FLOATING TREATMENT WETLANDS
Cesspool of a detention basin?

Lagoon not in permit compliance?

Park needs a little more pizzazz?

Need more opportunities for public education?

Are you looking to try something new?

How About Floating Treatment Wetlands?
Floating Treatment Wetlands are a form of biomimicry:
- Buoyant, porous base structure
- Wetland plants cover surface
- Roots grow into the water

WHAT ARE FLOATING TREATMENT WETLANDS?
WHAT ARE FLOATING TREATMENT WETLANDS MADE OF?

Base Structure Composed of Non-toxic materials including:

• HDPE plastic
• Marine grade polystyrene foam
• PVC pipe

http://www.biomatrixwater.com/floating-islands/
WHAT CAN A FLOATING TREATMENT WETLAND DO?

- Provides **Aquatic and Terrestrial Habitat**
- Opportunity for **Public Education and Outreach**
- Provide **Community Benefits**
- **Retrofit** for Existing Infrastructure
- **Water Quality** Improvement

Sources:
https://www.baltimorewaterfront.com/healthy-harbor/floating-wetlands/
http://www.vitaminwatertech.com/
Spicer Group
HABITAT CREATION

Aquatic Animals
- Fish
- Turtles
- Frogs
- Macroinvertebrates

Terrestrial Animals
- Variety of Birds
- Small Mammals
- Insects

Terrestrial Plants
- Intentionally Planted Species (Example): Sedges, Blue Flag Iris, Cardinal Flower, Marsh Blazing Star, Swamp milkweed, Sweet Flag
- Unintentionally Planted Species: Invasives, Cottonwood, Asters, Grasses
Floating treatment wetlands provide teaching moment opportunities on topics such as:

- Non-point source pollution
- Low Impact Design
- Stormwater management
- Importance of wetlands

Public Education and Outreach can take place

- During Installation
- After installation with signage
COMMUNITY BENEFITS

- **Enhance** existing parks and other municipal properties
- **Improve** water quality in local water bodies
- Pride taken in islands
- **Sense of community** and team building

Take pride in your floating treatment wetland. See the growth and how it specifically helps the environment.
Unsightly, smelly detention and retention ponds

• Golf courses

• Regional detention

• Subdivision or commercial stormwater storage

• Floating treatment wetlands supplemented by pre-existing aeration systems

Lagoon and municipal applications

• Lagoon treatment systems that need more nutrient removal, especially nitrogen, to be in permit compliance.

• Potentially less O & M cost than traditional nutrient removal methods
Floating Treatment Wetlands help to reduce:

- Nutrients (P, N)
- Suspended Solids
- Organic Carbon
- Polyaromatic Hydrocarbons (PAHs)
- Metals (Cu, Zn, others)

Efficiency of Contaminant Removal Studied by:

- University of the Sunshine Coast, Queensland Australia
- Swansea University, Wales
- Brinjac Engineering, Inc., Pennsylvania
- Montana State University
- Many Others!
Water Quality is Improved by:

- Uptake of nutrients, contaminants by plants
- Microbial breakdown of nutrients, contaminants due to the microbes and their biofilms built on the roots and island substrate in the water.

More on Microbes:

- Occur naturally in water, need surface area to grow
- Lots of surface area on roots
- Root, microbes, and biofilms create community of algae, cyanobacteria, zooplankton and invertebrates called Periphyton
- Periphyton is base of most aquatic food webs and sequesters nutrients from water
HOW WATER QUALITY IS IMPROVED
EFFECTIVENESS OF WATER QUALITY IMPROVEMENT

- Following data is from academic research studies
- Important to note that effectiveness is impacted by site-specific conditions:
  - Oxygenated water
  - Anoxic water
  - Temperature
  - Percent surface coverage by floating treatment wetlands
  - Residence time
  - Water circulation
  - Chemical makeup of influent water
  - Other variables
EFFECTIVENESS OF WATER QUALITY IMPROVEMENT
STORMWATER (% COVERAGE)

• Stormwater retention pond before and after floating treatment wetland retrofitting
• 18% coverage and 9% coverage of floating treatment wetland studied
• Data is a mean over different storm events
• Study by Winston et al. (2013).
8.7% floating treatment wetland cover
The pond contained a fountain.
Several storm events compared to baseflow events
Baseflow treatment rates much higher than storm events, likely due to lower flows and higher retention times
Study by Chang et al. (2013)
EFFECTIVENESS OF WATER QUALITY IMPROVEMENT
WASTEWATER LAGOON

% Contaminant Removal in Lagoon System

Location: St. Gabriel, Louisiana
Lagoon Flow Rate: 208 gpm
Depth: 3 ft
Acreage: 5.1 acres
% Floating Treatment Wetland Coverage: 0.7%
OPERATION & MAINTENANCE

Installation O & M
- Fencing
- Goose control
- Allows for establishment of plant plugs
- Remove all excess material used for installation

First Year O & M
- Invasive species
- Plant death
- Soil settling
- Protective fencing
- Anchoring Points

After First Year O & M
- Remove fencing after 1 year
- Inspect:
  - Buoyancy
  - Excessive plant and organic litter buildup (Trim plants in late March, early April)
- Anchoring Points
- Root Depth
DEQ coordination is needed

Goal is to install inexpensively where permitting is not an issue. NO $10,000 permit effort for a $5,000 installation

Potential Permitting Paths:
- General Permit – Straightforward projects
- Full Permit – For complicated projects
GROESBECK
PARK
DRAIN

CASE STUDY

- **Location:** County Drain in Ingham County, MI
- **Landuse:** Commercial, residential, roadways
- **Floating Treatment Wetland Surface Cover:** 789 square feet, 11 wetlands total
- **Installed in 4 different detention basins** as a part of a treatment train
GENERAL WETLAND PLANTING PLAN

• Plant in groups of species (3 – 6 plugs of same species)

• Variety of species on wetland
  • Utilitarian (sedges)
  • Aesthetic/pollinators (swamp milkweed)
WETLAND PLANTS USED

- List at right ➔
- Approximately 75% survival rate for 2017 Plants
- In one year, wetlands survived:
  - Below zero temperatures
  - Over 5-year storm events
  - Soil settling

- Carex comosa – Bristly Sedge
- Iris virginica – Blue Flag Iris
- Eriochorus palustris – Great Spike Rush
- Eupatorium perfoliatum – Common Boneset
- Lobelia cardinalis – Cardinal Flower
- Juncus effusus – Common Rush
- Liatris spicata – Marsh Blazing Star
- Carex squarrosa – Narrow-Leaved Cattail Sedge
- Lobelia siphilitica – Great Blue Lobelia
- Asclepias incarnata – Swamp Milkweed
- Acorus americanus – Sweet Flag
Wetlands need to be installed where there is at least 3 feet of depth at all times.
INSTALLATION

• Two phases of installation:
  • Fall 2017 – 3 wetlands
  • Fall 2018 – 8 wetlands

• 5 – 10 people to install islands
INSPECTION TIMELINE

10/17/2017 – Launch Day

10/17/2017 – Launch Day

10/31/2017

11/29/2017

12/14/2017

5/29/2018

5/29/2018

5/29/2018

5/29/2018
6/19/2018
7/10/2018
7/31/2018
7/31/2018
9/5/2018
9/5/2018
11/02/2018
11/19/2018
2018 FLOATING TREATMENT WETLANDS
THANK YOU!

Questions?
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