AFI

Artificial Floating Island Proposal
Cleaning Water Nature's Way

Submitted by Sandy William

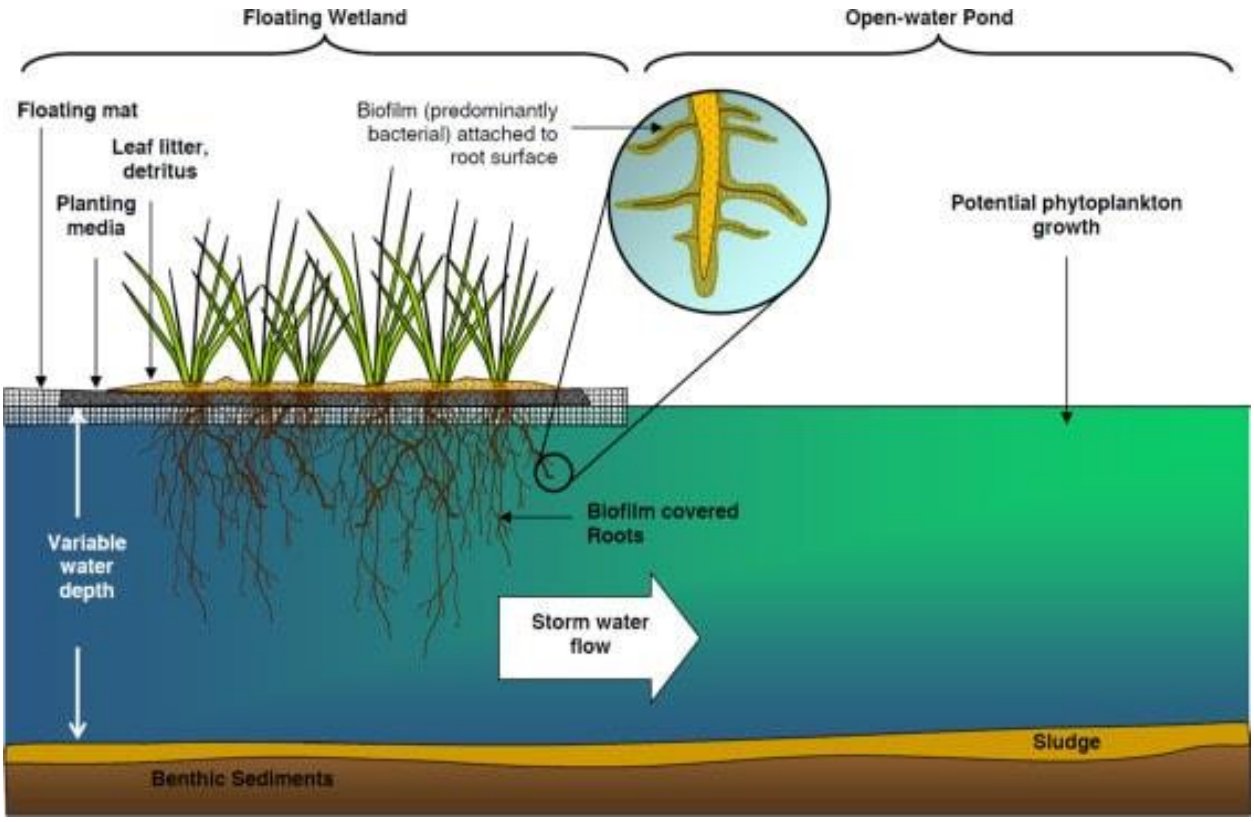
4/22/2019

This is a proposal to create an Artificial Floating Island (AFI) for the Verona Park Lake in Verona, NJ. The lake is suffering from numerous water quality problems. An AFI is a low cost, sustainable method to improve water quality. Specifically, the AFI will improve the levels of nitrates, phosphorous, pH, oxygen and the overall water quality of the lake.

