



*Cleaning Water Nature's Way*

# **Floating Treatment Wetlands, Technology Overview, Recent Advancements, Case Studies and Coming Advancement As An Evolving BMP**

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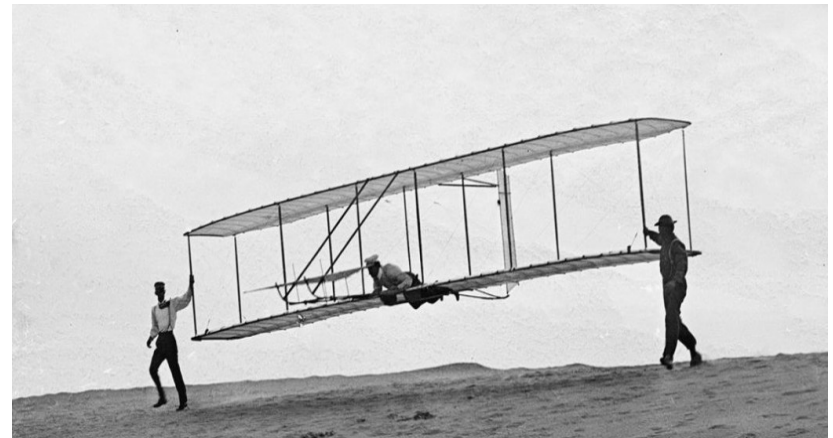
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# Stormwater BMP

Early  
Floating  
Island



Evolving from Humble Beginnings



# BMP To Meet TMDL Requirements



**Balancing Effects  
of Population  
Growth**

# Stormwater BMP



Today's  
Floating Treatment  
Wetlands

# Floating Treatment Wetlands

- Supplement nature's biological processes
  - Microbial habitat for Periphyton development
  - Platform for Terrestrial & Aquatic Plants
- Augment site conditions favorable for desired biological processes
  - Oxygen: Aerobic or Anoxic conditions
  - Sunlight or Shade

***Established Science***

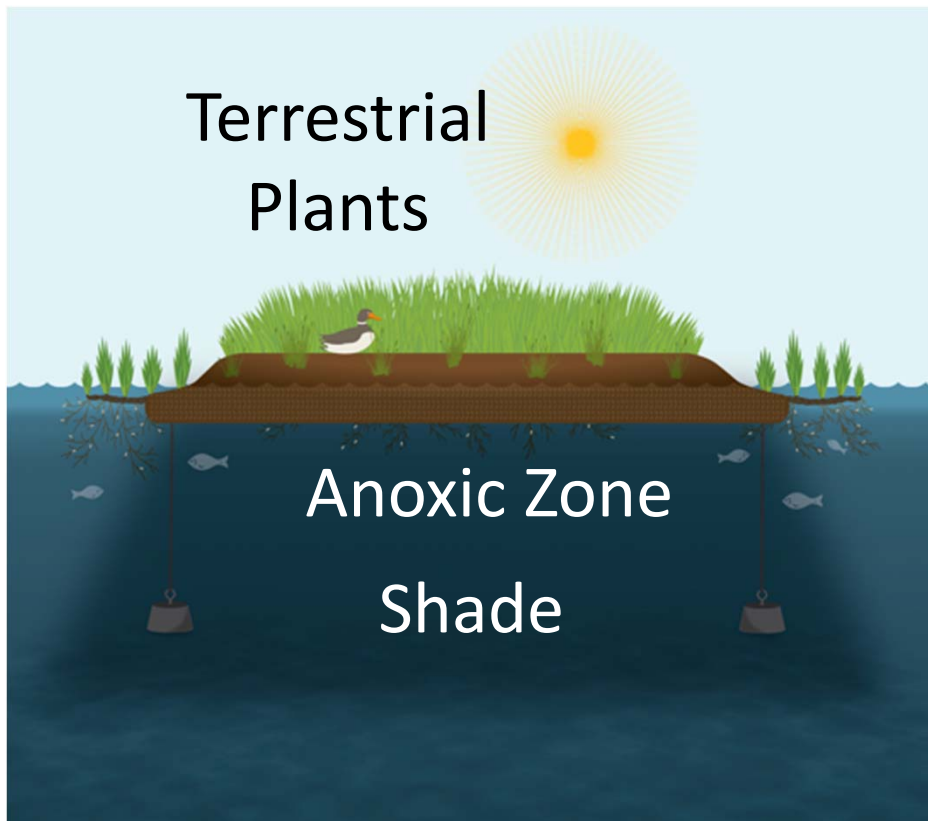
# Natural Biological Processes

- Nitrification & De-nitrification
- Biological & physical Filtration
  - Total Suspended Solids (TSS) Filtration
  - Colloidal Particle Filtration
    - Pathogens – coliform bacteria, E coli
    - Heavy metals
- Oxygenation & photosynthesis
- Nutrient sequestration & plant uptake

