

Clean Water Farming

York River and Small Coastal Basin Roundtable

Bernard C Courtney, PhD

The Tauri Group

14 July, 2011

Who is The Tauri Group?

- Partnership, 10 years
- >\$50M
- 150+ employees
- 5 skill athlete (>75% Advanced degrees):

Acquisition/Program Management Federal

Scientist/Mathematician/Engineer Military

Leadership

- Alexandria, Virginia

What The Tauri Group Does?

- Advisory and Assistance Services (A&AS)
- Systems Engineering and Technical Assistance (SETA)
- Program Management
- Science Management
- Technology Assessment
- Analysis of Alternatives
- Policy

Why Clean Water?

- HydroMentia
 - Small to medium size company
 - Program management need
 - Algal Turf Scrubber (ATS™)
- We are geeks!!!
 - A thirst for tackling the tough problems
 - A reputation for working effectively to help integrate programs and capabilities across organizations and political jurisdictions

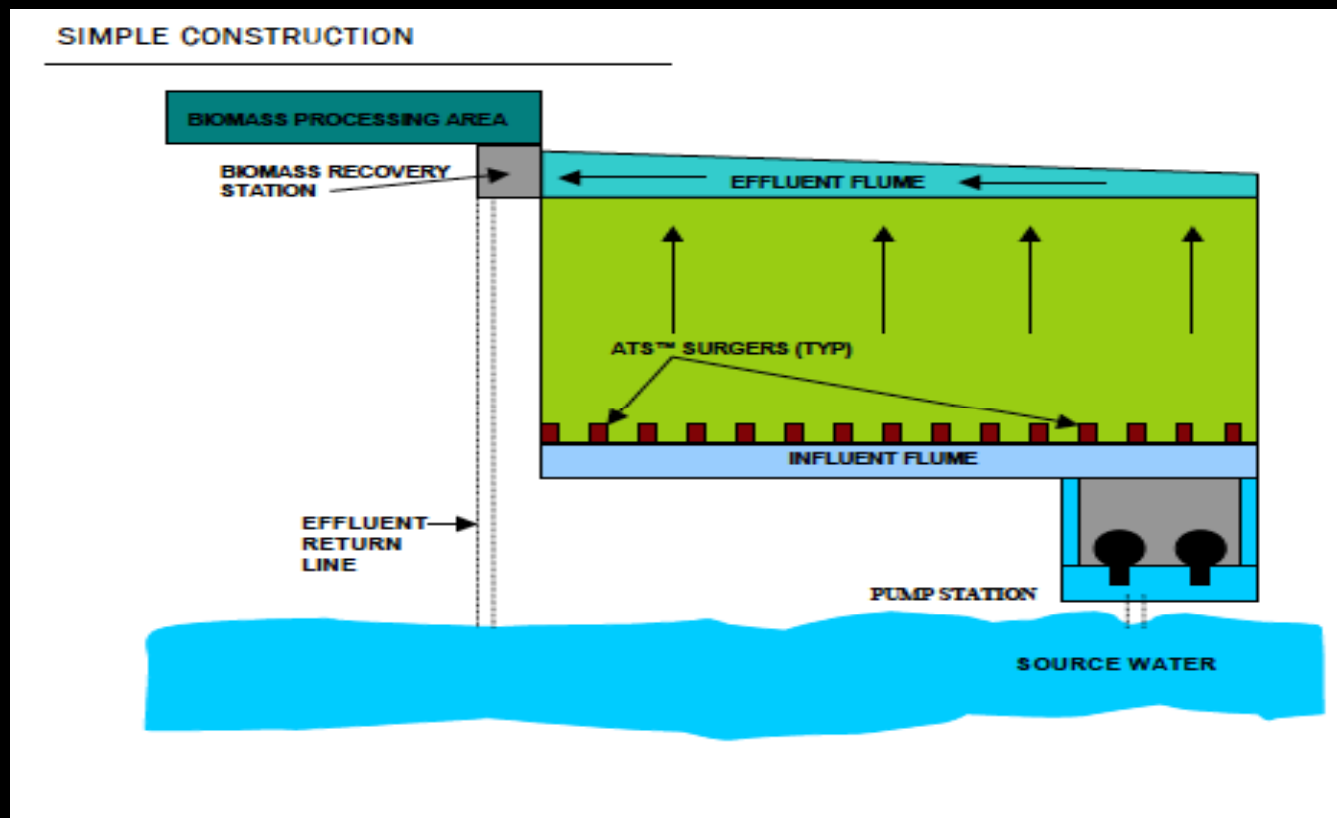
About Algal Turf Scrubbers

- Inventor: Walter Adey- Smithsonian
- Coral reef respiration
- Wave action + Light = High productivity
- Not nutrient limited or temperature dependent
- Aquarium ecology treatment system
- Native algae, “un-seeded”
- Carbon capture

ATS™ by Hydromentia

- Taylor Creek, near Lake Okeechobee
- Egret Marsh, Vero Beach, FL
 - 10 million gallons/day surface water
 - 3+ Acres
 - 1-18 ppm (mg/L) N loading
 - ~6400 lbs N/acre/year and ~800 lbs P/acre/year
 - >1 ton wet biomass/acre/week (~10% dry weight)

Schematic of Algal Turf Scrubber™



ATS™ by HydroMentia



Algal Turf Growth



Algal Biomass Harvest



Solar Powered Drying



Milled Algal “Flour”

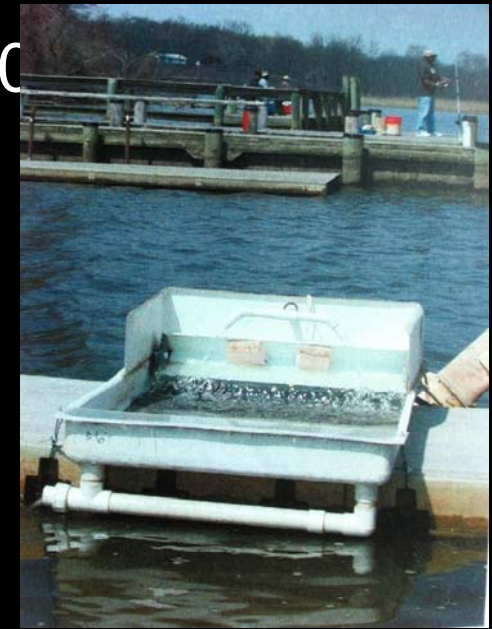
