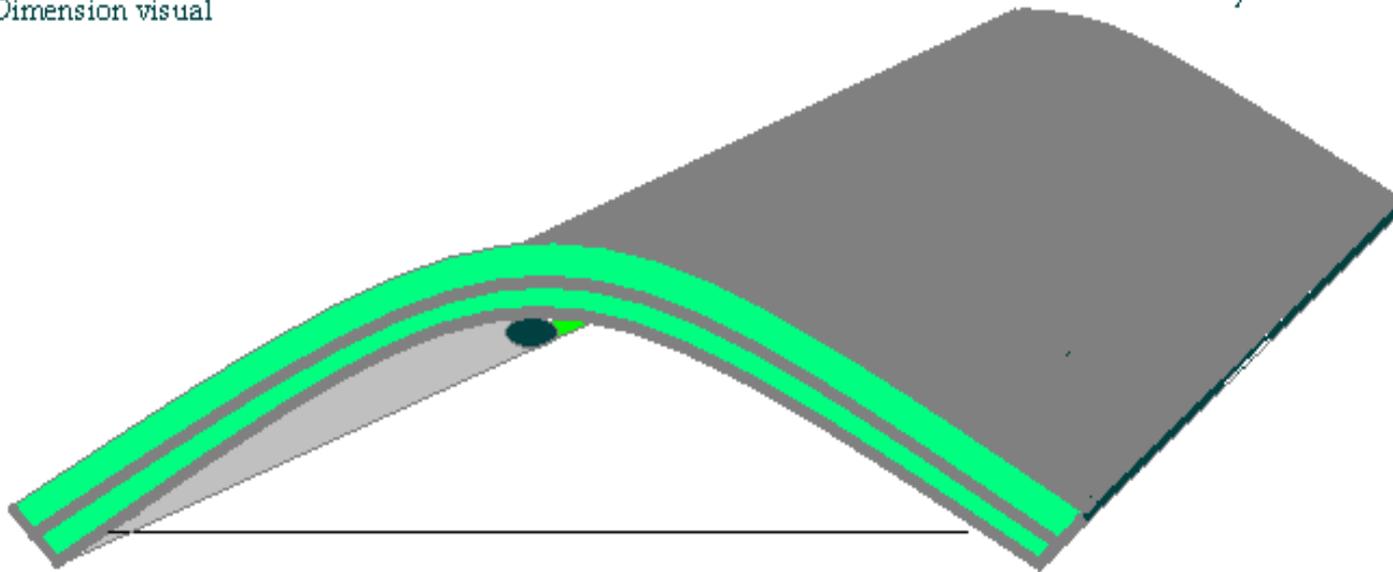
Ship flat with ribs  
mounted then string bow  
at site.  
Diameter of PVC depends  
on bendability to the  
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Note: Height and width is  
somewhat adjustable by  
variation of the tie length.

