



from problem to opportunity

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Restored wetland becomes the focal point of the new Chinese Garden at the Minnesota Landscape Arboretum

by John Hink



Japanese gardens are elaborate and formal, inviting visitors to contemplate the landscape architect’s vision of idealized, perfected beauty in an orderly, calm setting designed for reflection. The Japanese garden “Seisui Tei” (Garden of Pure Water) at the University of Minnesota Landscape Arboretum is one of the most renowned in North America. Much less common in the United States, Chinese gardens function more like parks to be discovered than gardens to be admired. Combining natural and built landscape features, and always including a path, a Chinese garden invites visitors to walk through, discover naturalistic beauty, and immerse themselves in its tranquility. The Arboretum has long envisioned adding a Chinese garden and set a bold vision to create one as a key element in its 2012 master plan.

The first phase of the Hsiao-Ho Chinese Garden, only the seventh to be developed in the United States, was completed in November 2015. Making progress on realizing the Arboretum’s vision for the garden required resolution of wetland mitigation requirements and challenges.

Problem or Opportunity?

The preferred site for the Hsiao-Ho Chinese Garden was along the Three Mile Drive, in part because it would provide convenient ADA access not only to the new garden, but also to existing collections of larch, willow, elm and hydrangea plants. Solution Blue Inc. and Damon Farber Associates undertook a pre-design study to determine the appropriate location and access for the garden on the Three Mile Drive. To arrive at a specific recommended location, and to develop a design concept for the garden on the site, we incorporated input from the Arboretum, several departments at the University of Minnesota, Carver County, the U.S. Army Corps of

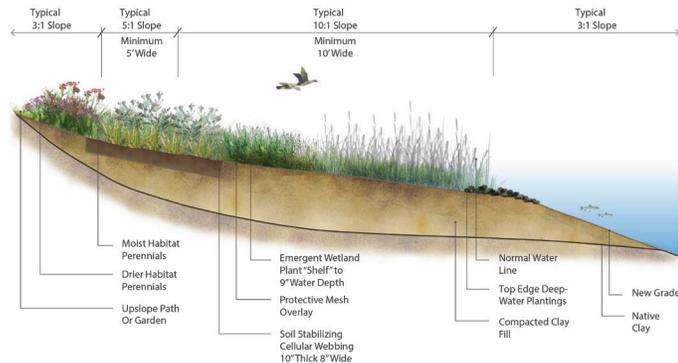
Engineers, and the Minnesota Board of Water and Soil Resources (BWSR).

Developing the garden on the selected site disturbed 61,500 square feet of a Class 3 wetland. Based on the standard 2.5:1 replacement rule, the Arboretum would have been required to mitigate the disturbance by adding 153,750 square feet of a comparable wetland. The project could have complied by either establishing new Class 3 wetlands (and sites on the Arboretum property were identified for this purpose) or by purchasing credits through a wetland bank to offset the disturbance.

Either option would have cost approximately \$140,000 (funding that was not in the budget).

As the project team, we challenged ourselves from the start. Could we consider wetland mitigation in a creative way? Could it be more than a regulatory requirement to meet, but a landscape design opportunity we could tap to the project's advantage?

Class 3 wetlands are low quality with low diversity. What if instead of adding more similar low-quality wetlands at some other location at the standard 2.5:1 ratio, our project team could improve the existing wetland on the project site and integrate it as a landscape feature in the new garden? The U.S. Army Corps of Engineers approved our plan to establish 46,600 square feet of Class 1 wetlands within the garden. Since Class 1 wetlands are high integrity and high diversity, the regulators agreed to a 0.75:1 mitigation rate.



Shoreline habitat enhancement section.



Installation of cellular confinement and natural fiber mat. Photo Credit: Erik Lemke

Improving Rather than Mitigating

When completed, the Hsiao-Ho Chinese Garden will encompass a total of 105,000 square feet (2.4 acres). Our plan creates 46,600 square feet of Class 1 wetland within the garden comprised of a 28,600 square foot pond and 18,000 square feet of enhanced shoreline, established with native wetland vegetation. The shoreline includes three habitats: 6,500 square feet of emergent

wetland, 3,500 square feet of deep-water plantings, and 8,000 square feet of wet meadow. The pond offers wildlife habitat for waterfowl, frogs, and other birds and animals.

To enhance the wetland site area, the first step was scraping portions of the existing degraded shallow marsh, which consisted of non-native cattail species. Marshes dominated by non-native cattails are low quality because they form dense single-species stands with few or no openings, resulting in low biological diversity. Best management practices for the scraping maintained the optimal amount of organic substrate. The pond was dredged and created by installing a weir at the southwest outlet of the wetland. The edges of the pond were graded to allow for future installation of a path that will create a loop around the pond as well as several bridges, buildings and a classic Chinese Moon Gate that are planned for subsequent phases of the garden's development. The reinforced concrete weir is 40 feet in length and 8 feet in height and built on a foundation supported by helical piers. The pond ranges from 0 to 5 feet in depth. A sliding gate on the weir controls the water level. It allows the Arboretum to better control invasive species by drawing down the pond level when necessary. With the unique design of its gate control, the gate opens downward, so the water level is lowered from the surface. Arboretum maintenance staff can skim the top of the pond in very precise increments without draining it too much.