***Established Science***

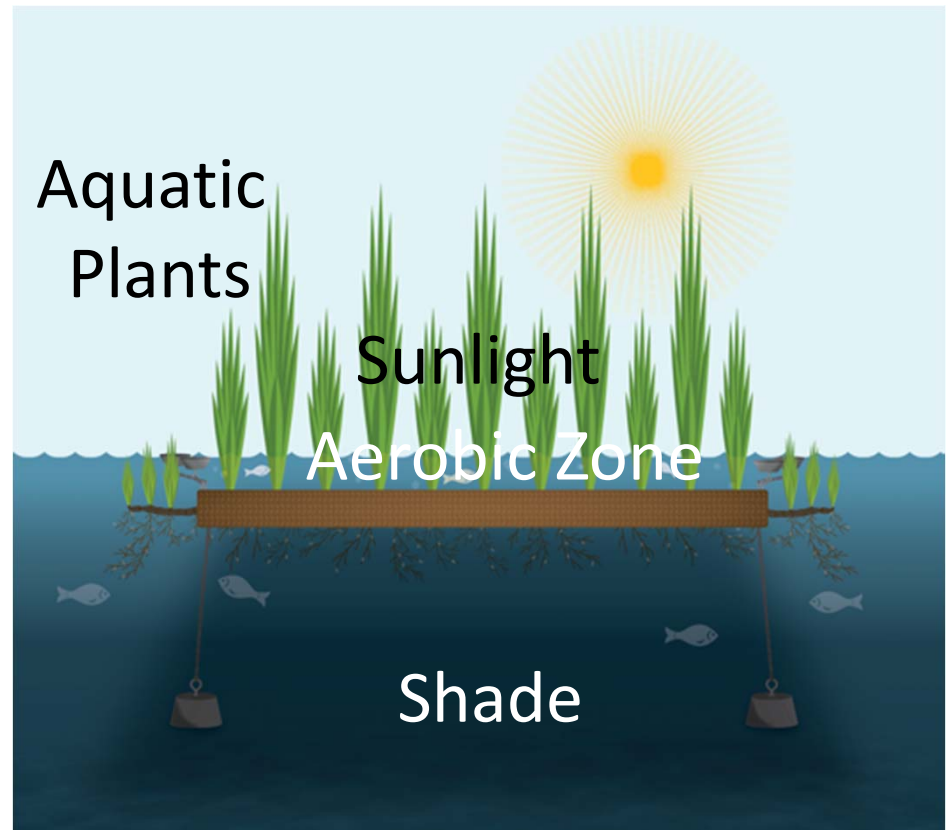
# Floating Wetlands

## Floating Island



Reduced DO promotes  
de-nitrification

## Floating Wetland



More productive biofilm  
for improved water quality

# Stormwater Applications

- Wet Pond Retrofits for increased performance
  - Nutrient reductions
  - Nutrient credits
- New Wet or Detention Ponds with smaller foot prints
  - Loss of perimeter planting offset by FTWs plants
- Replace littoral shelves that suffer from water level variations and drought conditions
- Enhanced habitat, fishing and beauty
  - HOA, Parks, Community, etc.
- Stormwater Run Off Areas



# Sizing

- FTW surface area
  - Research & Case Studies
  - Nutrient Credit Requirements
- Site Conditions
  - Watershed
  - Limnology
- Other Factors
  - Aeration

# Removal Rates

Ammonia	.6lbs psf / YR
Nitrate	.9lbs psf / YR
Total Nitrogen	1.7lbs psf / YR
Total Phosphorus	.54lbs psf / YR
Total Suspended Solids	9lbs psf / YR

***Based on Floating Island data in low concentration conditions without supplemental oxygen***

# Stormwater BMP Credits

Chesapeake Stormwater Network & Chesapeake Research Consortium

## **% Pond Coverage**

**10% 20% 30% 40% 50%**

## **Credits Earned**

<b>TN</b>	.8%	1.7%	2.5%	3.3%	4.1%
<b>TP</b>	1.6%	3.3%	4.9%	6.5%	8.0%
<b>TSS</b>	2.3%	4.7%	7.0%	9.2%	11.5%