New Jersey communities are recognizing the fact that storm water runoff, and other sources of water pollution, is creating a major problem in local waterways, lakes and ponds. The management of water runoff is vital to reducing pollutants from entering our waterways. This proposal can be implemented by many municipalities, especially those impacted by recent record setting storms which created significant storm water runoff and flooding, (such as Little Falls and West Orange) and for towns wanting to improve and mitigate water pollution.

An AFI is a green technology which offers an affordable solution to these water quality issues. It is a man-made island or shoreline barrier constructed of recycled and reused materials. It is composed of woven, recycled, plastic material which floats in water. Vegetation is planted directly in the plastic material with some peat and mulch. An AFI mimics nature's way of cleansing water by using obligate native plants to leverage biofilm and microbial activity on the long plant roots. This root system removes nutrients helping prevent or slow down the process of eutrophication (excessive richness of nutrients in a lake or other body of water).

Diagram of Artificial Floating Island or Floating Wetland



These “Floating Wetlands” are nature’s own water purifiers: as dirty water moves through water, the bacteria that cling to plants, timber, rocks, and other debris consume and process some common water pollutants. Other contaminants get trapped in the mud and muck. As a result of this, and other processes, the water visibility and clarity is improved and water that eventually flows out is much cleaner than the stream or water that came trickling in. The organic debris that attaches itself to the underside of an AFI also becomes a source of food for fish and other aquatic organisms, and the island itself provides new habitats for birds and other wildlife.

Typically only native and robust vegetation is planted on the AFIs; but whenever possible, species that also produce attractive flowers are used. A few of the native plants used in an AFI are: Lizzards Tail, Marsh Marigold, Allegheny Monkey Flower, Cardinal Flower, Scouring rush Horsetail and Swamp Milkweed. Undesirable species such as reed canary grass may be seen on the AFIs, but if such species are removed as soon as they are observed, they do not pose a major problem of taking over the island.

Artificial Floating Island Launched By Cub Scouts in Mahwah, Winters Pond

Cleansing Power

An AFI also mechanically filters out other pollutants like metals and particulates. The sticky biofilm essentially keeps the water clear because all the suspended solids tend to bond to it. For example, the concentrations of suspended solids, copper, lead, zinc, oil and grease fell dramatically after a floating island was installed in a storm water pond in Montana.*

Several islands were launched together and covered almost 2% of a Montana lake's 6.5-acre surface area. Within four years, the islands helped reduce nitrogen concentrations by 95% and phosphorus concentrations by nearly 40%. Today, levels of dissolved oxygen are sixty times what they once were.*

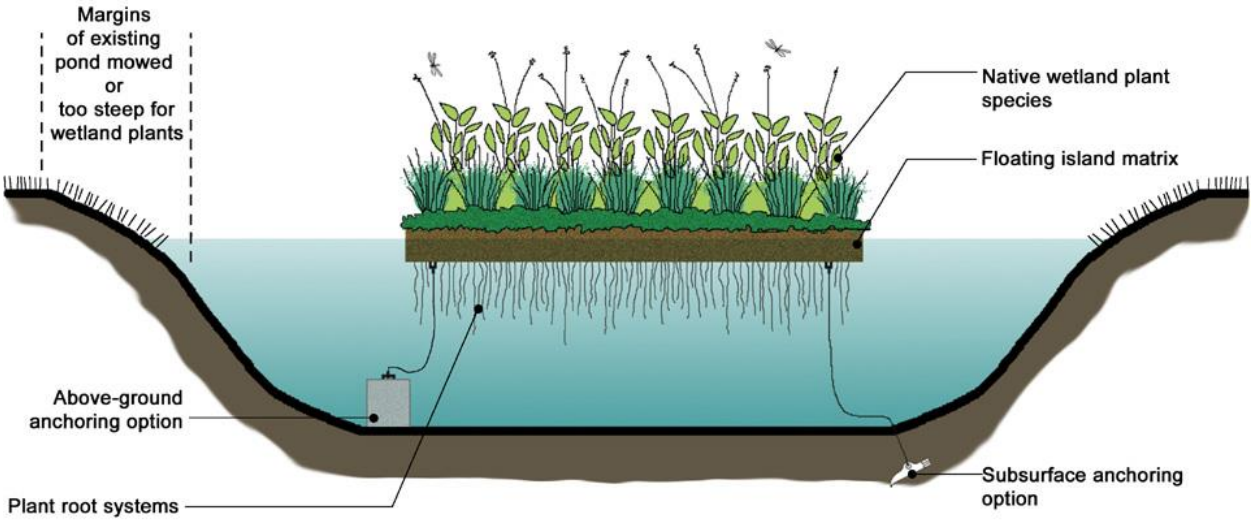
A number of studies have estimated that one 250-ft. AFI can remove approximately 10 lbs. of total phosphorus per year. Since one pound of phosphorus has the potential to generate up to 1,100 lbs. of wet algae biomass, one 250-ft. AFI could prevent the growth of up to 11,000 lbs. of wet algae biomass. The AFIs divert phosphorus that would otherwise stimulate nuisance algal growth into the more desirable wetland vegetation on top of the island. Since ten AFI cells have been installed in Ashely Cove at Lake Hopatcong, Montana, with a total surface of 500 ft., these Islands are expected to remove approximately 20 lbs. of total phosphorous from the water per year, resulting in a reduction of wet algae biomass in the cove of approximately 22,000 lbs.*

