LANDSCAPE PERFORMANCE SERIES

63rd Street Beach, Jackson Park – Chicago, IL
Methodology for Landscape Performance Benefits

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Environmental

Provides habitat for over 200 species of birds, including ducks, owls, raptors, and several scarce species of migratory sparrows. Endangered or threatened species sighted include the Black-crowned Night Heron, Least Bittern, Piping Plover, and Snowy Owl. The dune habitat is now a regular nesting area for Spotted Sandpipers, a strong indication of the success of the habitat management.

Bird species records were provided via Mitch Murdoch of the Chicago Park District (CPD) on June 21, 2013 through a document titled "BIRDS RECORDED FROM THE 64TH ST. BEACH, CHICAGO Compiled by Paul R. Clyne, June 2008". Zhanna Yermakov (CPD) confirmed that this document is incorrectly titled and should read "63rd STREET BEACH". This important 2008 record was made by Paul Clyne, who has 30 years of birding experience in the project area. He makes notes of 218 species that he identified in the project area, six (6) species of which were cited in the area during the 1980s and 1900s. It does not indicate the total number of species during those years or leading up to 2004 (construction completion) or 2008 (observation period).

For context, Chicago is currently "home" to over 300 species of birds, 50 of which may be called 'native' to Chicago. It is the presence and number of species (*both* migratory and native) that are the indicator of the health of the Chicago ecosystem. The Chicago Birds Agenda 2006[1] offers more detailed information on this topic.

A phone interview conversation with Paul Clyne on July 17, 2013, revealed that the project area improvements, both the 2004 and the 2010 scopes of work, have contributed to:

- … a regular habitat for t he Spotted sandpiper, where previously it was only occasionally seen within Jackson Park (located to the west side of Lake Shore Drive). Previous sightings of this species date to the 1950's.
- … an increase of migratory sparrows in the project area. The conversion of Northerly Island (a peninsula north of the 63rd Street Beach) from a private airstrip to open space, was previously pulling sparrows from Jackson Park to Northerly Island, but now they are well-sighted within the 63rd Street Beach area.

Mr. Clyne added that migratory patterns for birds along the Mississippi/Chicago flyway reach the lake, and upon reading the lake as a large "ocean", begin to fly south along its shore. The restored beach area

[1] The report can be accessed via: http://www.cityofchicago.org/dam/city/depts/doe/general/NaturalResourcesAndWaterConservation_PDFs/Birds/ChicagosBirdAgenda2006_1.pdf

is highly visible for south-facing birds and has attracted great numbers of birds to this site, particularly diurnal migrants. The dune grassland is particularly useful, as such habitats are rare in the Chicago area, since a variety of grassland songbird species that had shown significant declines due to loss of breeding habitat.

While several endangered species have been seen at the 63rd Street Beach, many of the bird species that live in this habitat during the breeding season are some of the most common and adaptable species. According to Mr. Clyne, "What makes Chicago's lakefront parks remarkable is the truly vital role they play for migrants [birds]". Research on bird species in Chicago indicates that upward of 300 species migrate through the Chicago area as part of the Mississippi Flyway, making it one of the most unique regions for birds in the central United States. 63rd Street Beach is an important location for concentrated habitat enhancement connecting other "landing spots" along the two-block wide lakeshore, which serves as a critical habitat corridor for a highly unusual concentration of migrating species.

However, Mr. Clyne did suggest that, compared to other more protected beaches in Chicago, the 63rd Beach would always be somewhat ecologically limited due to allocating so much space to human use, which will always disturb certain bird species. In particular bringing dogs to beaches and jogging activities are disruptive. The bird pest control program (the use of dogs to chase away gulls) undertaken by the Park District to improve water quality at the 63rd Street Beach has also scared away a significant number of other species of birds during the migrating season, according to Mr. Clyne.

Sources:
Clyne, Paul R. BIRDS RECORDED FROM THE 64TH ST. BEACH, CHICAGO Compiled by Paul R. Clyne, June 2008. Print.

Reduces sand erosion by nearly 100% by implementing two phases of beachside planting to create a stable native dune grassland system. (2004 and 2010 Restorations)

Discussions with the landscape architect and the Chicago Park District vary somewhat in attributing project areas to controlling beach erosion and underpass clearance for pedestrians. Through research and interviews, we determined that both planting installations (2004 and 2010) have contributed to the successful performance of the beach project, and therefore both together, impede sand drift and erosion.