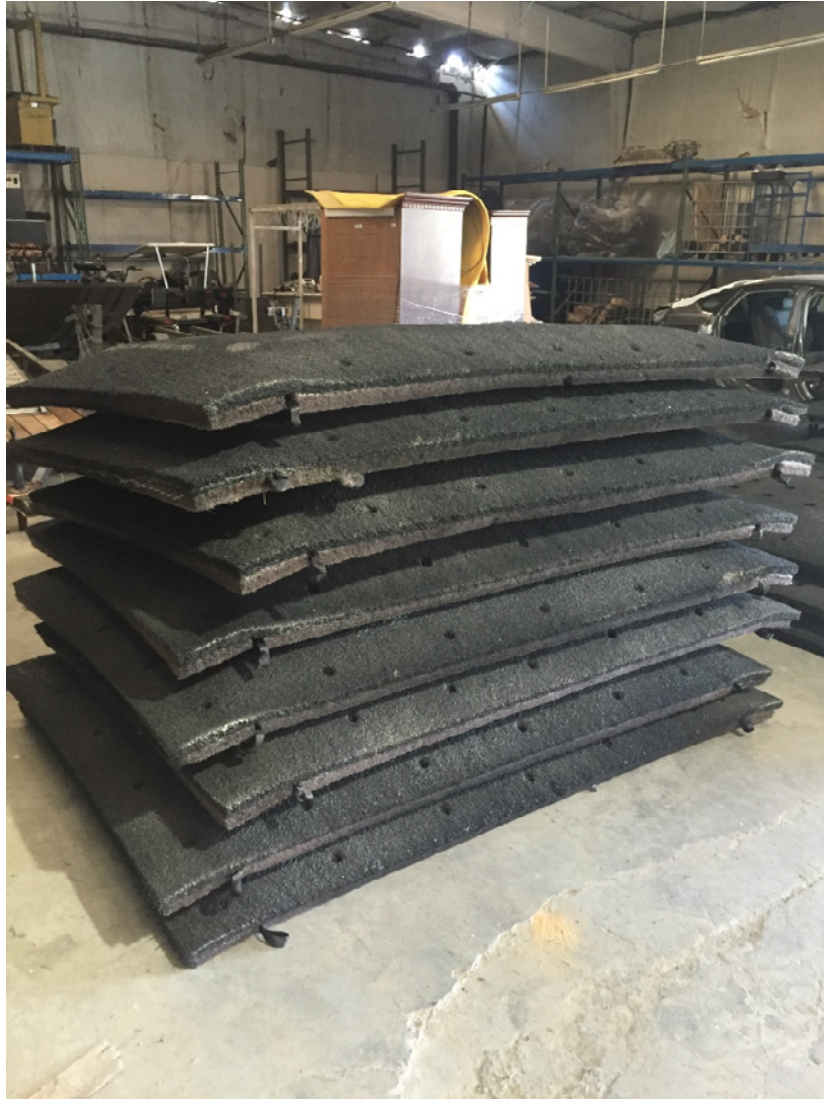
# Conservative Baseline

- Removal Rates are conservative benchmarks
- Data based on Research & Case Studies using Floating Islands in low concentrations
- Data does not include newer Floating Wetland designs that better leverage scientific mechanisms or site conditions

# FWS Floating Wetlands



# Standard Floating Island Modules



# Connecting Modules



Easy to Assemble

# Module Quick Clips





# FWS Floating Island



Standard Modules with Quick Clips

# FWS Floating Island



Engineered Floating Island  
Internal Conduits with Steel Rods  
Form Single Island From 3 Sections