Assayed after oil extraction

- 30.4% crude protein
- 35.4% soluble protein
- 41.2% TDN (energy)
- 32.7% ADF
- 8.0% lignin
- 36.6% NDF (low availability)
- < 3% oil



ATS in the Chesapeake Watershed

- Mulbry, et al., Ecol Eng 36:536 (2010)
- Upper Marlboro, Pasadena and Abingdon, MD
- Patuxent, Patapsco, and Bush Rivers
- Pilot systems (1 meter square and 3500 liter)
 - Patuxent River, May-Oct, 2007
 - 250mg/m²/day N
 - 45mg/m²/day P
 - 66% N and 50% P recovery
 - Hectare (2.47 acres) for 150 days:
840lbs N and 150lbs P



Productivity and Nutrient Recovery (Wilkie and Mulbry, 2002)

- Dairy effluent
 - Algal biomass: 2.5-24g Dry Weight/m²/day
 - 77-95% chemical oxygen demand reduction
 - Nitrogen recovery: ca 83%
 - Phosphorus recovery: ca 91%
 - 31% CP

How's the water?

- Increased pH (dependent on buffering capacity of water)
- Reduced sediment load
 - 60% of unwashed biomass is fine solids
 - “de-watering” ponds are sedimentation lagoons
- Reduced heavy metal concentrations
- Increased dissolved oxygen
- Reduced bacterial load
- Improved aquatic ecology

Business Model

- Value based nutrient and sediment recovery
 - Value in biomass
 - Value in responsible agribusiness
 - Value in independence from expecting federal intervention
 - Value in clean water
- Markets cognizance of algal biomass as commodity
- Sufficient algal biomass production to sustain users
- Diverse markets to balance production and need
- USDA/DOE biomass market development grant

Questions

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It would take 1000, 1-acre algal turf scrubbers to eliminate the nutrient impairment in the Chesapeake Bay— P. Kangas