SPIRIT OF THE LAND

Mirror lake water rehabilitation

Prepared for: Spirit of the land
Prepared by: Anderson Gael, Research assistant
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MIRROR LAKE WATER REHABILITATION

Abstract

What we are proposing to do is to clean a body of water using sustainable technology addressing specifically the issues of excess nutrients in the lake that cause algae blooms.

Goals

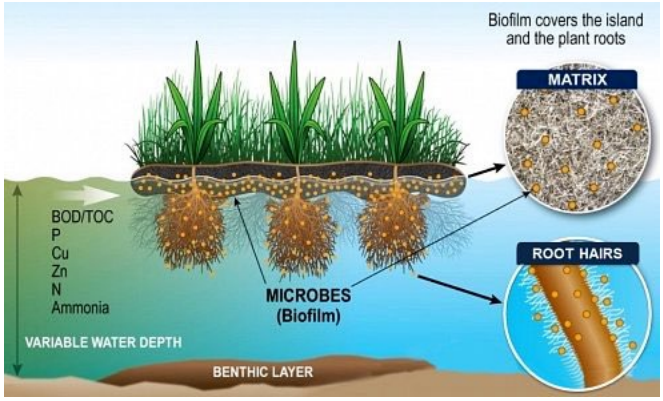
To eliminate algae blooms and help remediate the lake to a state of cleanliness. Additional goal would to help with sediment inflow.

Excess Nutrients

To clean the body of water we would use what is called a floating wetland which is “constructed of durable, non-toxic post-consumer plastics” to use plants to absorb the excess of nutrients. On the surface of the wetland is a multitude of different plants that work to absorb the excess nutrients that normally feed the algae. This, in turn, limits the algae growth due to the algae having no nutrients to grow with.

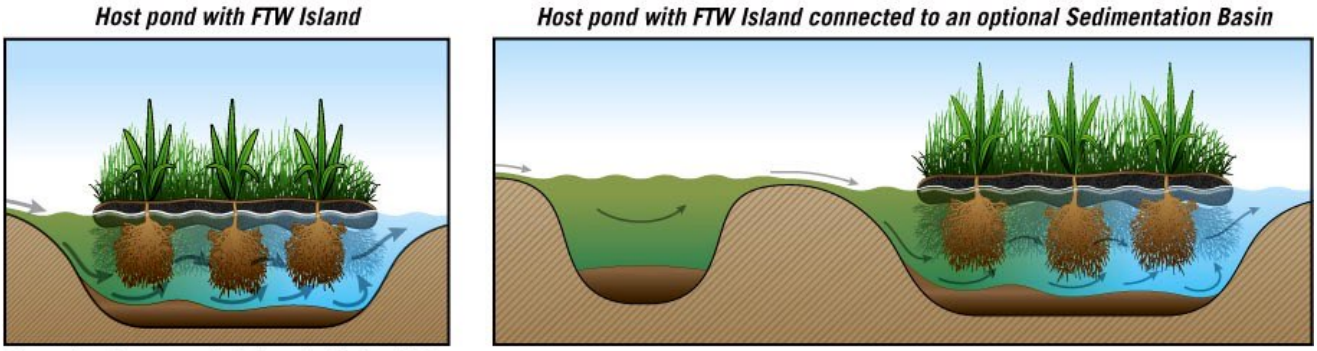
“Microbes are responsible for breaking down nutrients and other water-borne pollutants, but to be effective, they need a surface to stick to. The floating island matrix, with its dense fibers and porous texture, is the perfect surface area for growing large amounts of microbes (in the form of biofilm) in a short time. Nutrients circulating in the water come into contact with these biofilms and are consumed by them, while a smaller fraction is taken up by plant roots. Suspended solids slough off into the benthic zone below the island. Organic solids stick to the biofilms and become the base of the freshwater food web.” -Floating Island International (http://www.floatingislandinternational.com/)

Influent (left) vs. effluent (right)



Sediment inflow

A raised concern about mirror lake is the sediment inflow that is piling up year by year in the bottom of the lake. The common solution is dredging the lake but that has many negative effects including the disturbance of the ecosystem as well as disturbance of any pesticides or other inactive chemicals that can be reintroduced into the water system by digging it back up after it settling. What can be done is a building up of a sedimentation basin where all the coarse sediment would settle in an isolate location with the water then flowing over into the main section of the lake. The sediment basin can then be cleaned out occasionally without disturbing the main section of the lake itself.



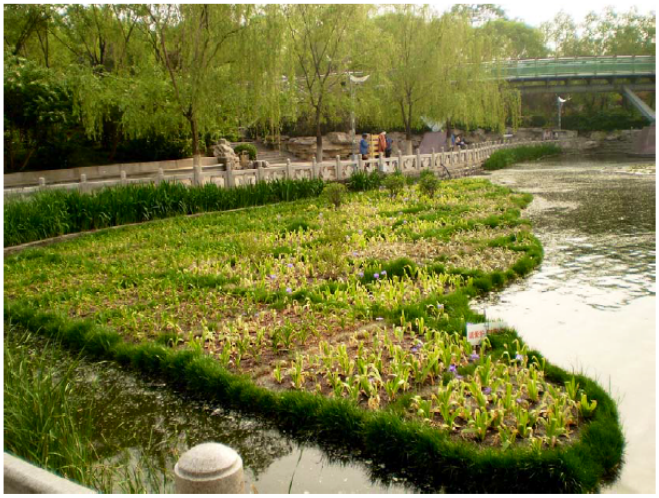
The two key factors to mimicking the Wetland Effect are circulation and surface area, both of which are eco-orchestrated with BioHaven FTWs.