# Engineered Island In Production



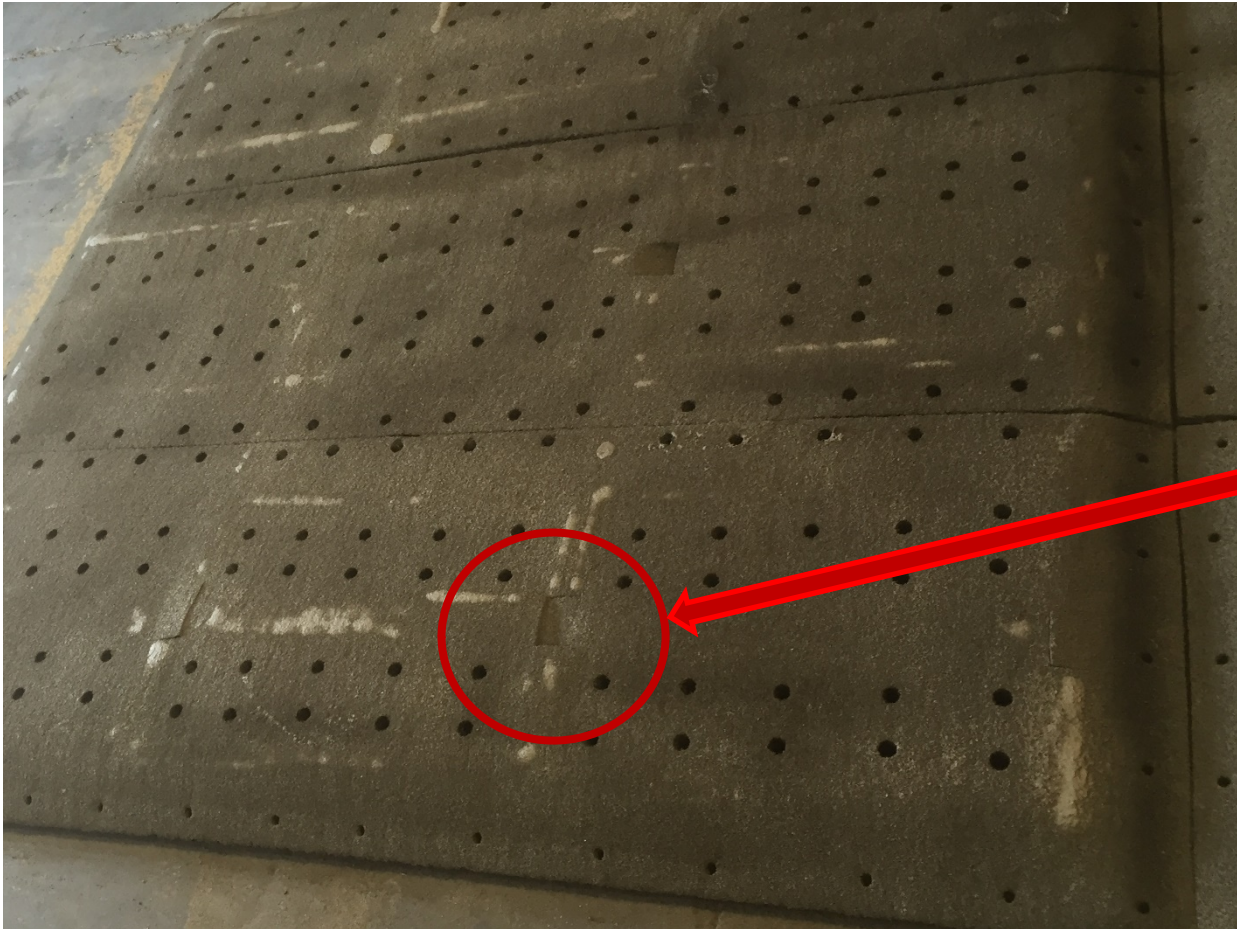
Large Engineered Floating Island

# Engineered Island In Production



Large Engineered Floating Island

# Engineered Island In Production



Access to Interconnecting Conduit

# FWS Floating Island



3 Engineered Islands – 250 sft each  
Goose Netting Used Until Plants Mature

# Planting & Launching



# Planting & Launching





# Planting & Launching



# Planting & Launching



# Planting & Launching



# Planting & Launching



# Planting & Launching



# Planting & Launching



# Mature Floating Islands



# Mature Floating Islands





# FWS Floating Wetland



# Mature Floating Wetlands

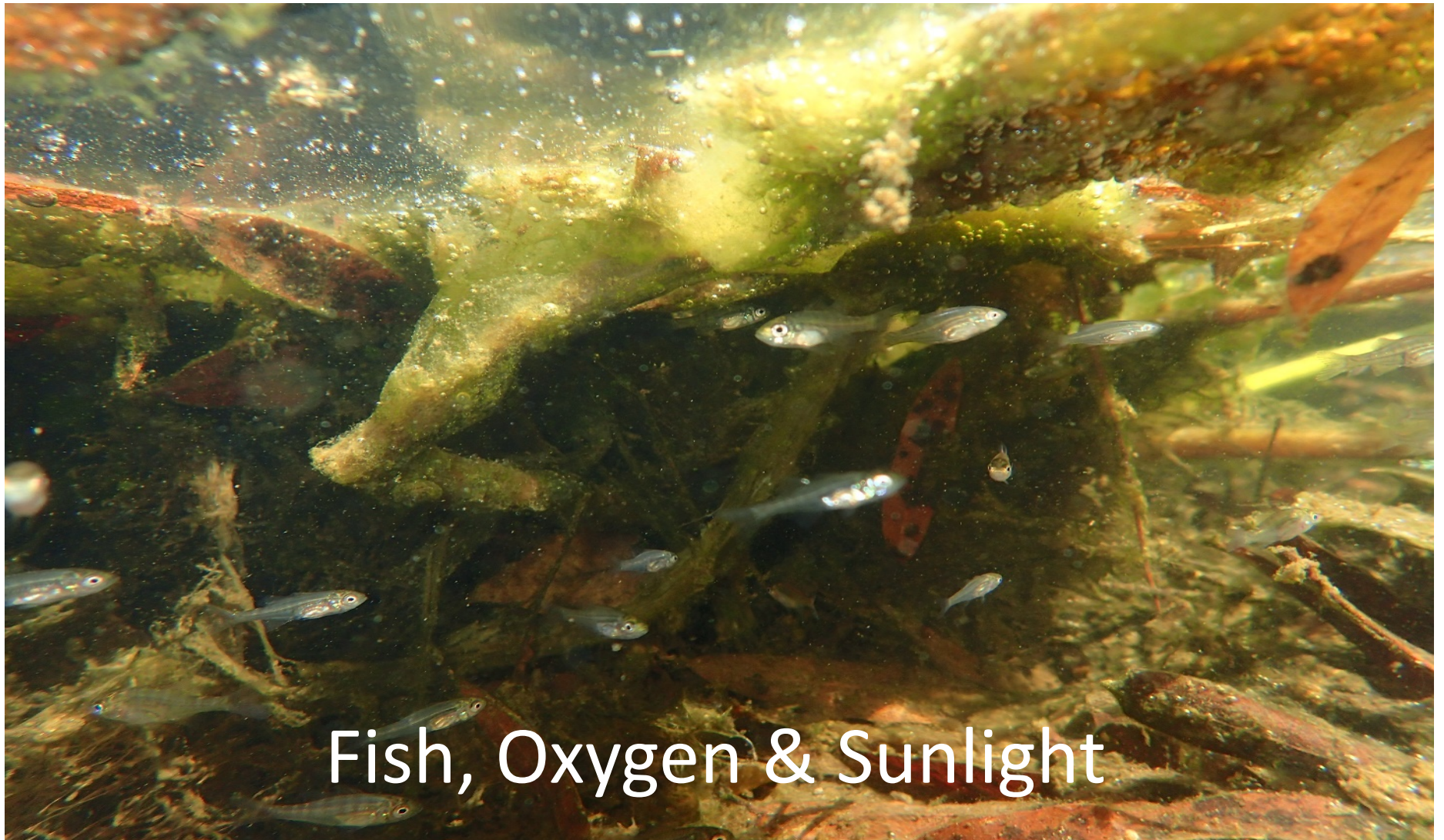


# FWS Floating Wetland



Extensive Root Mass

# FWS Floating Wetland

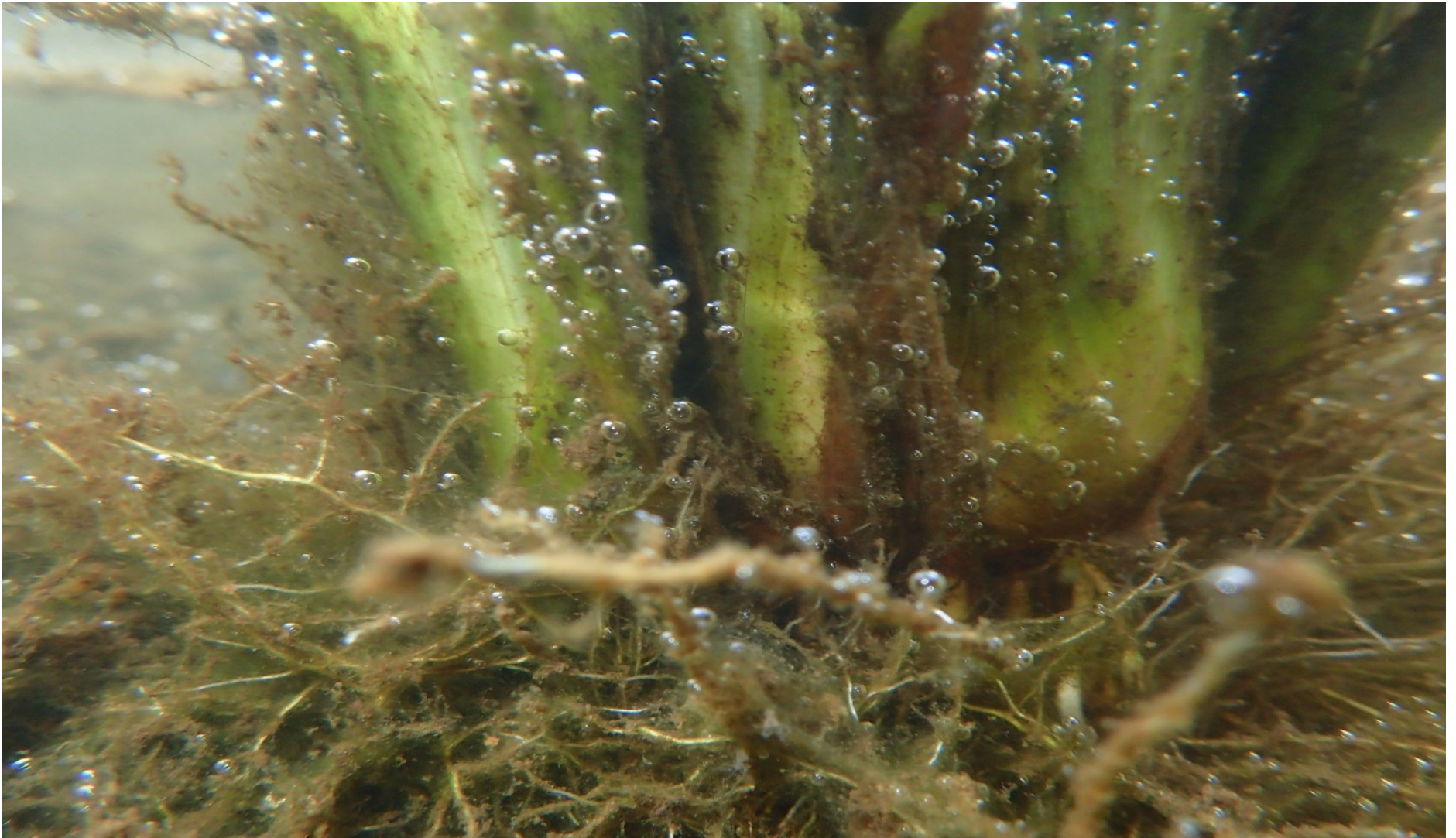


Fish, Oxygen & Sunlight

# FWS Floating Wetland



# FWS Floating Wetland



# Engineered Floating Island

Concept Sketch



Water Quality, Habitat & Community

# Engineered Floating Island



Installation In Progress



# Engineered Floating Island



Completed Project

# Engineered Run Off Control Solution



Run Off Ditch - Before

# Engineered Run Off Control Solution



Newly Planted

# Engineered Run Off Control Solution



Run Off Ditch - After

# Engineered Floating Wetland Variation



BioFil™ Colloidal Filter

# BioFil™ Colloidal Filter

- Physical & Biological Filtration extends down into water column
  - Total Suspended Solids
  - Colloidal Particles – pathogens, E.coli, heavy metals
- Aerobic zone promotes nitrification
- Sunlight promotes healthy more productive biofilm or periphyton development
- With or without plants

