William McDonough | Oberlin, Ohio

Case Study 2
Adam Joseph Lewis Center

Buck | Dorendorf | Fuhre

Building Description | Location

Oberlin is a city in Lorain County, Ohio to the South and West of Cleveland. Oberlin is home of Oberlin College, a liberal arts college and music conservatory with approximately 3,000 students.

Lat/ Lon: 41.29 degrees N ; 82.22 degrees W
Elevation: 814 feet
Land Area: 4.4 sq. miles

Population: 8,292 (2011)
Rainfall: 36.23" average per year

Building Description

- 13,600 square feet

-Program:
- -Classrooms
- -Offices
- -Atrium
- -Auditorium

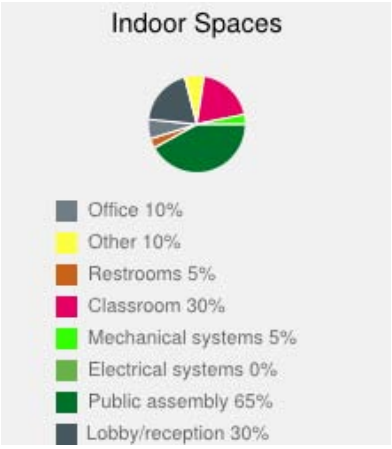
-Building operates on three fundamental principles:
1. Eliminate the concept of waste
2. Rely on natural energy flows
3. Honor diversity

-Distinction between indoors and out is blurred

-Daylighting and natural ventilation in atrium

-2006-site became a net energy exporter- producing 30 percent more energy than it needs

Building Description



OCCUPANCY

Typical Number of Permanent Occupants:	80
Owner Occupied:	Yes
Owner Type:	Corporation, nonprofit
Average Hours Per Permanent Occupant:	60
Details About Occupancy:	A variety of courses both within and outside the Environmental Studies program are taught in the Center's classrooms and auditorium. The building is also used regularly for guest lectures, presentations, banquets, student organization meetings, Quaker meetings, informal gatherings, and study space. Occupancy estimate assumes three classrooms at 25 students for 5 hours per weekday plus use of offices, resource center, auditorium and atrium. Summer use is usually restricted to 10 people for 40 hours per week.

Building Water Use Scheme

-Water Conservation Education
  -Educate building management and employees about water conservation

-Landscape Plantings
  -Landscape with indigenous vegetation
  -Landscape with edible plants
  -Minimize turf area

-Managing Stormwater
  -Design a constructed wetland for pollutant removal from stormwater

-Wastewater and Graywater Recycling
  -Plumb building to accommodate graywater separation

Water-use Estimate

	# of people	Gallons per day	Total GPD
Staff:	80	20	1600
Students:	75	20	1500
			Total: 3,100

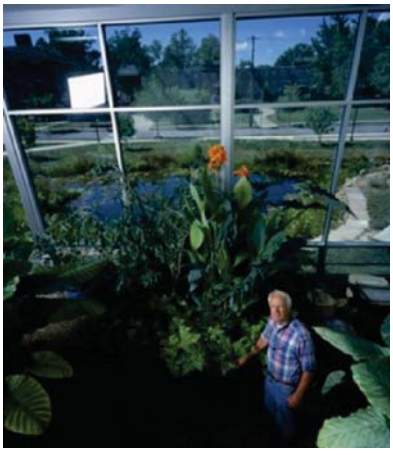
Water Collection

-Inside the Lewis Center, a "Living Machine" collects and treats all wastewater from the bathrooms and kitchen

-Housed in a greenhouse abutting the atrium, the Living Machine combines conventional wastewater treatment technology with purification processes of a natural wetland ecosystem to remove organic wastes, nutrients, and pathogens from wastewater.

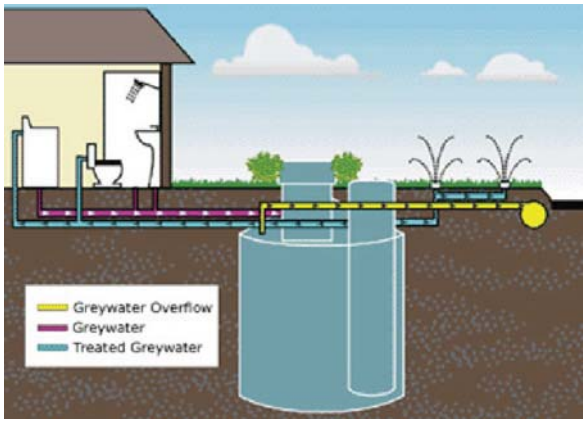
-The use of the gray water produced by the Living Machine also keeps the Center's water needs to a minimum.

-http://www.livingmachines.com/Animation.aspx



Water Collection

-The resulting graywater then returns to the toilets and urinals for reuse and may eventually also be used to supplement on-site irrigation.