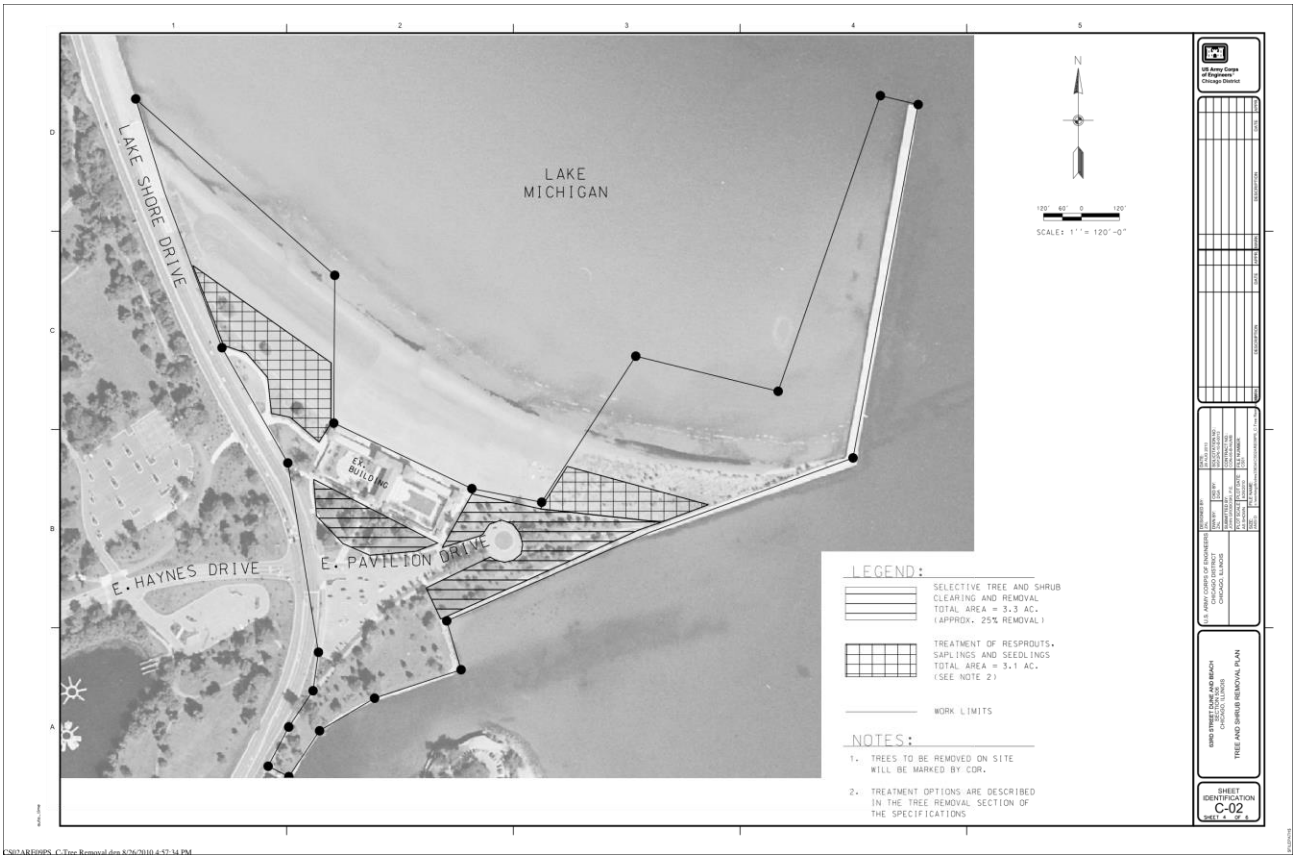
Very common to the beachfront environment along Lake Michigan, sand blows across roadways and pathways, impeding pedestrian movement and requires cleanup along both pathways and roadways. Following the first installation of grassland planting in 2004 in the west dune (0.7 acre) and southwest dune (0.69 acres), but before the planting was fully established, critique was leveled at the project for not performing. However, subsequent additional planting following initial installation helped prevent this drift, and site observation during summer 2013 shows a fully functioning erosion control for the Phase 1 area (west and southwest dune leading to the underpass) of the project. Almost no sand is visible on walkways except for where a single informal path through the grassland enters the concrete sidewalk.

Site visits occurred on 5/16/2013, 5/23/13 6/21/13, 7/14/13, which included lengthy site observation and plant cataloging, as well as discussions with Mitch Murdock (Chicago Park District) on 6/21/13 and Zhanna Yermakov (Chicago Park District) on 7/16/13. These methods and interviews confirmed that sand erosion at this site is almost completely controlled. It should be noted that other beach sites (North Avenue Beach and 57th Street Beach in particular) exhibited more sand drift onto the lakefront recreation trail, which have fewer grassland plantings between sand beach areas and the pedestrian path (as observed when biking from Belmont Avenue to 63rd Street on 5/16/2013, 5/23/13, and 7/14/13).

In August 26, 2010, the U.S. Army Corps of Engineers issued the solicitation: 63rd Street Dune and Beach Chicago IL, Great Lakes Fisheries and Ecosystem Restoration (GLFER) Section 506 project. Through that project, supplemental planting in a 1.2 acre patch called "Area 2" in Planting Plan C-03, has helped contribute to the successful erosion control by keeping the sand from the primary section of beach from migrating and blowing toward the back dunes themselves. The landscape architect's office reported that

they had issued a memo in 2005 recommending this additional planting in the fore dune area of the site for this reason (see Image 1).

