

AQUA  
Dynamic  
Solutions, LLC

# In Situ Bioremediation treatment for Storm water, Combined Sewer Outfalls and Eutrophic Ponds

Presented by  
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# Our Company

- Aqua Dynamic Solutions, LLC is the culmination of 20 years of research.
- Our head of research, John Di Turo began in the field of Marine Biology with the aim of solving pollution problems in our Oceans, Lakes and Ponds.
- To achieve this goal there are three key steps:
  - Understand the problem and locate it's sources.
  - Develop a solution that does not create additional problems.
  - Implement the solution in a practical way (most difficult step)

# The Problem: Unhealthy Lakes, Ponds, and Beaches

- The presence of an excessive amounts of pathogenic bacteria and microorganisms are concentrating in our Ponds, Lakes and Beaches.
- Traditionally considered a “Non-Point Source” of pollution.
- Storm water discharge during rain events carry excessive amounts of nutrients and other contaminants into waterways.
- These unnaturally high nutrient levels disrupt ecosystem balance producing severe consequences

# Unhealthy water causes Fish Kills



- Low dissolved oxygen levels due to excessive demand
- High nutrient levels, Nitrogen and phosphorus
- High metals and toxic chemical levels
- Elevated toxin levels leads to drop in fecundity
- Weakened immune systems leads to infections

# Unhealthy water causes: Hazardous Algal Blooms (Red Tides)



Arial view of bloom in Penn Cove, Washington

HAB's directly Result in :

- shellfish bed harvesting restrictions
- Recreational Lake and Beach closures
- Human health risks from exposure, Paralytic Shellfish Poisoning (PSP)
- Environmental damage do to exuded toxins



*Alexandrium fundyense*  
(East coast )

# Unhealthy water causes: Hazardous Algal Blooms (Cyanobacteria)



Taste-and-odor producing cyanobacteria bloom in Cheney Reservoir, south-central Kansas. June 2003. Photos Courtesy of KDHE

Cyanobacterial Hepatotoxins and Neurotoxins ( e.g. microcystin) can bypass traditional water filtration methods in freshwater reservoirs

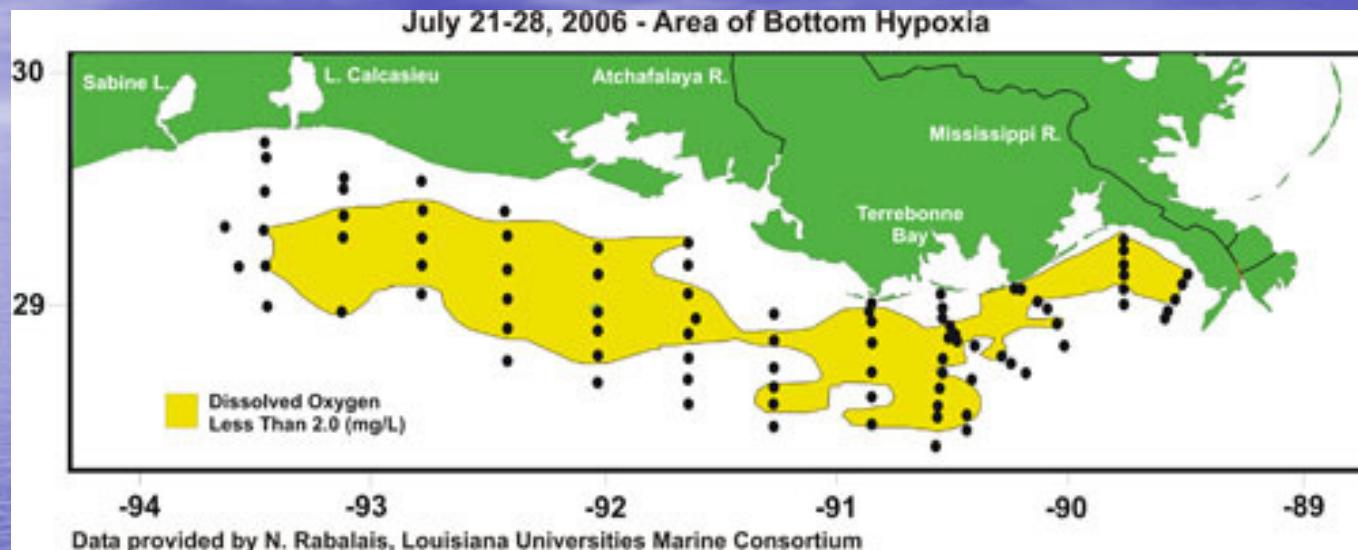
# Unhealthy water causes: Dead Zones in Ocean Estuaries