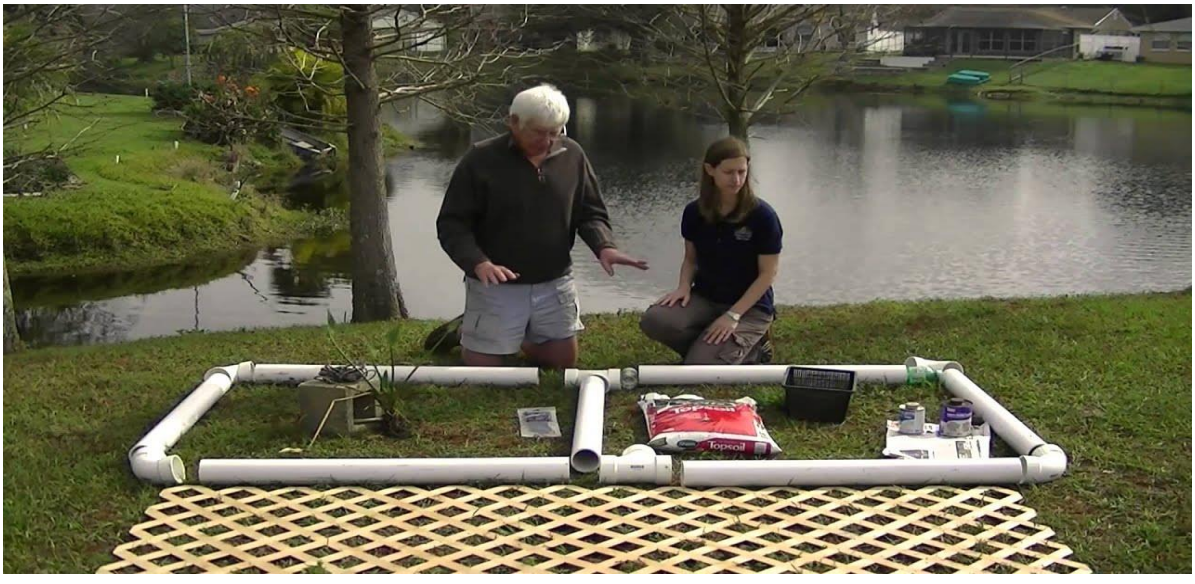
Easy Installation, Variable Designs and Construction

An AFI can be built by students from Elementary through to College, community members, environmental groups, etc., An AFI can be located in the middle of the waterway or as a shoreline buffer adding a riparian edge. Many different construction materials can be used to build the AFI. They can be scavenged, come from reused or recycled items, donated or purchased for little cost. AFI designs can be customized to the waterway's shape and specific pollution challenges. Its' design can be as creative as its makers!

