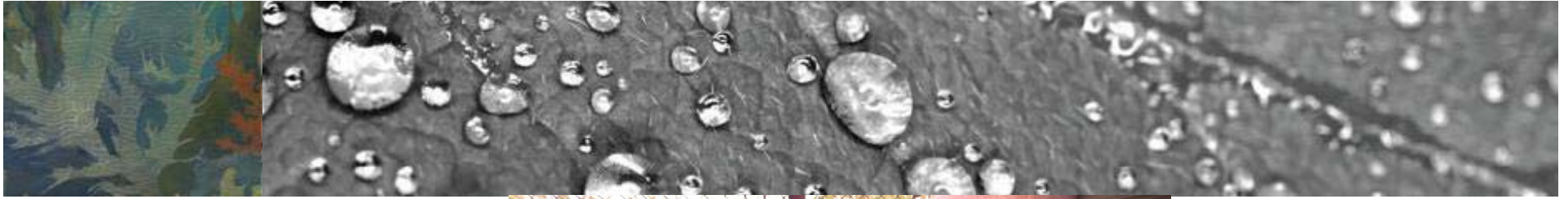


# Algal Turf Scrubber®

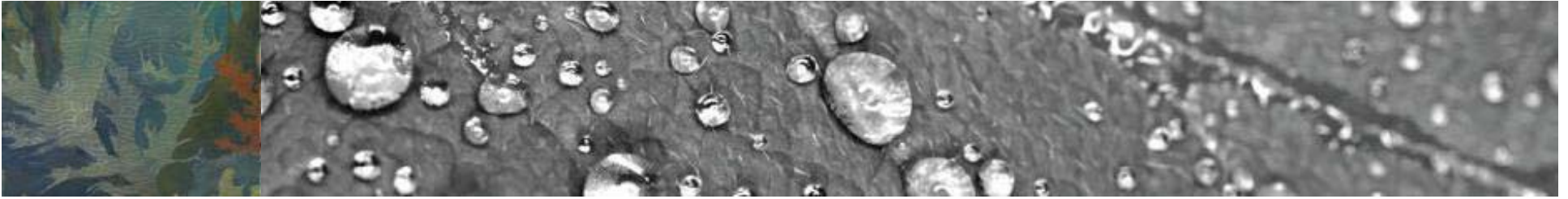
An Algae Based Ecotechnology for Water Quality Improvement in Support of Chesapeake Bay TMDL Requirements



Looking down the Maryland Port's 2 meter x 100 meter flowway from the inflow surge buckets that pulse water across the algal turf bed.



**Attached filamentous algal “turf” pulls nutrients and traps sediment from the inflowing water while pumping dissolved oxygen into the outflowing water.**



**Looking up the flowway with the water turned off so that scraping and vacuum harvesting of the algae can take place.**

# ATS™ and Chesapeake Bay



Draft material prepared for consideration by the  
Federal Leadership Committee for the Chesapeake Bay

9 September 2009

## DRAFT REPORT

# Focusing Resources to Restore and Protect the Chesapeake Bay and its Tributary Waters

Executive Order 13508, Section 202b Report

Draft material prepared for consideration by the  
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### Algal Turf Scrubber

Dr. Walter Adey's 1980s algal turf scrubber (ATS) process, which is being used increasingly in Everglades clean up work, has not yet been applied to tackle the Chesapeake Bay nutrient problems. Dr. Kangas, University of Maryland professor, and Dr. Adey would like to see that change. ATS uses pretty simple technology – nutrient-laden water is diverted into raceways containing screens with algae. The algae absorb the nutrients and oxygenate the water, which is returned to its source. The two scientists are conducting a pilot in Lancaster County, PA to test the ATS technology in a temperate climate. Partnering with Exelon Power Company, which owns and operates Muddy Run Storage and the Conowingo Dam, the project is generating encouraging results. On-site researchers have measured a near doubling of oxygen concentration in waters after their journey through the raceways, while water samples analyzed at USDA's Beltsville facility showed nitrogen reductions of over 30 percent. The hardworking algae are harvested periodically to keep them at peak performance and the residue offers another opportunity according to the researchers – conversion to biofuels. The partners in this pilot are already talking about scaling up. Adey and Kangas have a vision of ATS systems on small strips of farmland along the rivers and creeks of the Chesapeake Bay Watershed (Chesapeake Quarterly, 2009). And they may not be alone in that vision, the Caroline County Conservation District is doing just that – testing a field-scale application of the ATS technology to achieve nutrient load reductions from agricultural drainage systems in the Upper Choptank River watershed. The project was funded in 2008 through the Chesapeake Bay Conservation Innovation Grants program, supported by USDA and the National Fish and Wildlife Foundation. The project team will be evaluating the feasibility of this innovative approach to nutrient reduction, including the overall maintenance costs and barriers to acceptance.



The Perdue AgriRecycle litter recycling plant on the Delmarva peninsula is an example of industry led solutions to a significant environmental issue. The plant has handled more than 500,000 tons of poultry litter in its first seven years of operation; reducing

**ATS™ Pilot locations around Chesapeake Bay and the draft technical report supporting President Obama's Executive Order 13508 directing Chesapeake Bay cleanup which includes ATS™ as an emerging technology in the effort.**



## Areal Nutrient Uptake Rates for an ATS in the Chesapeake Bay Region

	Lower Boundary Estimate lbs / acre / year	Upper Boundary Estimate lbs / acre / year
Nitrogen	214	3900
Phosphorus	43	390

**Averages from data collected from ATS™ studies on outdoor raceways operated for at least one annual cycle. The Port ATS™ has not completed a year of operation but was giving production rates in the Summer and Fall of 2013 near the upper boundary estimate of 20-30g/m<sup>2</sup>/day.**

**Typical biomass production rates for ATS™ in the Chesapeake Bay region range from 10 – 35 grams dry weight/m<sup>2</sup>/day and typical nutrient contents are 3-5% nitrogen and 0.3-0.5% P.**

System Location	Water Treated	%N	%P
Lancaster, PA	Susquehanna River	2.5	0.3
Beltsville, MD	Dairy Manure	5.9	0.8
Bridgetown, MD	Ag Drainage Ditch	2.0	0.3
Gloucester, VA	York River	1.3	0.2
Reedville, VA	Great Wicomico River	2.5	0.2