WISCONSIN LEGISLATURE
P.O. BOX 8952 • MADISON, WI 53708

Testimony before Senate Committee on Natural Resources and Energy
Senate Bill 485
Rep. Amy Loudenbeck and Sen. Pat Testin

Thank you, Mr. Chairman and committee members, for the opportunity to testify in favor of Senate Bill 485, relating to: lake management grants and river protection management grants for floating treatment wetlands.

In the interest of reducing the impacts of excess phosphorus, nitrogen, and other nutrients in surface water in Wisconsin, we are proposing SB-485 which defines floating treatment wetlands in Wisconsin statutes, and adds floating treatment wetlands to the list of activities that are eligible for lake and river management grants.

As we contemplate new policies to reduce point and non-point source discharges into groundwater and surface water, it is also important to promote the utilization of existing, proven engineered technologies such as floating treatment wetlands (FTW) to remove excess nutrients in surface waters in Wisconsin.

Engineered treatment technologies such as FTWs are not new or untested. They may go by other names such as floating wetland islands, floating treatment islands, floating treatment wetlands or other terms. SB-485 defines the term "floating treatment wetland" as an artificial, buoyant platform for keeping plants afloat that mimics the function of natural wetlands and allows plants to grow in water that is typically too deep for them and is placed below the ordinary high water mark in a navigable water.

FTWs consist of a buoyant structure, or raft, which supports plants in a growing media over the water column. These plants are perennial, non-invasive emergent plants. FTWs mimic the function of natural wetlands, in that they filter and process nutrients, suspended solids, metals and other pollutants. Unlike a traditional wetland, the plants will not take root in the soil. In a FTW the roots will stay suspended in the water column in order for the plants to adjust to any fluctuations in water level without harming the plants. FTWs are a useful tool used to increase water quality of ponds and lakes. FTWs will target excess nutrients in water, which are the main contributor to aquatic weed growth in ponds. Adding FTWs to a pond can also increase the biodiversity by providing additional wildlife refuge.

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According to the Wisconsin Department of Natural Resources (DNR), a total of one Individual Permit has been issued by the DNR for a FTW project in Wisconsin. FTWs were placed in a storm water pond that services Drexel Town Square in Oak Creek. The project was paid for by a grant from the Fund for Lake Michigan. The permit was issued under the "miscellaneous structures" category for Individual Permits. DNR has indicated an interest in providing additional information on FTWs and their potential benefits on their website in order to increase awareness of this available technology.

By defining Floating Treatment Wetlands in statute and allowing FTW projects to qualify for existing Lake and River Management Grants, SB-485 will increase opportunities for deployment of this proven engineered treatment technology in surface water in Wisconsin.

Thank you for your kind attention to our testimony. We would be happy to answer any questions at this time.

Wisconsin Wetlands ASSOCIATION

To: Senator Testin and Representative Loudenbeck

From: Erin O'Brien, Policy Director, Wisconsin Wetlands Association

Cc: Members of the Senate Committee on Natural Resources and Energy

Re: Senate Bill 485 and Assembly Bill 503

Date: October 22, 2019

We appreciate your recent efforts through Senate Bill 485 and companion legislation, Assembly Bill 503 to provide recipients of Lake Management Project Grants and River Protection Grants an additional tool to improve water quality by helping absorb excess nutrients.

We would like to share two recommendations for Senate Bill 485 and Assembly Bill 503.

1) To reduce confusion and more clearly distinguish this water quality technique from a natural "wetland," which is defined in state and federal law, we request that you replace the term "floating treatment wetland" in proposed 281.69 (1b) (ae) and 281.70 (1) (a) with "artificial floating vegetated island." We also believe this term is more precise and provides consistency with a project using similar techniques that the Environmental Protection Agency is currently tracking and researching in Colorado.[1]

2) Secondly, we note that under the bill the term is defined as "an artificial, buoyant platform for keeping plants afloat that mimics the function of natural wetlands and allows plants to grow in water that is typically too deep for them and that is placed below the ordinary high-water mark in a navigable water." Because there are many wetland functions that would not be replicated, we support a simple change to specify that the term mimics some of the water quality improvement functions of natural wetlands.