We reinforced the enhanced shoreline with three geotextile components to protect the plantings and amplify the sculptural slopes. A cellular confinement product, constructed from polyethylene with 8x10-inch expandable cells, was placed 4.5 feet above and below the typical water level. Placed parallel to the shoreline, it helps prevent degradation of the slopes during water height fluctuations. The cellular confinement was filled with a root zone mix consisting of 80 percent sand and 20 percent organic matter. As the plants mature, the cellular confinement webs together with the roots to form a rugged barrier against wave erosion.

Farther down the slope, a woven bristle coir mat reinforces the plants. This mat protects the roots and crowns of the shallow water plantings. It also provides firmer footing for the maintenance staff as they step along the softer soils.

Finally, small interlocking, three-dimensional polyethylene mesh elements to reinforce the turf on the island were intermixed within the top six inches of the 80/20 soil mix on the top surface of the island - a featured landscape element in the pond. The design of the island creates a dramatic sculptural bulbous effect representative of a steep mountain. The mesh supports the steep 2:1 slopes and helps resist water erosion.

There are three primary plant communities: shallow marsh, wet meadow and deep-water. The shallow marsh, which has standing water, features emergent plants, such as arrowhead, water plantain, softstem bulrush, hardstem bulrush, lake sedge, and tussock sedge. These aggressive native plants can hold their own against cattails. The wet meadow, which has saturated soils but seldom has standing water, includes a variety of species such as prairie cord grass, fox sedge, tussock sedge, blue flag iris, swamp milkweed, cup plant, and blue vervain. Plant installation in this area consisted of both seeding and planting live plants as plugs. Under the supervision of Tom Brinda, University of Minnesota Landscape Arboretum Horticulture Manager, the project team worked with Wetland Habitat Restoration to propagate



Wetland planting. Photo Credit: John Hink

strong-rooted plugs. It was important for the plugs to have well developed roots in order to support quick establishment and resistance to invasive species.

Finally, the deep-water plantings were established with large groupings of white water lily, yellow water lily, and wsago pondweed placed at strategic locations. In Chinese culture, water lilies represent perfection and symbolize ultimate purity of the heart and mind, because they rise untainted and beautiful from the mud. The two varieties of water lilies were chosen because they are proven to thrive in shallow ponds and are particularly cold climate tolerant.

Essential Results

Our design makes the restored, improved wetland and enhanced shoreline edge the central focus of the Hsiao-Ho Chinese Garden. The pond, carved out from the existing degraded wetland, provides vistas of open water and island while improving the ecological function of the site.

Our team took advantage of the variety of textures and colors of the numerous wetland species that were introduced. The shoreline was planned and planted as a semi-formal landscape. The plantings were laid out by height, differences in foliage, shape and color, and variations in bloom times. The result is a restored and landscaped wetland with the naturalistic beauty characteristic of a Chinese garden.

Removal of the cattails and replacement with native plants results in greater plant diversity, as well as improved wildlife habitat. Establishment of wildflowers, including blue flag iris and swamp milkweed, creates new habitat for pollinators. Plants such as arrowhead provide food sources for waterfowl, and seed producing grasses, for example, prairie cord grass, serve as a food source for birds.

The solution our project team developed and implemented for the Arboretum cost \$40,000. While saving \$100,000 compared to the cost of conventional mitigation practices, we achieved compliance with wetland mitigation regulatory rules, restored healthy

ecological function to the site, and created a naturalistic landscape feature that not only integrates with and complements the garden, but also provides a focal point fitting for a Chinese garden.

Lessons Learned

Landscape architects usually view wetland mitigation requirements resulting from their site development plans and landscape designs to be problems for engineers to solve outside the spaces they are creating. Wetland mitigation does not have to be just a problem to solve or an obstacle to overcome, but an opportunity to incorporate improved wetlands that function both ecologically and aesthetically as integrated elements within a landscape design. With environmentally sensitive landscape strategies, landscape architects can attain regulatory compliance, ecological function and aesthetic appeal.

In the design and development of the Hsiao-Ho Chinese Garden, our team identified an opportunity to create a high integrity, high diversity wetland with an ecologically balanced pond and enhanced shoreline with three diverse habitats within the garden site. We not only enhanced an existing degraded wetland, we demonstrated that it is feasible and affordable to sensitively transform one into a Class 1 wetland that is ecologically successful, attractive, inviting and useful for our communities.●



John Hink, President and Co-founder of Solution Blue, is an innovative and passionate environmental engineer with 22 years of experience in sustainable site design, brownfield re-development, water resources, and construction administration.

Acknowledgements: The author thanks Lance Schuer, Landscape Architect at Damon Farber Associates, Randal Tweden, Civil Engineer at Solution Blue, Inc. and Tom Brinda, Horticulture Manager at U of M Landscape Arboretum for their project support and David Aquilina, Strategic Storyteller, for his assistance in preparing the article.