# Basic Bio-Hut

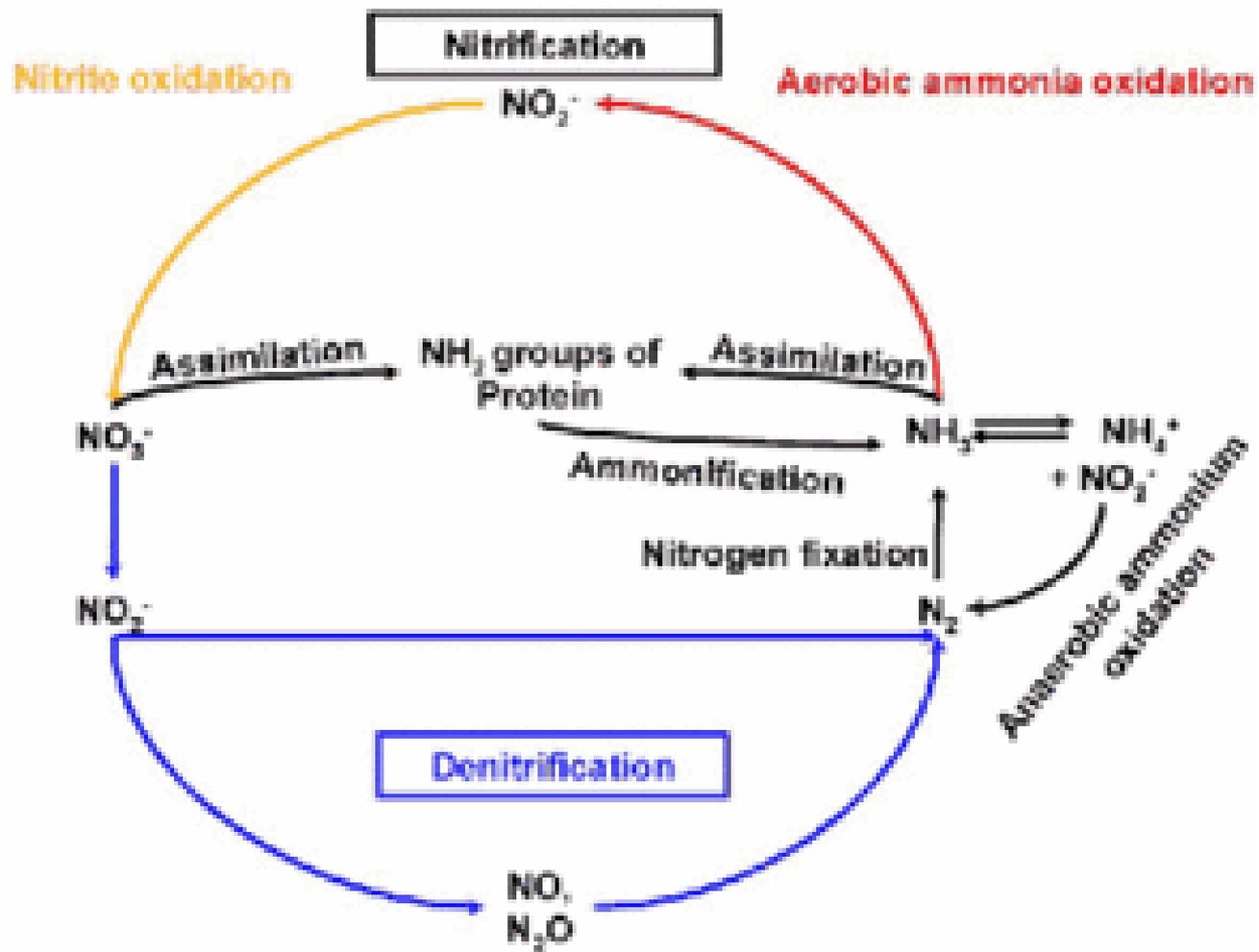
BioHut Detail #02  
Dimension visual

Design: 11/2009  
Ray Stinnett



# Denitrification

- $\text{NO}_3 > \text{N}_2$ ; conversion of soluble nitrate in lake water to nitrogen gas that is vented to the atmosphere.
- The bio-matrix biology could be monitored via sensors placed in key locations in the matrix grid. Remote monitoring could be tied to the control program for the aeration system.



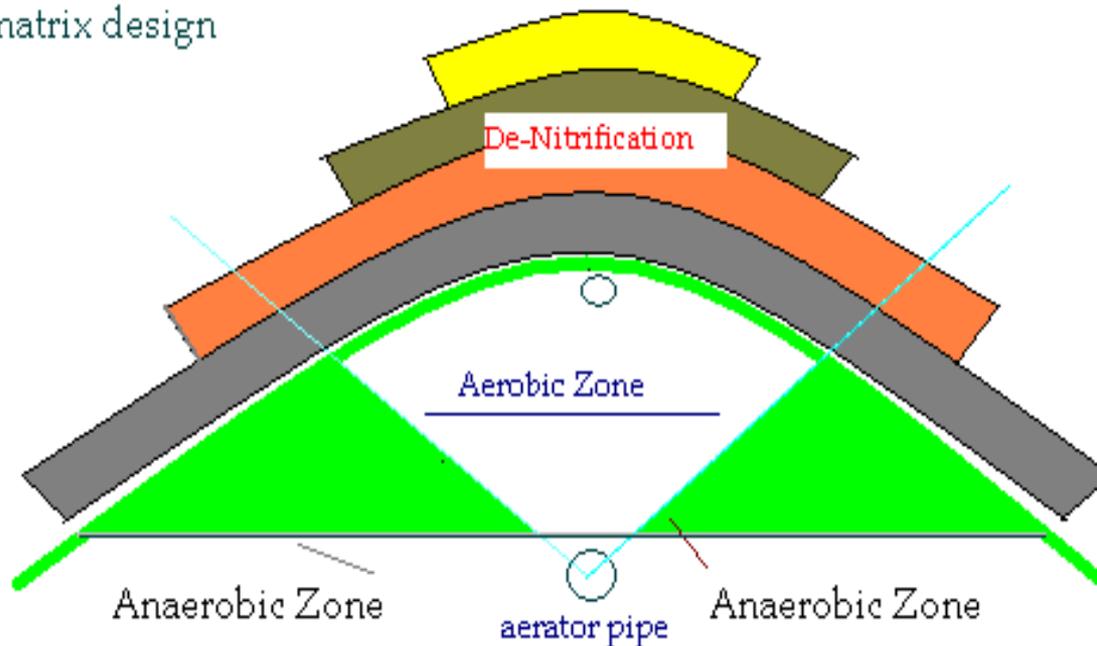
# Eight Conditions Needed for Denitrification