Again, thank you for the opportunity to provide feedback on Senate Bill 485 and Assembly Bill 503. We appreciate the opportunity to be a resource for you and your staff as you craft policies focused on improving water quality and the essential role wetlands play in that result. Please don't hesitate to contact us with any additional questions or concerns you may have.

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[1] https://www.epa.gov/sciencematters/epa-uses-floating-vegetated-islands-remove-excess-nutrients-water

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
101 S. Webster Street
Box 7921
Madison WI 53707-7921

Tony Evers, Governor
Preston D. Cole, Secretary
Telephone 608-266-2621
Toll Free 1-888-936-7463
TTY Access via relay - 711

WISCONSIN DEPT. OF NATURAL RESOURCES

Senate Committee on Natural Resources & Energy

2019 Senate Bill 485
Lake Management & River Protection Management Grants for Floating Treatment Wetlands
October 22, 2019

The Wisconsin Department of Natural Resources welcomes the opportunity to provide written testimony on Senate Bill 485 (SB 485), which makes the placement of floating treatment wetlands eligible for funding under the lake management and river protection management grant programs.

SB 485 defines floating treatment wetlands as artificial, buoyant platforms for keeping plants afloat that mimic the function of natural wetlands and allows plants to grow in water that is typically too deep for them. Further, the bill specifies that these platforms would be placed below the ordinary high-water mark in a navigable water. This clear definition helps to define the scope of these types of projects and avoids confusion with other types of waterway and wetland projects.

The provisions of SB 485 can be implemented through existing permitting processes and procedures. In addition, because this new eligible project type will be included in the Wisconsin State Statutes, a revision to the Administrative Code will not be necessary in order to begin issuing grants under the respective programs.

The Department expects to be able to implement the provisions of this bill with existing staff and resources.

Finally, the Department would like to thank the authors of SB 485 for their engagement of the agency during their drafting of the bill.

Thank you for your consideration of these written comments. Please contact Department of Natural Resources Assistant Legislative Liaison Erin Ruby at 608-266-7566 or Erin.Ruby@Wisconsin.gov with any questions.

BioHaven® Floating Islands

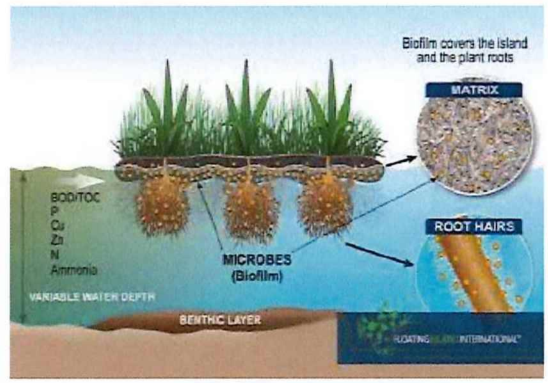
Oak Creek, WI

Background

Three BioHaven® Floating Islands were installed in a stormwater pond in Emerald Preserve. Located on a former brownfield site at Drexel Town Square, the city of Oak Creek installed the floating islands as an innovative best management practice for improving water quality. Signs around the pond educate the public about floating wetlands and other practices. These islands serve as a great example of a sustainable green infrastructure tool.