A "young" floating island. As it matures, the plants will grow throughout the plastic fencing.

Designs can take any form or shape.





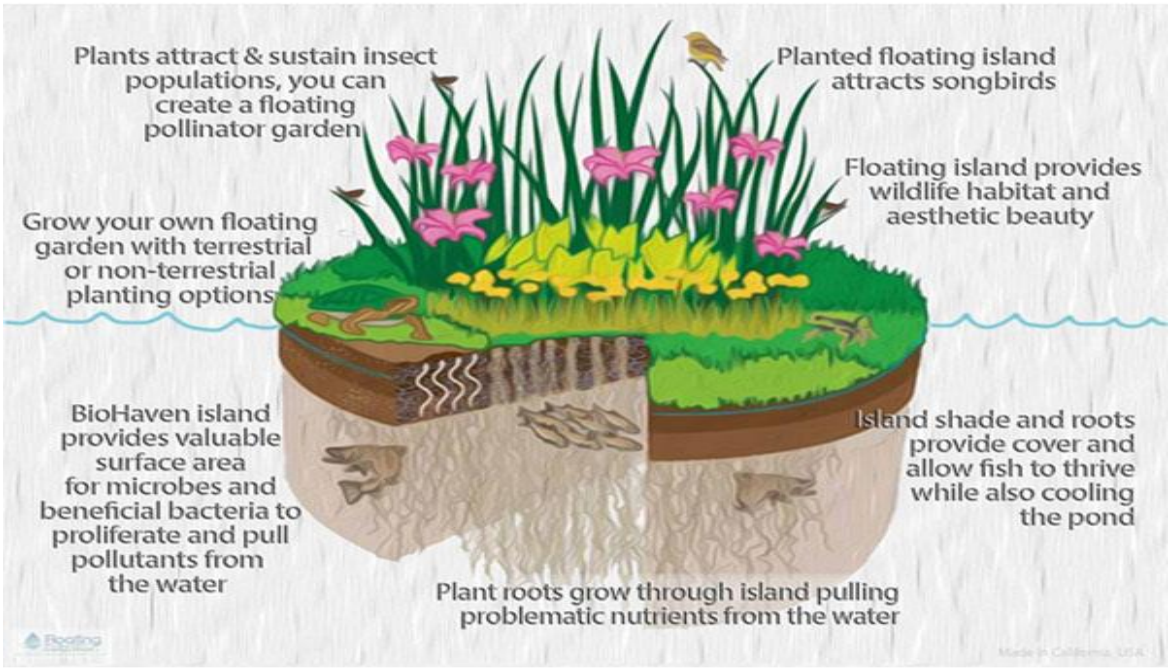
Multiple methods of construction using cheap, easy to obtain materials and little manpower.