-Majority of water used is for toilet flush water, which is 100 percent recycled.

-Water cycles through the building continuously as it is used, treated and reused.

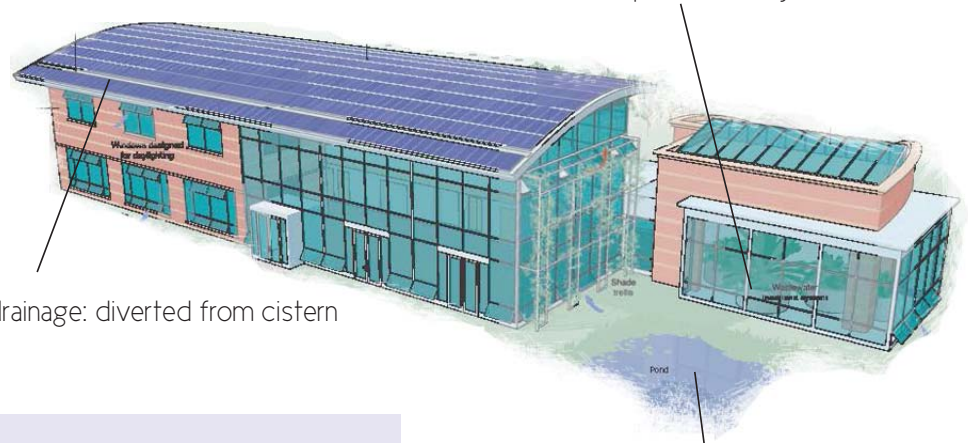
-City water is principally used for hand washing and drinking water.

-Median annual rates for internal water recycling are near 90 .

-http://www.livingmachines.com/Animation.aspx

Water Retention

Living Machine: organic water purification system



Roof drainage: diverted from cistern

Pond: The key function of the pond is water storage for irrigation

* Average monthly rainfall = 36.23"

Water Retention

-The on-site wetland, in conjunction with a **9,700 gallon cistern**, serves as a storm water retention basin, as filtering storm water runoff.

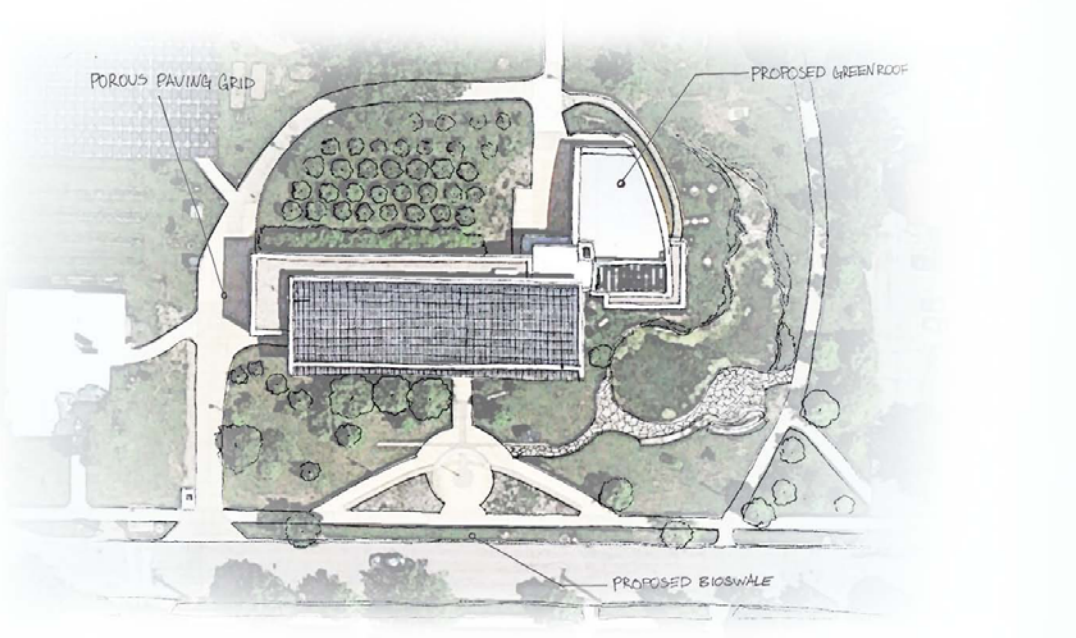
-Wetlands once comprised 90 percent of the north-central Ohio landscape, only 10 percent of those wetlands remain today.

-A constructed wetland and surrounding meadow ecosystem wrapping around the southeast corner of the building. The wetland and connected **7,500 gallon storage cistern** collect stormwater and retain it on -site, lowering demand on Oberlin's often-overwhelmed stormwater and sewage collection system.