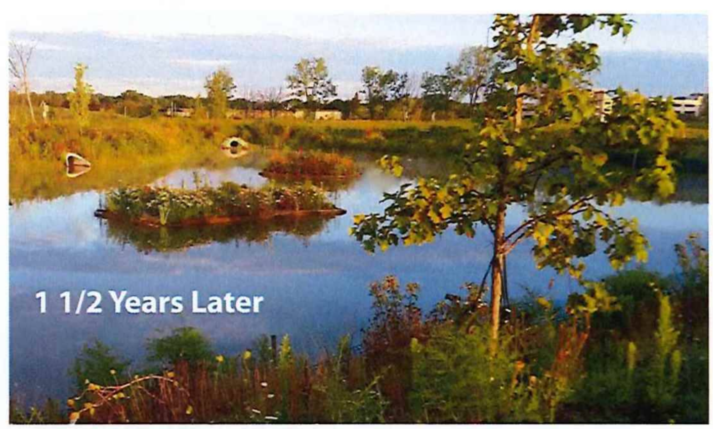
FTW Technology

Floating Treatment Wetlands (FTW's) biomimic natural wetlands. Made from recycled BPA-free PET plastic, the durable islands support plants that grow roots below the island. The plants and the island matrix attract microbes which form a sticky biofilm. The biofilm and microbial communities trap and reduce pollutants, leading to better water quality. The islands provide wetland habitat to create a new floating ecosystem.



Fast Facts

- Installed 3 islands totaling 1,300 square feet in a 1.4 acre stormwater pond
- Made from recycled materials which kept 32,500 plastic bottles out of landfills
- Native aquatic plugs were planted such as Sedges, Swamp Milkweed, Joe Pye Weed, Boneset, Blue Flag Iris, Red Cardinal Flower, and more
- Each island was enclosed by goose fencing for protection



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roject funded by the City of Oak Creek and
grant from the Fund for Lake Michigan.
esigned by Midwest Floating Island and

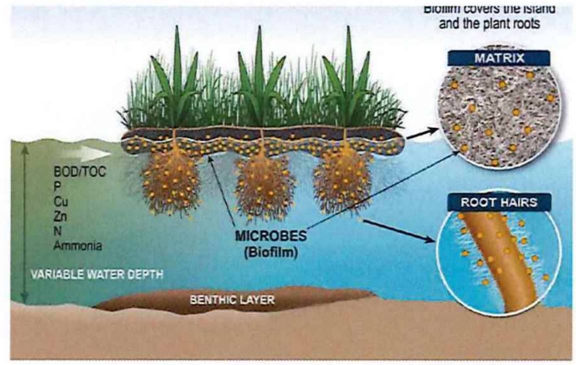
Fund for Lake Michigan OAK CREEK TRC MIDWEST FLOATING ISLAND

Floating Islands

HARTUNG POND IN MILWAUKEE, WI

BACKGROUND

The City of Milwaukee installed six floating islands in Hartung Park which is shared with the City of Wauwatosa. The floating islands were chosen as an innovative best management practice for improving water quality as well as to increase biodiversity. These islands serve as a great example of a sustainable green infrastructure tool.



FTW TECHNOLOGY

Floating Treatment Wetlands (FTW's) biomimic natural wetlands. Made from matrix that is recycled, BPA-free, PET plastic, the islands support plants that grow long roots below the island. The plants and the open-cell structure matrix attract microbes which form a sticky biofilm. The biofilm and microbial communities trap and reduce pollutants, leading to better water quality. The islands also provide wetland habitat to create a new floating ecosystem.

FAST FACTS

- 1,800 square feet of islands were launched in a storm water pond in September, 2018
- The recycled matrix mat kept 45,000 plastic bottles out of landfills and uses them instead to improve water quality
- Native aquatic plugs were planted such as Great Blue Lobelia, Boneset, Cardinal Flower, Crooked Stem Aster, Bluejoint Grass and more to attract pollinators
- Each island was enclosed with goose fencing to protect the plants and was anchored to go up and down with changing water levels

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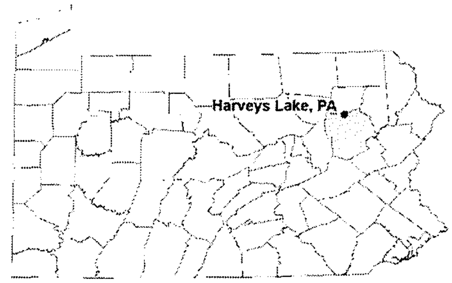
City of Milwaukee

tallgrass RESTORATION, LLC

Olson Ecological Solutions, LLC
olsonecosolutions.com

MIDWEST FLOATING ISLAND

STORIES OF PROGRESS IN ACHIEVING HEALTHY WATERS
EPA Region 3 Water Protection Division