Community Benefits

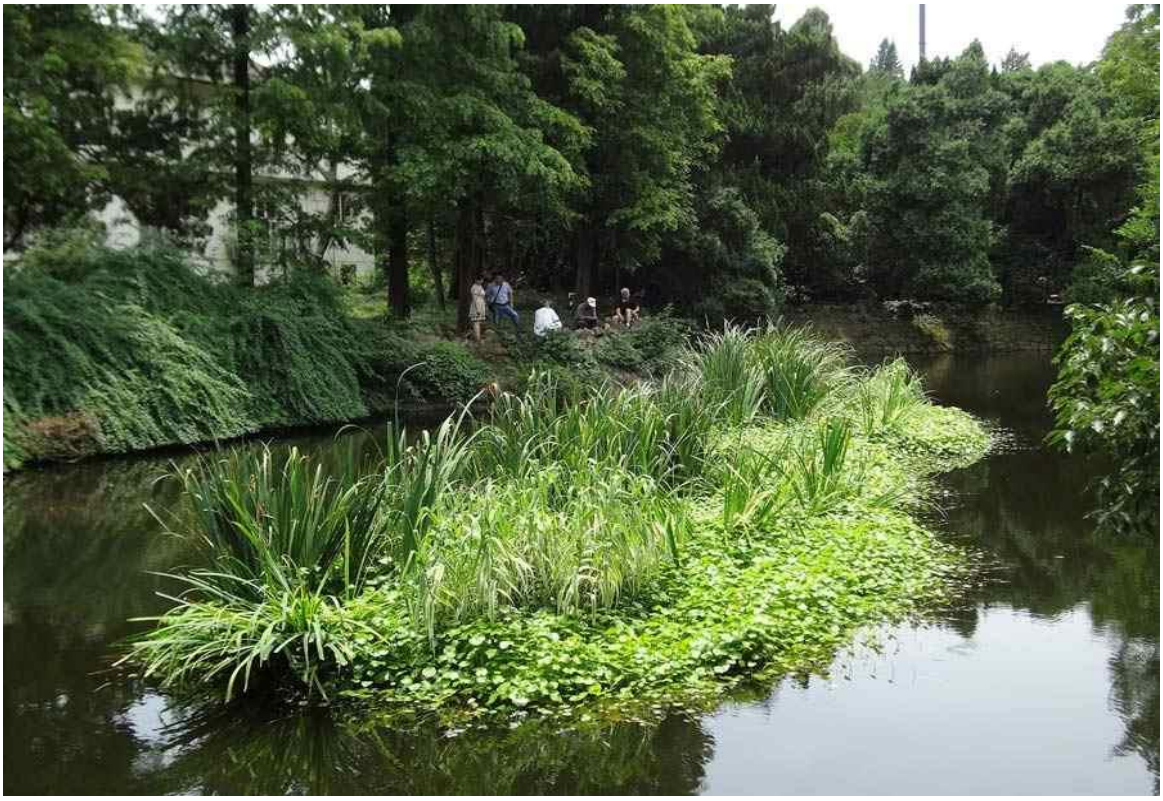
AFIs can reduce the expensive cost of traditional water treatment, create aquatic and terrestrial habitats, sequesters carbon, and adds aesthetic beauty to the community.

The AFI can be constructed to float in a body of water or shore line of a waterway and designed to meet the particular needs of a community (strengthening and protecting shorelines, mitigating pollution and effects of storm water runoff, filtering Guano from Geese, etc.,). Community recreation activities e.g. fishing, boating, scenic viewing etc., can be easily integrated and improved by the installation of an AFI.

Source of Food for Fish, Aquatic Organisms, Birds, and Pollination



Enhances and Integrates with Community Recreation and Activities



Adds Esthetic Beauty to the Environment

Innovative Possibilities

Some scientists are now exploring how to optimize the design of AFIs and think they can get even more out of them by seeding the rafts with plants that are of commercial value, such as lettuces and herbs. Screenings of a number of potential plant candidates are being performed. If ones that grow well on AFIs or shoreline installments are found, we may soon see constructed systems that "give us a little bit more return," producing saleable crops while purifying the water.*

Growing vegetables on an AFI. An innovative extension of community gardens.

Plant beds provide produce while improving water quality.

Verona Park and Lake are part of the Essex County Parks Department. We hope the department funds this AFI proposal and AFIs for other waterways within the Essex County Park System (particularly those recently effected by the extreme flooding and storm water over flow and run off from the unprecedented 2018 storm).

The AFI's can be used to educate residents and students (especially in STEM studies) and increase awareness of local water quality issues. The project can give a community a sense power and influence over their environment and improve sustainable water use and understanding of factors leading to poor water quality.

We envision waterways that flow through adjacent municipalities linked together with AFIs creating continuous strings of natural water cleansing, and pollution preventing oasis.

Sources:

* Emily Anthes, BBC.com, September 26 2012
* Emily Anthes, BBC.com, September 26 2012
* Fred S. Lubnow, Ph.D., Princeton Hydro, LLC, ANJEC Reprint 2015 Issue
* Gary Burtle, an aquaculture specialist at the University of Georgia

Authors: Co-written by Karin La Greca and Sandy Williams