- Enough Nitrate
- Presence of denitrifying bacteria
- Areas or times of high & low DO
- Warm temperature
- Source of organic carbon
- Solid surface or substrate
- Low grazing on bacteria
- Low rates of competing reactions

# Bio-Haven Dual Zone Step Matrix

Detail #04 01  
BioHut four layer  
step matrix design

Design: 11/15/2009  
Ray Stinnett



Efficient weight distribution on the frame and placement of bulk of bio matrix in line with air bubbles from the aeration pipe.

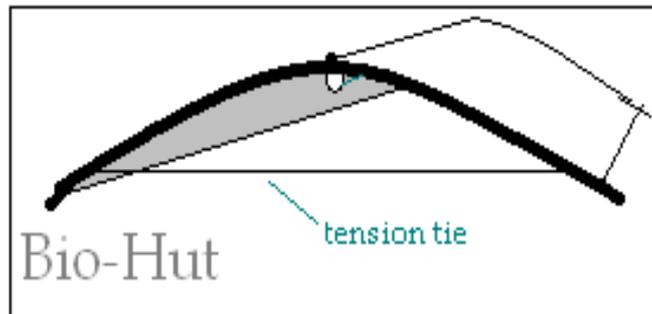
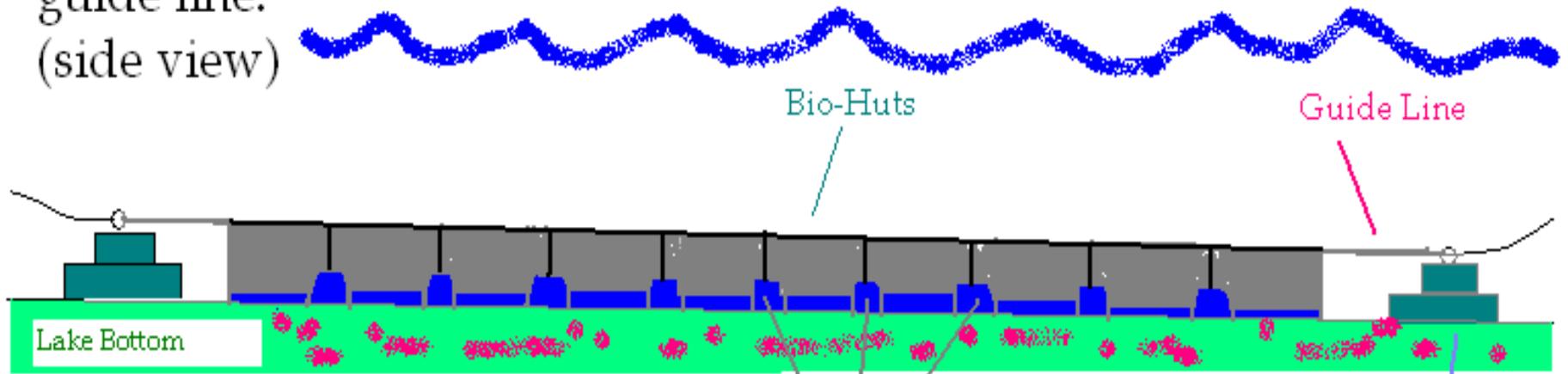
Dual Zone multi functional Bio-Haven Seeded and assisted Microbiology Colonies. Supports Nitrification/De-Nitrification Cycle... All In One Unit

# 5.6 miles of Bio-Remediation

Bio-Hut huts on the guide line. (side view)

Each unit is 4' wide with ample space provided at the bottom for fish access.