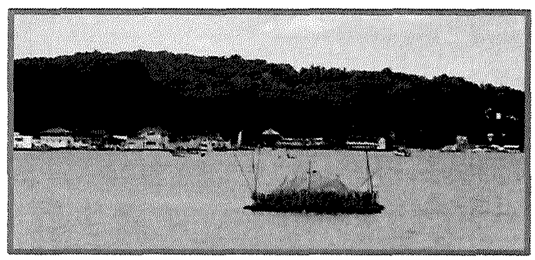
Floating Wetland Islands Help Restore Large PA Lake

Harveys Lake, Pennsylvania · May 14, 2015

One of Pennsylvania's largest natural lakes has been removed from the state's list of impaired waters following years of EPA-funded work to control phosphorus pollution. One of the innovative actions taken to meet the goal was deployment of five floating wetland islands.

AT A GLANCE

- *Large PA lake removed from state's impaired waters list*
- *EPA Clean Water Act Section 319 grants provide bulk of restoration funding for Harveys Lake*



In a community with homes and roads ringing the water's edge, stormwater runoff was the main source of high nutrient loads to Harveys Lake in Luzerne County, prompting the state in 1996 to add it to the Clean Water Act Section 303(d) list of impaired waters. The high nutrient loads contributed to algal blooms, which impacted water quality and recreational use of the lake.

A Total Maximum Daily Load (TMDL), or pollution diet, and a stormwater implementation plan were developed to reduce nutrients by 22 percent, or 230 pounds a year, and restore the nearly 659-acre lake.

Partners involved in the restoration projects have included Harveys Lake Borough, the Harveys Lake Environmental Advisory Council, the Luzerne County Conservation District, the Pennsylvania Fish and Boat Commission, Princeton Hydro, LLC and the Pennsylvania Department of Environmental Protection (PADEP).

The partners designed and constructed two stream restoration projects and installed a series of 38 urban stormwater best management practices, including roadside swales with filter sleeves, chambered "baffle boxes," small storm basins with removable cartridges, and other techniques to filter out pollutants. Finally, the partners launched the man-made, 250-square-foot floating wetland islands to reduce phosphorus already in the lake. Additional actions are anticipated this summer and beyond.

The wetland islands are made of recycled plastic material and covered with soil and wetland plants. The plants and the microorganisms that grow around their roots take up phosphorus and nitrogen from the water. PADEP, local volunteers and others helped assemble, plant and position the islands.

Recent PADEP surveys found that the efforts had restored water quality to state standards; the nutrient control practices so far have reduced nutrient pollution by about 10 percent of the estimated 22 percent called for in the TMDL. By the end of 2015, the phosphorus load is expected to be reduced by 132 pounds per year. The lake was removed from the impaired waters list in 2014 based on restored water quality standards and Aquatic Life Uses. PADEP staff credits the community for its instrumental role in the successful outcome.

Nearly $1.7 million in EPA Section 319 non-point source grants from 2000 to 2014 were used for the restoration actions. There were also state matching funds and earlier federal funding from the 1990s.

U.S. Environmental Protection Agency
EPA Region 3 Water Protection Division
Philadelphia, PA

For additional information contact:

Fred Suffian, suffian.fred@epa.gov
EPA WPD Office of State and Watershed Partnerships

Virginia Cooperative Extension
Virginia Tech • Virginia State University

Publication BSE-76P

Innovative Best Management Fact Sheet No. 1: Floating Treatment Wetlands

David J. Sample, Assistant Professor and Extension Specialist, Biological Systems Engineering, Virginia Tech
Chih-Yu Wang, Ph.D. Student, Biological Systems Engineering, Virginia Tech
Laurie J. Fox, Research Associate, Horticulture, Hampton Roads Agricultural Research and Extension Center

What Is a Floating Treatment Wetland?