Source: USGS

This map shows the Mississippi drainage basin and tributaries that lead into the Gulf of Mexico, the dead zone is shown in red.

# Ocean Dead Zones



Dr. Nancy Rabalais of LUMCON coined the term “Dead Zone” in the 1970’s, it refers to an area of water lacking the necessary oxygen to sustain plant and sea life.

In 1985 the Gulf Dead Zone : 600 Sq. Miles

2006 LUMCON: Over 6,600 Sq. Miles



# Unhealthy water causes: Beach Closures

## Rhode Island Beach Closings by County: Year-to-Year Comparison

County	2005	2004	2003	2002	2001
Bristol	5	7	132	9	9
Kent	38	42	208	67	89
Newport	7	31	39	21	18
Providence	4	13	42	6	15
Washington	11	29	38	0	20
<b>Total</b>	<b>65</b>	<b>122</b>	<b>459</b>	<b>103</b>	<b>148</b>

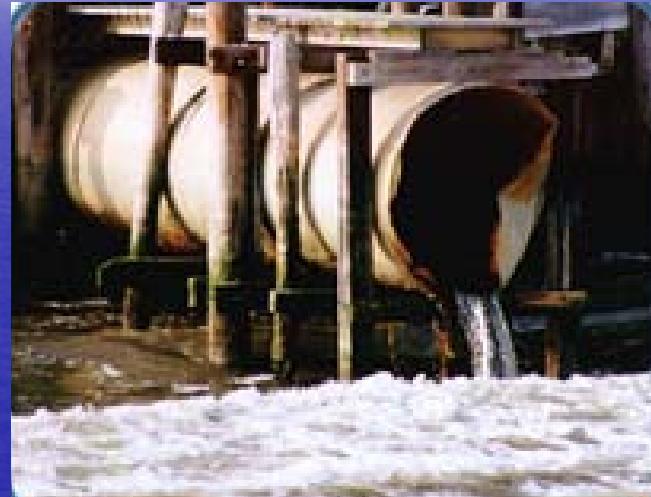


# Unhealthy water causes: Beach Closures

## New Jersey Beach Closings by County: Year-to-Year Comparison

County	2005	2004	2003	2002	2001	2000
Atlantic	2	0	0	0	1	0
Cape May	3	1	7	0	0	11
Monmouth	69	79	84	25	22	5
Ocean	5	88	97	6	102	17
<b>Total</b>	<b>79</b>	<b>168</b>	<b>188</b>	<b>31</b>	<b>125</b>	<b>33</b>

# Unhealthy water Sources: Stormwater Runoff



## Urban and Residential Storm water Runoff

- As stormwater moves through infrastructure transport system, it picks up pollutants and carries them into the waterways
- Beach closings linked to stormwater events

# Unhealthy water Sources:

## Ground water contamination and topsoil erosion



Failed Septic System



Agricultural soil erosion



### Polluted Runoff from Rural Areas

- Storm water draws agricultural related pollutants
- Failed septic system overflow onto the surface
- Storm events carry the waste to waterways.

# Unhealthy water Sources: Accidental Spills



East Providence, RI - 80 Year 4" Steel Reinforced Concrete Force main fails after only 15 years discharging millions of gallons of raw sewage.