Design 11/2009  
Ray Stinnett version #2



Fish can easily access inside of structures for grazing and habitat.

anchor guides

# How To Multiply Success

- **Lets Do The Numbers**
- Bio-Augmentation: Compilation of facts and estimations based on available raw data.
- Description:
- Base Estimates:
  - \* Aeration portion of all piping equals thirty thousand feet or about 5.6 miles.
  - \* This would equal about 7500 Biomatrix modules at 4 ft. length ea.
  - \* If all were 4 ft. wide this would be 120,000 sq. ft. total module area.
  - \* At 6 inch thickness, the bio matrix quotient is a concentrated surface area factor of about 36 to 1.
  - \* So a potential of surface area containing enough bio film to stretch over a total surface area of 4,320,000 square feet, equals 99 acres. of oxygenated periphyton.
  - \* The total units could be bubbled by 216 tons of air per day.
  - \* One million eighty thousand pounds of air divided by 120,000 sq ft equals 9 pounds of air per day per sq ft available to biomatrix modules.
  - \* If anchor to anchor point was 50 ft there would be 600 total anchor points.

# Conclusions

- Bio-Augmentation of the existing aeration system can yield short and long term success.
- The water column eventually clears of suspended solids over time by the use of multi-faceted biological remediation.
- The Bio-Huts on the lake floor can begin to support algal and emergent vegetation.

# Plan Development Options

- **Options:**
- A small pilot project for R&D could be implemented.
- There are 12 aeration pipes, therefore the project could be done in 12 phases.
- The whole project could be rolled out until completed.

# Provable Numbers

## Modular Success

- If one module can bring in provable numbers then each unit is delivering compliance.
- Modular rollout over time will lead to total compliance for the whole water body.
- All bio matrix units submerged and floating will work in concert with nature as a host body. Here the essence of biological life can interact to create the natural symbiotic relationships of creatures small and large.
- What begins as remediation will continue as working eco-systems and habitat for all inhabitants of the lakes eco-culture.

# Nothing Ventured Nothing Gained

- It is my hope that enough feasibility has been shown by our efforts so far to warrant further research and development.
- My Plan: build a bridge to the future so we can meet ourselves there.

# The New Paradigm

- **Bio-Mimmemcry: Imitate and integrate with Natures Proven Systems of Success.**
- Making the bio-remediation available to the troubled areas.
- Dealing with the short term effects.
- Developing a biological plan that will satisfy the requirements of the permit.
- Develop a strategy for developing such a plan.

# End of Presentation

About Stinnett Enterprise  
Follows



# About: Stinnett Enterprise

- Owners: Ray and Sandra Stinnett
- Ray Stinnett... background
- Music and entertainment history
- Biological pond designer/ keeper over 20 yrs.
- Landscape and organic gardening experience
- Owner/developer of natural food store
- General contractor “Sol-Arc Design & Construction”
- Licensed Realtors
- Computer/Internet design/marketing
- Music and internet publishing/promotion
- R&D in clean Energy and Water
- Riparian property owner and stake holder in watershed
- Marketing/Design/Development of 21<sup>st</sup> Century Solutions

# Our Islands Photos



# 3.5' Growth



3.5' mid spring



# 3.5' spring inspection



# 15' Test Island



# 15' Island mid spring



# Baby Duck Baby Grass



# New Life For The Pond



# Ducks Love The Pond And Plants



# Symbiotic Biology At Work



# 15' spring



# 15' Early Growth Roots



# Pond Plants



# Research Ducks At Work



# Ducks Grazing and Playing



# More Duck Work



# Ducks Eat Everything



# Stretch



# Plants Feed Ducks Ducks Feed Plants



# Tall Ducks Short Grass



# Ducks Ate the Sod



# My Koi Before The Raccoon



# 3.5' Early Summer



# Young Bull Rushes and Garden Plants



# Cat Tails Rule



# Me at the Shepard Research Facility in Montana



# Experimental Island



# Disappointed Ducks Fenced Out



# Ducks Ate Sod & Cattails Rule



# Earth Day Dos Logos



# Sub Terrain Aqua System



# My Garden Wall



# Ducks Eat Every Tender Morsel



# Duck Worked Island



# Bull Rushes Emerge From Habitat



# Pond Fed Garden



# Almost Grown



# Garden



# After The Ducks Are Gone



# 3.5' With Umbrella Plants



# 3.5' Umbrellas Rule



# Red Coach Whip Dropped By Crow



# 1.5' water garlic and umbrellas



# Spring Re-Growth



# Habitat Bull Rushes Rule



# Island Cat Tail Heads



# Big O Cat Tail Anomaly



# Fish and Pond Culture



# Fish and Riparian Edge



# Riparian Growth



# Lilly Bloom From Duck Phosphorus



# Riparian Edge Plant Matrix



# Riparian Edge And Small Fish



# Riparian Cat Tail Roots



# 25' Bare Root Experiment



# 25' Bare Root LKEL Earth Day 09



# Heron On Island LKEL



# Ducks Dispute Territory