Floating treatment wetlands (FTWs) are manmade *ecosystems* that mimic natural *wetlands*. FTWs are created using floating rafts that support plants grown *hydroponically*. The rafts float on a *wet pond* water surface and can be used to improve water quality by filtering, consuming, or breaking down pollutants (e.g., *nutrients, sediment*, and metals) from the water (fig. 1). FTWs may represent a relatively low cost and *sustainable* engineered *best management practice* (BMP) for reducing pollution in *stormwater*. Evaluating their effectiveness as a BMP is the subject of ongoing research at Virginia Tech and other locations across the U.S.

Please refer to definitions in the glossary at the end of this fact sheet.

Glossary terms are italicized on first mention in the text.

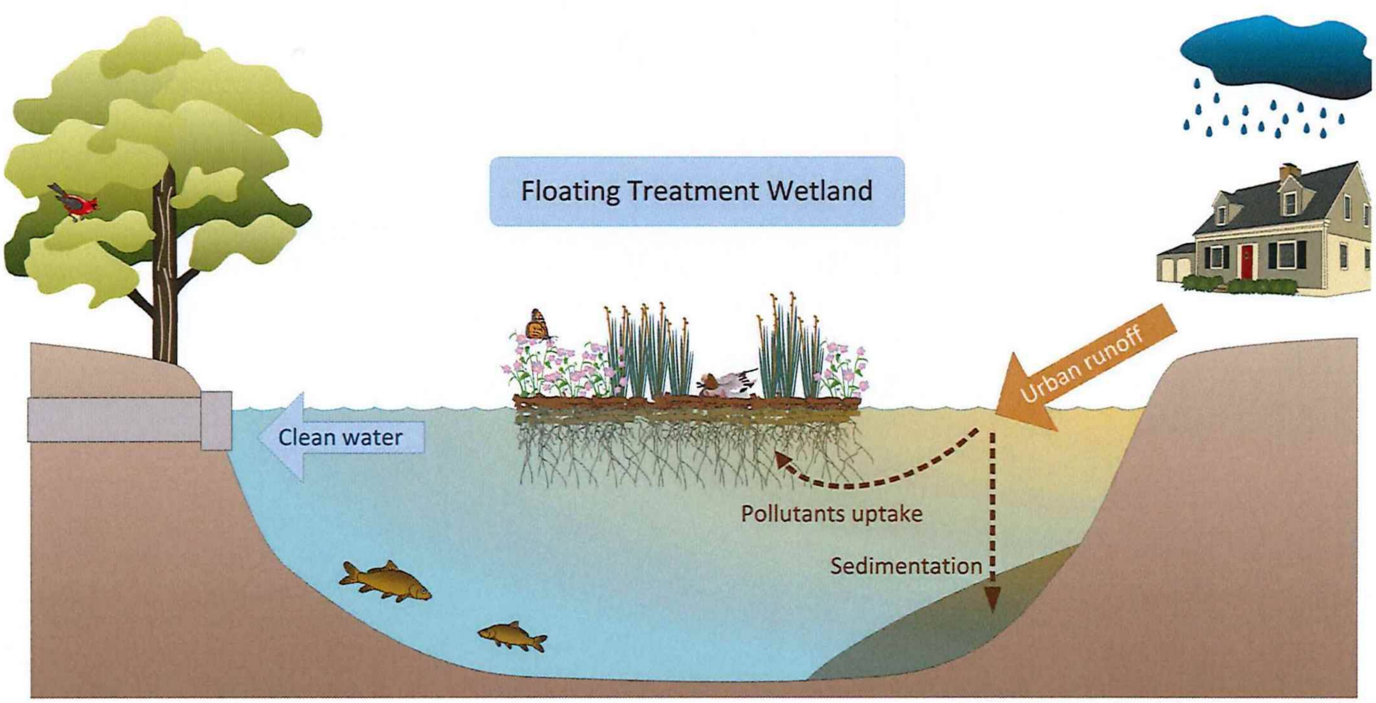


Figure 1. Diagram of a floating treatment wetland receiving urban stormwater runoff. Icons courtesy of the Integration and Application Network, University of Maryland Center for Environmental Science.