- **Sewer-Line Breaks** due to chronic acid exposure from untreated odors

# Unhealthy water Sources: Antiquated Infrastructure



Combined Sewer Overflows

## Sanitary Sewer Overflows and Combined Sewer Overflows

When influent exceeds a facility's capacity untreated or partially treated waste is discharged

# Unhealthy water collection points:



- Stormwater detention points
- Roadway swale
- Recreational ponds

- Manufactured lakes
- Golf course water hazards

# Unhealthy water collection points



## Eutrophic ponds and streams

Which are rich in minerals and nutrients causing low levels of dissolved oxygen

The solution:  
ADS Augmentation Pucks  
ADS Pond Clarifier Pucks  
ADS Wastewater Treatment Pucks



# What ADS Pucks can do

## Pond Clarifier Pucks for Long term treatment

- Helps restore a balanced natural environment in the water
- Interrupt the negative Eutrophic cycle
- Gives Macrophytes growth an advantage over cyanobacteria
- Settle any suspended matter making the water clearer
- Prevent the production of unpleasant odor created by anaerobic degradation of detritus

# What ADS Pucks can do

## Augmentation Pucks for quick response

- Raise DO levels and purge odors without mechanical equipment
- Counter any peaks of pollutants due to rainfall by being added to outfalls, lift stations and wet wells
- In concentrated form can be used to chemically oxidize wastewater with out the storage and handling issues associated with potassium permanganate, hydrogen peroxide, and calcium nitrate.

# Use of natural alternatives to synthetic chemicals

- ADS BioAssistant™ – unusual consortia of non-ionic ethoxylated alcohols
- ADS AquaFloc™ – series of botanical proteins (anionic and cationic ) useful as flocculants
- ADS ReDOX™ -microscopic divalent Oxygen Bubbles
- ADS S.S.P.V™ –Simultaneous Selective Particle Vectoring allows us to control ingredient distribution as the puck dissolves

# Using Biomimicry to find Solutions

- All answers found in Nature, it is up to us to view them correctly
- Pollutants and waste can be broken down with natural processes
- ADS products take advantage of physical properties, altered chemistry and enhanced biological degradation
- ADS restores the correct environmental balance with a blend of the correct strains of microorganisms and additives to creating proper environment for them to germinate.
- Always treat a problem early, ideally at the source, to prevent an exponential increase in difficulty later on.

# Why Use natural alternatives?

- Recalcitrant synthetic compounds, not occurring in nature, are difficult to degrade in the field.
- Naturally derived compounds are more easily degraded and therefore less persistent.
- Avoid the necessity of toxic chemicals required in the manufacture of synthetic compounds.
- Solutions must meet the constraints of being readily available, bio-degradable, environmentally friendly and sustainable

# Application

## **ADS Pond Clarifier Pucks**

- Application is typically 3 times a year depending on the seasonal climate zone.
- Apply during calm windless day to maximize even distribution.
- Sunlight activates the process. A series of sunny days is ideal.
- Distribute pucks evenly throughout the water
- Ensure that the pucks are submerged below any floating slime or algae mats
- Clarification occurs in 5 – 7 days

## **ADS Augmentation Pucks**

- Submerge pucks in deepest section to ensure maximum plume size
- Can be added via erosion feeder at discharge point.

# Pond Clarifier Dosage

Surface area in acres*	ADS Pond Clarifier Pucks	
	Large 150g	Small 50g
.25	-	7 – 11
.5	5 – 8	14 – 23
.75	7 – 11	20 – 34
1.00	9 – 15	27 – 45
2.00	18 – 30	-

\* 1 acre ≈ 200ft. X 200ft.

# Pre-treatment

Aqua Dynamics Solutions has developed a whole line of products to treat the sources before they even reach our ground water collection points.

- Solids: AquaPucks™ line of products
- Powders: Aqua Floc™, No Fly Zone™
- Liquids: Odor Neutralizers, Cleaners, Detergents

**All our products are Bio-degradable, environmentally friendly and sustainable**

# Detailed information on water pollution

- Louisiana Universities Marine Consortium,  
[www.lumcon.edu](http://www.lumcon.edu)
- Natural Resources Defense Council, "Testing the Water 2006"
- National Oceanic & Atmospheric Administration,  
[www.noaa.gov](http://www.noaa.gov)
- U.S. Geological Survey Kansas water Science Center,  
[ks.water.usgs.gov](http://ks.water.usgs.gov)
- Non-Point source pollution information  
[www.protectingwater.com/index.html](http://www.protectingwater.com/index.html)