# BioFil™ Colloidal Filter



BioFil Deployment In Series

# BioFil™ Colloidal Filter



Single BioFil with Plants

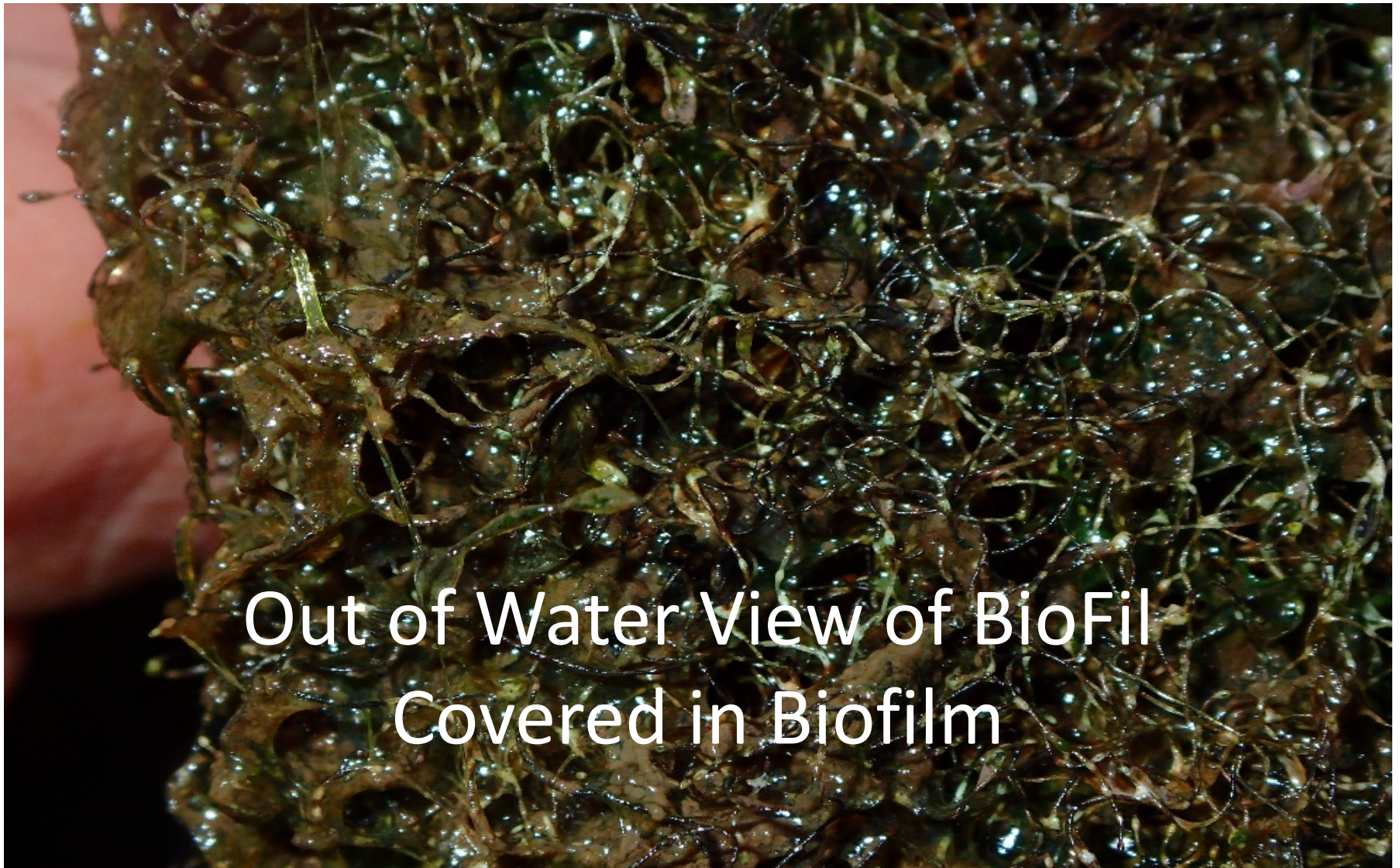


# BioFil™ Colloidal Filter



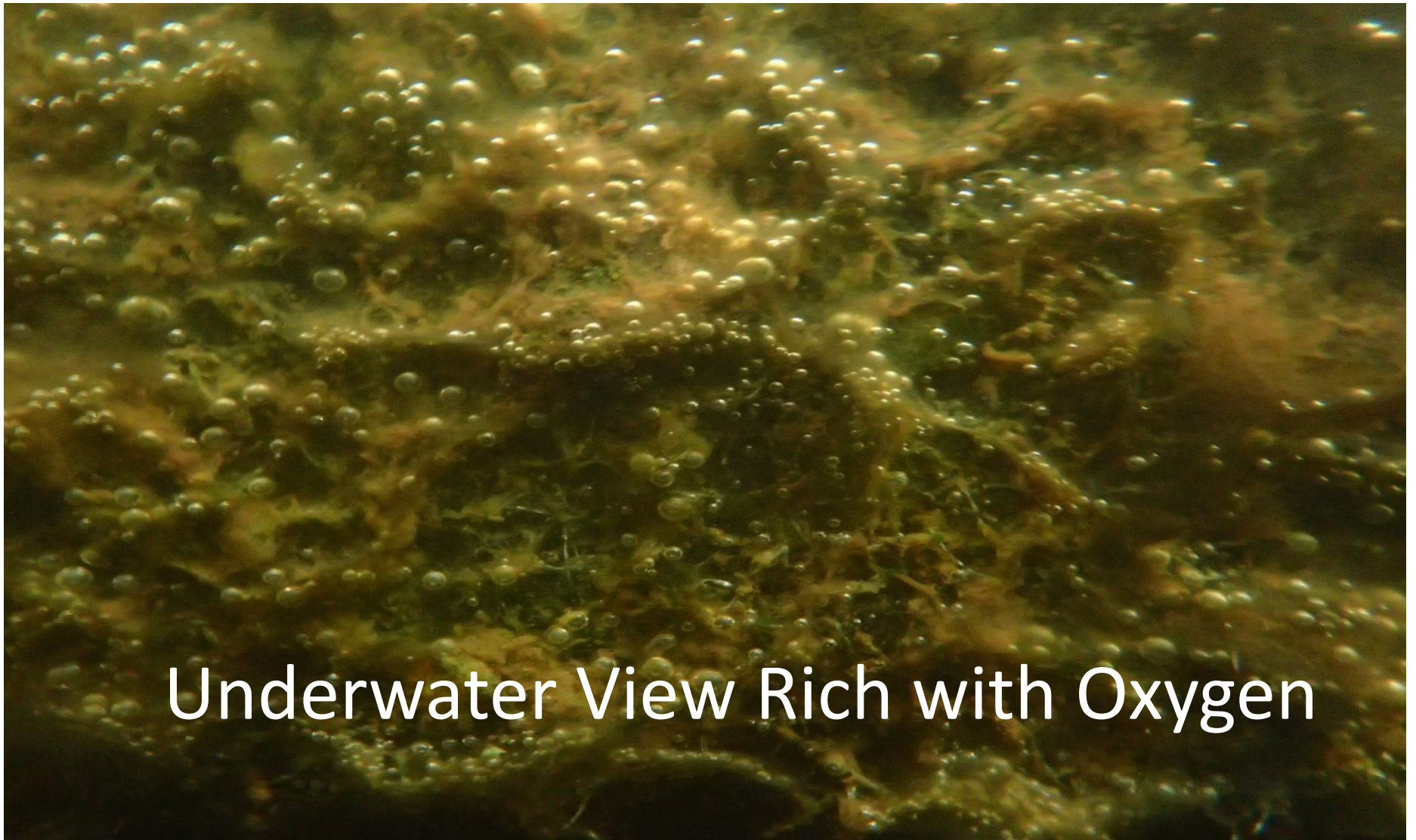
Single BioFil with Plants

# BioFil™ Colloidal Filter



Out of Water View of BioFil  
Covered in Biofilm

# BioFil™ Colloidal Filter



Underwater View Rich with Oxygen

# BioFil™ Colloidal Filter

Underwater View of Fish Feeding Off BioFil



# FWS Floating Wetlands



Islands, Wetlands & BioFil  
Bundled Together In Any Configuration

# Engineered Fish Spawning Wetland



Gravel & Depth of Bed  
Variable for Species

Spawning Platform

# FWS Floating Wetlands



# Engineered Materials



Variables include: porosity, tensile strength, stiffness, abrasiveness, surface area per volume