www.ext.vt.edu

Produced by Communications and Marketing, College of Agriculture and Life Sciences, Virginia Polytechnic Institute and State University, 2013

VT/0713/BSE-76P

How Do Floating Treatment Wetlands Work?

Three major pollutant reduction mechanisms have been identified in FTWs:

1. Plants directly uptake pollutants, especially nutrients, from the water, using a process known as *biological uptake*.

2. Microorganisms growing on the floating rafts and plant root systems break down and consume organic matter in the water through *microbial decomposition*.

3. Root systems filter out sediment and associated pollutants.

These pollutant-removal mechanisms constitute a system that could be a low-cost, sustainable method for removing pollutants from stormwater.

Figure 2. Floating treatment wetland (FTW) rafts in Ashby Pond, Fairfax, Va.

Where Can FTWs Be Used?

If it can be demonstrated that FTWs effectively remove waterborne pollutants, FTWs could be placed on most existing lakes and ponds. Many of these ponds located in urban settings are used as stormwater catchments. Examples of research FTW applications are shown in figures 2 and 3, from Fairfax and Virginia Beach, Va., respectively.

When used in conjunction with a stormwater wet pond, FTWs are generally placed close to the shoreline at the point(s) where stormwater enters the pond either through the buffer area or through an *inflow* pipe. This is so they will intercept the most polluted runoff entering the system. FTWs located near the shoreline attenuate wave action and reduce undercutting and bank/shoreline *erosion*.

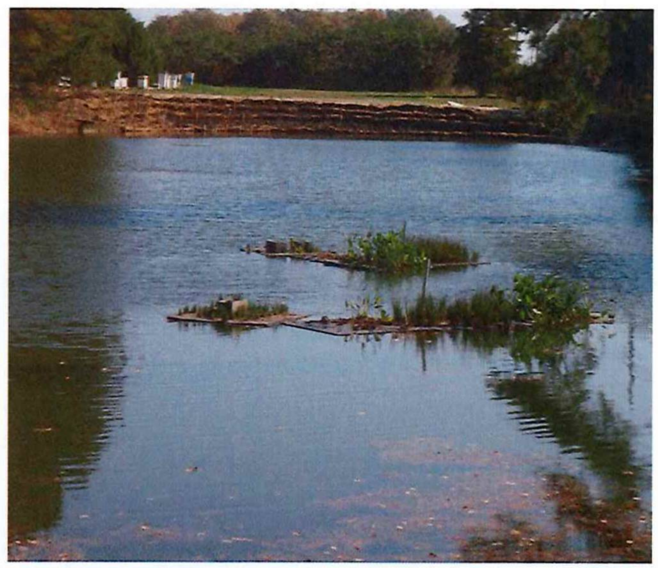


Figure 3. Floating treatment wetland (FTW) rafts in a pond located at Virginia Tech's Hampton Roads Agricultural Research and Extension Center in Virginia Beach, Va.

Potential Advantages of FTWs

- Provides design flexibility. FTWs can be sized to fit into almost any pond or lake.
- Enhances the pollutant-removal effectiveness of existing stormwater wet ponds.
- Provides a sustainable pollutant-removal system and wildlife *habitat*.
- Offers resiliency. FTWs can tolerate storm-event driven water-level fluctuations as long as they are anchored to the bottom or tethered to the shoreline so they are not damaged or lost by flowing through the *outlet structure* of the pond.
- Improves aesthetics. FTW can be used to enhance the visual appeal/interest of surface water features like ponds and lakes.