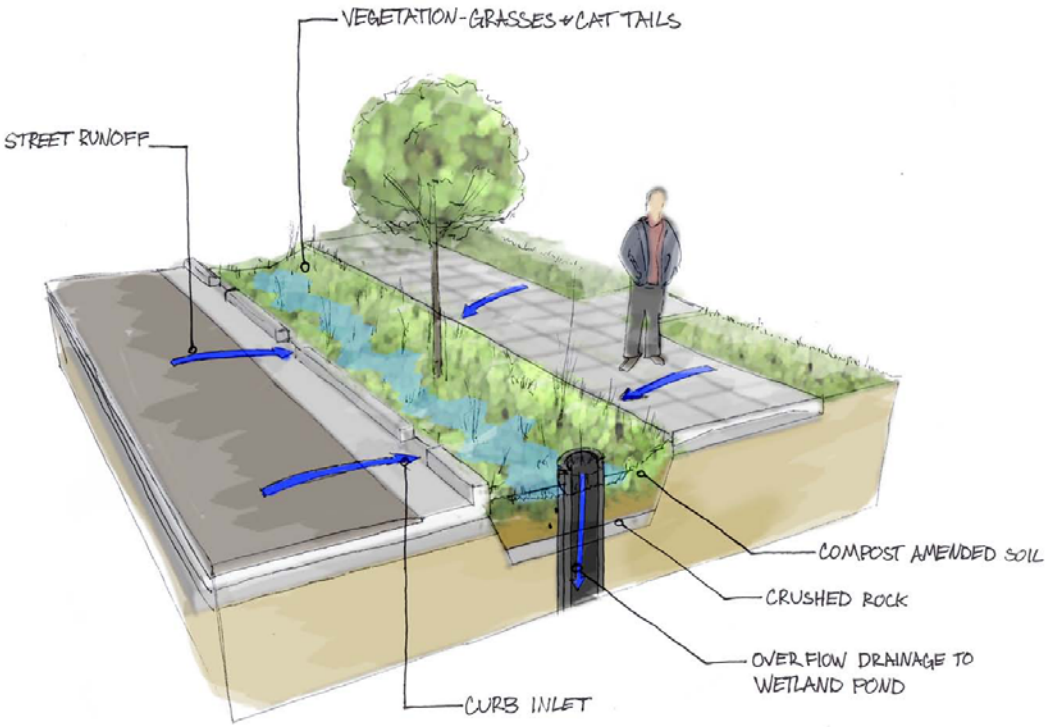
-Once mature, the wetland will irrigate the site's grasses, gardens and orchard.

How water use scheme can be improved.....

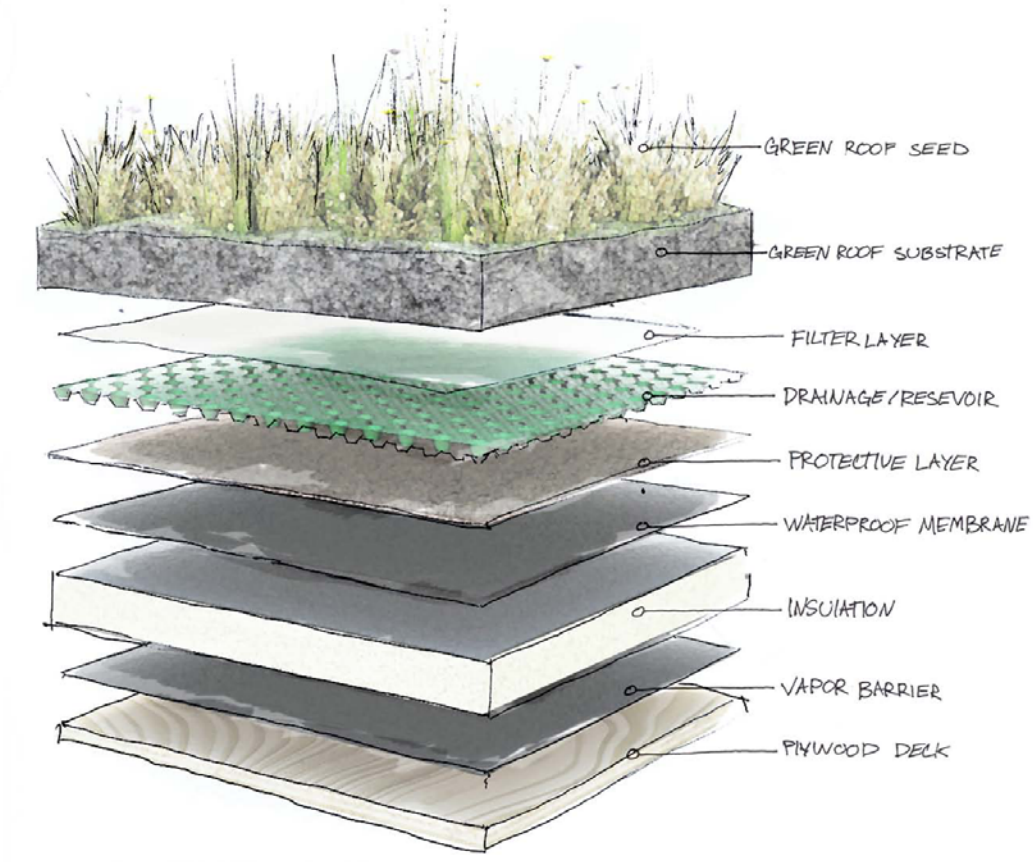
Bioswale along the street edge to capture stormwater run off from the road
Green roof over the living machine to capture more stormwater
Porous BodPave gravel driving surface to reduce stormwater sent to sewer