# Engineered Materials



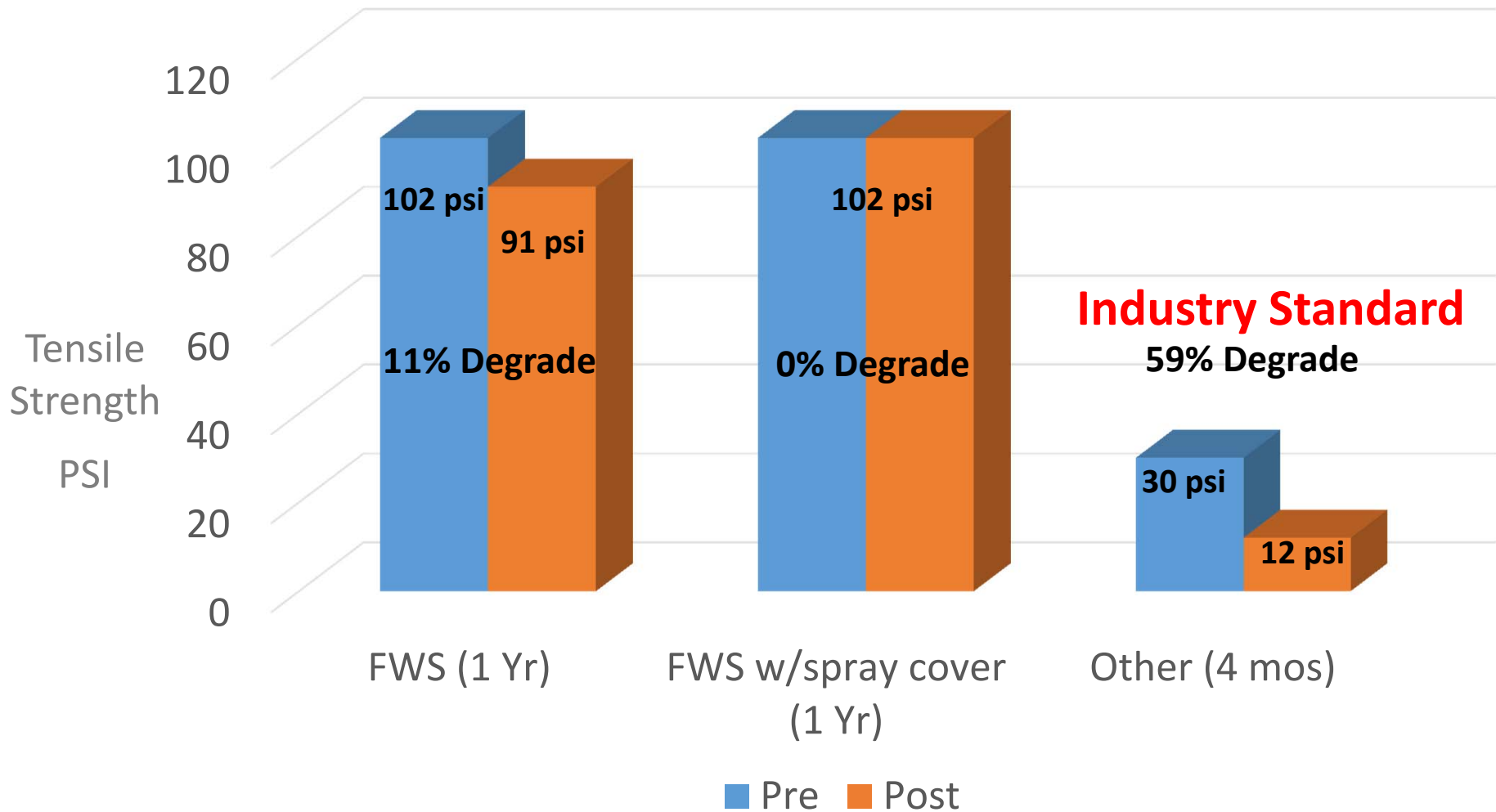
Composite Material



Cementitious Spray Cover

# UV Degradation

(measured by loss of tensile strength)



**Note: spray cover is cementitious-mineral based spray**

# Economics

## Floating Wetlands:

Standard \$19+ psf

Engineered \$23+ psf

BioFil Colloidal Filter \$595 ea

Add Plants & Planting \$3+ psf

Add Assembly & Anchoring \$3+ psf

Add Delivery \$2+ psf

# Our Services

- On site evaluations
- Design or design assistance
- Material & product development
- Installation, service & maintenance
- Supervisory field support
- Product training
- Sales & marketing assistance

# Other Markets & Applications

- Lakes, ponds, rivers, streams & estuaries
- Industrial waste water
- Mining residue waste water
- Landfill leachate lagoons
- Combined sewer overflow (CSO) systems
- Rural human waste water lagoons
- Animal effluent lagoons
- Wave breaking & shoreline protection
- Erosion control and agriculture runoff

*Throughout The Watershed*



*Cleaning Water Nature's Way*

## Q&A

*For more information, contact us:*

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