Potential Limitations

- Anchoring FTWs can be a challenge.
- For maximum nutrient-removal efficiency, FTWs need to be harvested or removed seasonally. Current environmental policy would likely require harvest of plant material in the fall to receive any credit for nutrient removal as a treatment. This requires a potentially significant labor effort.
- FTWs occupy open water surface and may block access or reduce available area for lake/pond recreational use. Minimum water depth should be no lower than three feet (four to five feet is recommended). Plants on the FTWs can root into sediments in shallow water and cause the floating rafts to be submerged when pond water level rises during storm events.
- Some contaminants, such as oil and herbicides, in urban runoff could damage the plants and harm microorganisms.
- Non-native and *invasive species* (plants) should not be planted on the FTWs and may need to be weeded out of the FTWs to avoid adverse effects to local ecosystems.

Performance

Evaluating the pollutant-removal performance of FTWs is difficult, in part because the pollutant-removal processes thought to be active in FTWs supplement those already taking place in wet ponds. One method commonly used to assess FTW performance is to use *mesocosms*, small-scale ponds (fig. 4). The performance of FTWs is an area of active research at Virginia Tech, North Carolina State University, and Clemson University in the U.S. and at several universities in China. Additional information about FTW performance is provided in a literature review compiled by Headley and Tanner (2012).

Figure 4. Floating treatment wetland mesocosms, Fairfax, Va.

Expected Cost

Although research is ongoing, initial cost estimates for FTW rafts range from \$1 to \$24 per square foot. The lower value is for homemade FTW rafts constructed either of recycled materials or PVC pipes; the higher value represents the cost of a commercially available, proprietary FTW rafts.

Costs for vegetation plugs for planting FTWs are dependent on vegetation species and source, type of FTW system (harvested or permanent), and purpose of the FTW (nutrient management, nursery production, habitat restoration, etc.). An estimation of maintenance costs can be made based on the size of the FTWs and the labor for plant harvesting or replacement, weed management, etc. If no structure repair is required, annual costs are expected to be lower than those for constructed wetlands, which is 3 to 5 percent of the estimated construction cost (Center for Watershed Protection 2010).

Additional Information

The Virginia departments of Conservation and Recreation (VA-DCR) and Environmental Quality (VA-DEQ) are the two state agencies that address nonpoint source pollution. The VA-DCR oversees agricultural conservation; VA-DEQ regulates stormwater through the Virginia Stormwater Management Program.

Additional information on best management practices can be found at the Virginia Stormwater BMP Clearinghouse website at http://vwrrc.vt.edu/swc. The BMP Clearinghouse is jointly administered by the VA-DEQ and the Virginia Water Resources Research Center, which has an oversight committee called the Virginia Stormwater BMP Clearinghouse Committee. Committee members represent various stakeholder groups involved with stormwater management.

New BMPs such as FTWs must demonstrate their performance through either the Virginia Technology Assessment Protocol, or special expert panels appointed through U.S. Environmental Protection Agency Chesapeake Bay Program. Ultimately a performance credit is assigned for use of the BMP.

Online Resources

Fairfax Virginia FTW Project – www.cws.bse.vt.edu/index.php/research/project/fairfax_virginia_floating_treatment_wetland

Virginia BMP Clearinghouse – http://vwrrc.vt.edu/swc/

Clemson FTWs research – www.clemson.edu/extension/horticulture/nursery/remediation_technology/floating_wetlands/research.html

Virginia Institute of Marine Science – www.vims.edu/about/sustainability_at_vims/news/index.php

Numerous vendors and nurseries market FTWs for aesthetic and water quality purposes. Some of those websites include:

Floating Islands International (Biohaven) – www.floatingislandinternational.com/

Beemats LLC – www.beemats.com

Maryland Aquatic Nurseries – www.floatingwetlands.com/

This list is for information purposes only, and is not intended as an endorsement of any particular product.