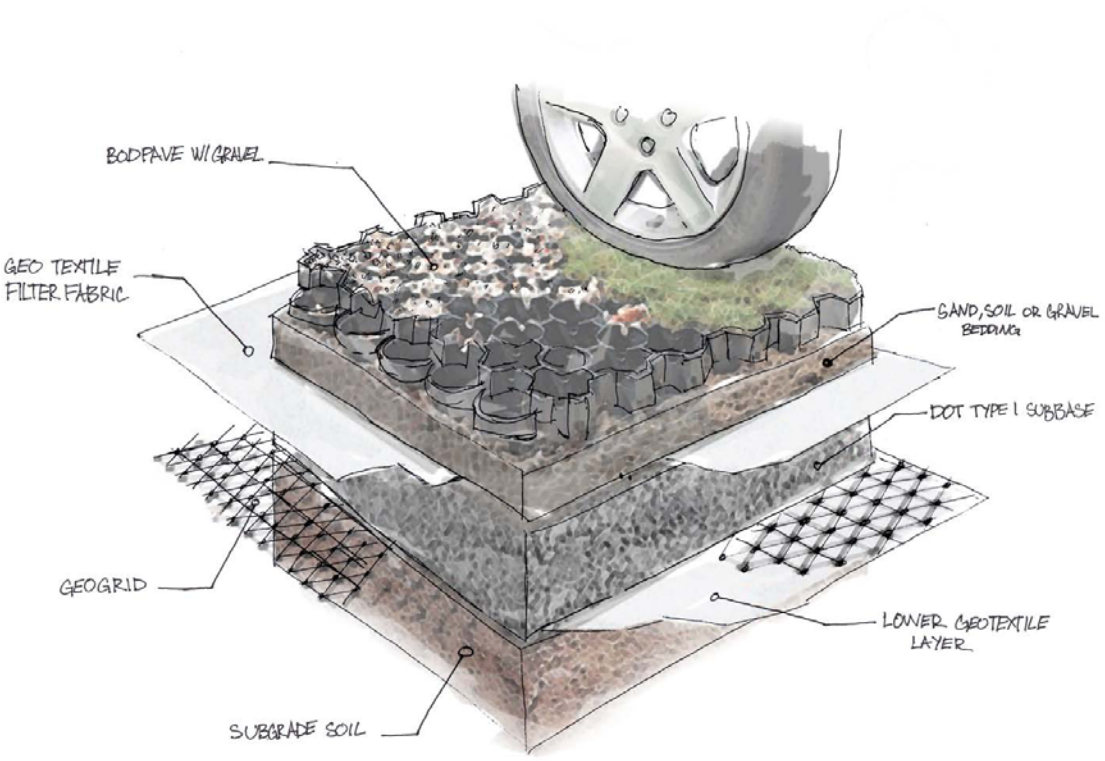
PROPOSED BIOSWALE



PROPOSED GREENROOF



PROPOSED POROUS SURFACES



CONCLUSION

Because this site already takes advantage of efficient grey water toilets, cisterns, stormwater collection, and a living machine the best way to improve it would be to create a bioswale along the road to collect street runoff, change the driveway to a porous path, and place a green roof on top of the living machine to capture additional run off not captured by the sistern.

Bioswale will divert 987,000 gallons of runoff anually

(road surface 200' x 22') = 4400 sq ft x (36" of rain annually/12" per ft) =132000 x 7.82 gallons per cubic ft

Green roof will capture an additional 18,700 gallons of stormwater

(roof surface 40' x 20') = 800 sq ft x (36" of rain annually/12" per ft) = 2400 x 7.82 gallons per cubic ft

Permeable driveway will divert 37,500 gallons of stormwater annually

(driveway surface 80' x 20') = 1600 sq ft x (36" of rain annually/12" per ft) = 4800 x 7.82 gallons per cubic ft