Green Infrastructure & Stormwater Management CASE STUDY

The Morton Arboretum, Meadow Lake & Main Parking Lot

Location: Lisle, IL
Client: The Morton Arboretum
Design Firm(s): The Morton Arboretum Staff, Conservation Design Forum, MWH, CB Burke Eng. West, Ltd
Landscape architect/Project contact: Susan Jacobson, FASLA
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ASLA Chapter: Illinois

Project Specifications

Project Description: This site includes two projects which were completed on The Morton Arboretum grounds and are adjacent. The first is the Meadow Lake Restoration project. Meadow Lake entered the Illinois Clean Lakes Program in 1998. A Phase I diagnostic-feasibility study was completed in 2001, recommending stabilizing lake surface fluctuations and reducing phosphorus loads from ground water and waterfowl. Implementation of these recommendations began in 2003 and were completed in 2005 and include:

1. A slurry cutoff wall to mitigate seasonal lake level fluctuations and groundwater flows;
2. the lake was drained and reshaped and a 4” deep 10’ wide geoweb was installed at the normal water elevation
3. a new outlet, weir and flapgate were installed to stabilize the lake level;
4. a diversion structure was built at Crabapple Lake allowing for diversion of nutrient poor water from that lake to Meadow Lake when additional water is needed to maintain the water level; and
5. the lake shore was re-graded, soils were amended, and over 68,000 plants were established.

The second project is the Main Parking Lot project. This 'green' parking lot adjacent to the visitor center and Meadow Lake incorporates best management practices for managing stormwater impacts and nonpoint source water pollution. The surface is composed of a permeable interlocking concrete paver system. Below the paver system is a four foot deep gravel bed that stores stormwater and slows its progress through the watershed. Water is also collected in bioswales along the parking lot aisles. Plants within the bioswales filter

contaminates in the water biologically, assisted by mechanical filtering on the gravel bed under the parking lot. The cleaner and slower moving water enters a Meadow Lake and eventually the East Branch of the Dupage River. A $1.2 million EPA grant provided partial support for this construction project. Completed in 2004 the renovated parking lot holds 500 cars and 11 buses.

Project Type:
Open space - garden/arboretum
Part of a redevelopment project

Design features: Bioswale, porous pavers, and curb cuts. Other features include: pervious pavement material appropriate to our climate easily maintained long life cycle, gravel drainage layer beneath pavement to store and slow run-off while trapping heavy solids, vegetated biofiltration swales to gather and clean stormwater and reduce particulate matter, curb cuts to direct surface run-off into swales, level spreaders to slow run-off before it is released into lake, wetlands to clean stormwater then release it into the lake, and irrigation of parking lot vegetation from existing lake.

This project was designed to meet the following specific requirements or mandates:
County ordinance, developer/client preference

Impervious area managed: 1 acre to 5 acres

Amount of existing green space/open space conserved or preserved for managing stormwater on site: greater than 5 acres

The regulatory environment and regulator was supportive of the project.

Did the client request that other factors be considered, such as energy savings, usable green space, or property value enhancements? Yes to all of the above.

Cost & Jobs Analysis

Estimated Cost of Stormwater Project: $1,000,000-$5,000,000 (Public funding: Federal, state)

Was a green vs. grey cost analysis performed? No some partial analysis was done, see comment under #13.

Cost impact of conserving green/open space to the overall costs of the site design/development project: Conserving and protecting green space is part of our mission.

Cost impact of conserving green/open space for stormwater management over traditional site design/site development approaches (grey infrastructure)? Slightly reduced costs (1-9% savings).

Pervious Pavement vs. Asphalt

- Higher installation cost (1.7 times) // Lower installation cost the cost of asphalt)
- Non-toxic // Toxic
- Slows down/ absorbs run-off // All water runs off
- Water is cleaner when it leaves the system // Water has more contaminants system when it leaves the system
- Maintenance cost estimated to be $1,245/yr over 50 yrs // to be $26,390/yr over 50 yrs (21.2 times the cost of pervious)
- Life span of approx. 50 yrs // Life span of approx. 15 yrs
- 25% cheaper than asphalt
- 50-year maintenance cost $62,250 // 50-year maintenance cost $1,319,500

Number of jobs created: Not available

Job hours devoted to project:

Planning and Design: Not available
Construction: 2 year construction project
Annual Maintenance: Not available

Performance Measures

Stormwater reduction performance analysis:
Meadow Lake By The Numbers

- Before 4.5 surface acres @ normal water level; now 5.2 surface acres
- 21,000 cubic yards of sediment and more than 30,000 cubic yards of excess material were excavated and hauled to the new Crabapple Lake Berm
- Normal water level was 664.9; now 666.25 (1.35' higher than previous)
- Before max. depth was 11' & avg. depth 6'; now max. depth is 13'& avg. depth is 8'
- Approximately 68,300 plants installed, 223 trees and shrubs
- 14 memorial benches were removed prior to construction, reconditioned, and reinstalled as closely as possible to their original positions; 4 backless benches were salvaged from the former Visitor Center Courtyard and reinstalled at the stone steps
- Trail is .8 mile long
- Cost of restoration = $ 3.4M

Community & economic benefits that have resulted from the project: These two projects are comprised of approximately 26 acres of the 1,700-acre arboretum. These projects showcase The Morton Arboretum's commitment to sustainable design and construction while reinforcing the mission and vision of the arboretum. We have over 850,00 visitors per year. Established in 1922, The Morton Arboretum's mission is: to collect and study trees, shrubs and

other plants from around the world, to display them across naturally beautiful landscapes for people to study and enjoy, and to learn how to grow them in ways that enhance our environment. Our goal is to encourage the planting and conservation of trees and other plants for a greener, healthier more beautiful world.

Project Recognition

Entire Arboretum received an ASLA Centennial Medallion in 1999; IL Engineering Council-Outstanding Engineering Achievement Award; The Conservation Foundation-Award for Protecting the Environment & DuPage River Watershed

Additional Information

Links to images: Call or email request for images, we have a ppt. presentation on the construction process.

Both projects are showcased in our main visitor area and provide an educational opportunity to all who visit. The parking lot has interpretive panels explaining the storm water benefits and Meadow Lake has a paved accessible walkway around it with benches, interpretive signage and plant display labels. The plantings were selected for the appropriate moisture gradient, and provide submergent, emergent and wet mesic plant zones. The planting plan shows interlocking drifts of 1 to 4 species with combinations to provide color and texture throughout the growing season. The Phase II lake monitoring was begun in 2005 and comparisons have been made to the pre-construction Phase I data. The data clearly supports the intended purpose of this project to greatly improve water quality.