Companion Virginia Cooperative Extension Publications

Gilland, T., L. Fox, M. Andruczyk, and L. Swanson. 2009. *Urban Water-Quality Management: What Is a Watershed?* VCE publication 426-041. http://pubs.ext.vt.edu/426/426-041/426-041_pdf.pdf.

Sample, D., and C.-Y. Wang. 2011. *Best Management Practices Fact Sheet 13: Constructed Wetlands.* VCE publication 426-132. http://pubs.ext.vt.edu/426/426-132/426-132_PDF.pdf.

Sample, D., et al. 2011-12. Best Management Practices Fact Sheet Series 1-15. VCE publications 426-120 through 426-134. http://pubs.ext.vt.edu/.

Acknowledgements

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References

Center for Watershed Protection. 2010. *Stormwater Management Fact Sheet: Stormwater Wetland.* The Stormwater Manager's Resource Center. Website. www.stormwatercenter.net/Assorted%20Fact%20Sheets/Tool6_Stormwater_Practices/Wetland/Wetland.htm.

Headley, T. R., and C. C. Tanner. 2012. "Constructed Wetlands With Floating Emergent Macrophytes: An Innovative Stormwater Treatment Technology." *Critical Reviews in Environmental Science and Technology* 42, 2261-2310.

Glossary of Terms

Best management practice – For urban lands refers to any treatment practice that reduces pollution from stormwater. BMPs can be either a physical structure or a management practice. A similar but different set of BMPs are used to mitigate agricultural runoff.

Biological uptake – The process by which plants absorb *nutrients* for nourishment and growth.

Detention time – See *residence time.*

Ecosystem – energy and materials cycling within a unit that include all the organisms interacting with the physical environment.

Erosion – The gradual weathering away of soil and *sediment* due to water and wind.

Floating treatment wetlands (FTWs) – Wetlands created from plants that can grow hydroponically on water surfaces. Natural FTWs float by their own means.

Habitat – The environment where organisms, like plants, normally live.

Hydroponics – The ability of a plant to uptake nutrients directly from water, also called aquaculture. Adv. *hydroponically.*

Inflow – The flow of water entering a BMP, in this case, a pond.

Invasive species – Non-native species that can cause adverse economic or ecological impacts to the environment, usually due to the tendency of these introduced species to dominate local *habitats* and replace native ecological communities.

Mesocosm – A model of a biological system that is used to focus on a limited number of variables. The biological system referred to in this fact sheet is a wet pond.

Microbial decomposition – The breakdown of compounds or organic matter into smaller one with the aid of microorganisms.

Nutrients – The substances that are required for growth of all biological organisms. When considering water quality, the nutrients of highest concern in stormwater are nitrogen and phosphorus because they are often limiting in downstream waters. Excessive amounts of these substances are pollution and can cause algal blooms and dead zones to occur in downstream waters.

Outflow – The flow of water exiting a BMP, in this case, a wet pond.

Outlet structure – Also known as control structure, structure that regulates water discharging, or *outflow* from a BMP; serves as an exit point from the BMP.

Residence time – The average time it takes water to travel through a treatment system such as a wet pond. Residence time can also be called *detention time.*

Sediment – The soil, rock, or biological material particles that are formed by weathering, decomposition, and erosion. In water environments, *sediment* is transported across a *watershed* via streams.

Stormwater – Water that originates from *impervious surfaces* during rain events, often associated with urban areas and is also called runoff.

Sustain – Enduring for a long time (see sustainable).

Sustainable – The ability of the system to endure, or *sustain*, and remain productive over a long time.

Watershed – A unit of land that drains to a single *pour point.* Boundaries are determined by water flowing from high elevations to the *pour point.* A *pour point* is the point of exit from the watershed, or where the water would flow out of the watershed if it was turned on end.

Wetland – Land that has saturated or hydric soils, or specialized wetland vegetation, and is periodically saturated with water.

Wet ponds – *Stormwater* impoundments that have a permanent pool of water used to treat water pollution. Normally has an *outlet structure* to regulate flows.