OPTIONAL SEDIMENTATION BASIN
(coarse sediment removal)

FLOATING TREATMENT WETLAND
(removal of fine particulates, metals, denitrification)

Beautification

Rehabilitating water often has a negative effect on the look and beauty of the body of water that is being rehabilitated. This is not true of floating wetlands which can be made to custom sizes and shapes with a myriad of different plants not limited to reeds.



Project Outline

Some of the ground work has been done on this project in regards to the preliminary research into what can be done to help with the problems described above but the steps that are to be taken are as follows

- Get city approval for the project.
- Form a comity that includes like-minded organizations and representatives to include and educational aspect for the community and schools (we have already spoken with the Battle River Watershed Alliance, who would do water testing for us, and have had a number of teachers express interest in bringing out students to learn about water purification, etc.)
- Apply for grants.
- Contact Vita water technology to begin consultation.
- We would then plan the details of the project with vita so that we would be ready to implement it when the water thaws. This planning process would include nailing down details such as which plants would be best to use, determine the locations within the lake, and come up with blue prints for the floating wetlands.
- In the early spring we would purchase materials and plants and start construction and placement of the floating wetlands.
- From that point on, we would simply continue testing the water and watching the results, and of course adjusting as needed.

BUDGET

Budget for the project

So far the budget is slightly unknown as we need to gain approval for the project before we start the consultation process.

Description	Quantity	Unit Price	Cost
Consultation with Vita (Refundable when technology is acquired)	1	$ 950	$ 950
BioHaven® Floating Island	?	$25-30	
Plants			
Total			

Private Grants

There are many grants in which we can apply for here below are a few listed that would work for our project:

- The Co-Op Community Spaces (http://crs.coopconnection.ca/communityspaces.html)
- TD Friends of the Environment (https://fef.td.com/funding/)
- Camrose Daybreak Rotary Grant (http://camrosedaybreakrotary.org/)
- Camrose Thrift Store Grant (call (780) 672-5027)
- Battle River Community Foundation (http://www.brcf.ca/applying_for_grants.html)
- Alberta Ecotrust Foundation (http://albertaecotrust.com/current-grants/)
- RBC Foundation (http://www.rbc.com/community-sustainability/environment/rbc-blue-water/index.html)

Federal/Provincial Grants

- EcoAction Community Funding Program (Federal) (https://www.ec.gc.ca/ecoaction/)
- Community Initiatives Program/Other Initiatives Program (Provincial) (http://www.culture.alberta.ca/community/community-grants/community-initiatives-program/)

Contacts

WHO: Malcolm Boyd
WHY: City manager
CONTACT: admin@camrose.ca or 780.678.3027

WHO: Jeremy Enarson
WHY: City Engineer
CONTACT: engineer@camrose.ca or 780.672.4428

WHO: Sean Mascaluk
WHY: Public Works
CONTACT: pw@camrose.ca or 780.672.5513

WHO: Steve Schultz
WHY: is a teacher in Lacombe who does aquaponics with his students. We could ask him about some of his curriculum in order to see if we could apply similar curriculum for students to become involved with the Mirror Lake Project.
CONTACT: steven.schultz@wolfcreek.ab.ca

Previous research

Installation Data

Location	Yingri Lake, Jinan, China
Parameters Studied	Chemical oxygen demand (COD), biochemical oxygen demand (BOD), total nitrogen, total phosphorus, dissolved oxygen (DO)
Environment	Lake in public park
FTW Size	Total area for five islands of 7000 ft^2 (660 m^2); total thickness of 10 inches (25 cm)
Installation Date	4-19-10
Flow Rate	Non-circulating
Water Body Depth	Average of 4 ft (1.2 m)
Water Body Area	108,000 ft^2 or 2.5 acres (10,000 m^2)
% Coverage	6.6% of lake covered by FTW
Species Planted	Iris, yellow flower iris, day lily, Greek Jacob's ladder, holly trees, ligustrum vicaryi, hosta sieboldiana, canna; some of these terrestrial plants were later replaced with aquatic plants
Funding Agency	Gardening Bureau of Jinan City

Installation Data

Operational Data

Average O&M Costs (Labor, Materials)	1 hour/week; no materials
Training Required to Operate	1-day training seminar
Anticipated Lifespan	At least 10 years

Results

Parameter	Before FTW Installation (July 2009)	After FTW Installation (July 2010)	Reduction
COD (mg/L)	63	30	52%
BOD (mg/L)	20	11	45%
Total nitrogen (mg/L)	11	3.9	65%
Total phosphorus (mg/L)	0.93	0.10	89%
DO (mg/L)	12.1	6.0	50%

Yingri Lake has typically experienced a severe algae bloom every spring; however, no algae bloom was seen in 2010 after the FTW installation in April.

Conclusions

- Large reductions in COD, BOD, total nitrogen and total phosphorus were measured within three months after FTW installation, which met the project objectives.
- The islands are aesthetically pleasing.
- It is unclear why dissolved oxygen concentrations decreased; however, the primary related goal of reducing algae blooms appears to have been achieved.