A phone interview conversation on July 11, 2013 with Shawn Sinn, Project Manager for the Conservation Land Stewardship (Elmhurst, IL), who completed the 2010 Section 506 scope of work, confirmed that the intentions of the 2010 project were to prevent further sand erosion and to develop habitat both along the beach frontage and through underwater aquatic habitat structure. Aquatic habitat for a species of Redhorse and Smallmouth Bass were of particular interest at that time. Aquatic structures were composed of a cobble base, with a lattice of tree trunks and branches, weighted by concrete anchors. The trees were utilized from the tree removal areas shown on Tree and Shrub Removal Plan C-02. (see Image 2).



Sources:
US Army Corps of Engineers. Chicago District. 63RD STREET DUNE AND BEACH SECTION 506, GLFER (WRDA 2000) CHICAGO, ILLINOIS. 26 Aug. 2010.

Saves an estimated 450,000 gallons of potable water and over $1,300 annually with the use of native species that require zero irrigation compared to a turf landscape (Project Area 2004), or a savings of $2.57 per 100 sf.

In “Sourcebook on Natural Landscaping for Local Officials”, Pizzo & Associates, Ltd. (natural areas managers for the 63rd Street Beach) estimated in 2004 that $500 is spent annually on irrigation for one acre of turf. The cost of water in 2004 for the City of Chicago was $1.29 per 1,000 gallons, which indicates just under 390,000 gallons of water is needed to irrigate one acre of turf per year. On the 1.18-acre grassland at 63rd Street Beach site, the species of plants promote deep infiltration, are drought tolerant, and require no irrigation. Compared to the irrigation needed for turf, the grassland saves an estimated $1321.79 per acre annually.

It should be noted that when enhancement plantings are added to the 63rd Street Beach grassland, Pizzo undertakes establishment irrigation for 1-2 weeks after installation.

Table 1 Irrigation of Turf, from "Sourcebook on Natural Landscaping for Local Officials" and City of Chicago water rates.

Irrigation Cost Per Acre Annually (2004)	Cost of 1 Gallon Water (2004)	Gallons Per Acre Annually	Cost of 1 Gallon Water (2013)	Grassland (Acres)	Irrigation Cost Per Acre Annually (2013)
500	0.00129	387,596.90	0.00289	1.18	1321.79

Sources:
"Sourcebook on Natural Landscaping for Local Officials." Chicago Wilderness. Web. <http://www.chicagowilderness.org/files/4413/3087/4878/natural_landscaping_sourcebook.pdf>.

"Natural Landscaping for Public Officials: A Source Book." Applied Ecological Services, Inc. Web. <http://www.appliedeco.com/Projects/NativeLandscapeSourceBook.pdf>.

"Know My Water & Sewer Rates." City of Chicago. Web. <http://www.cityofchicago.org/city/en/depts/water/provdrs/cust_serv/svcs/know_my_water_sewerrates.html>.

"Original Green Values Calculator." Green Values Stormwater Calculator. Center for Neighborhood Technology. Web. <http://greenvalues.cnt.org/calculator/calculator.php>.

Increased the Biomass Density Index -- a measure of the density of plant layers covering the ground -- by nearly 150% for the project area. (2004 Restoration)

Context:
Biomass density has been recently (the last year) discussed as a potential Urban Ecology design criteria for the Sustainable Urban Infrastructure Guidelines (SUIG), a new planning and design document to be published by Chicago Department of Transportation. This type of index would help to develop a denser biomass throughout the public right-of-way within the City. Biomass has been included within this case study as a Benefit, as it plays an important role in the transfer of energy in the environment, and can improve soil fertility and moisture content. Biomass is also used to estimate a plant's ability to store carbon (oftentimes in reference to trees and deep-rooted grasses), which can reduce carbon emissions into the atmosphere.

Methodology:
The Sustainable Sites Initiative (SITES) 'Guidelines and Performance Benchmarks 2009' sets up a guide for calculating biomass density for a proposed project. The method is meant to compare existing biomass density to proposed biomass in the process of earning SITES credits for a proposed project design. For our purposes, we find the calculator extremely useful in calculating the impact to biomass density of the 2004 design relative to the pre-existing conditions of the site planting.

Aerial images were taken of the site from 2002 and 2010 and were mapped in AutoCAD. Vegetation areas were assigned based on the SITES descriptions. The rating value for vegetation in this system is based on leaf area, and assigns "grassland" to the turf category. Since this system only puts value in vegetation, the 2004 project lost some vegetation area, therefore gained fewer points that it might have, because of installing the new, required ADA-accessible recreation trail and underpass, which is wider than the previous trail.

One note on the limitation of this method is that this process is an estimation due to the imprecision of mapping from historic aerials, which are not available in high resolution. A diagram from the TGDA office provided the project area boundaries, but the area of Lake Shore Drive was not included as part of this scenario because this section of Lake Shore Drive did not alter significantly during reconstruction. Also noted: the previous pedestrian overpass (south of the TGDA project) was not counted; the area of current

pedestrian underpass (under Lake Shore Drive) was also not counted. See Image 3 for Biomass Density Index diagram.

Table 2 Vegetation types, mapped from 2002 aerial.

	Sand	Turf	Trees (no understory)	Hardscape	
	32047.926	8013.7544	495.9696	10586.7796	
		4929.3472	6077.11	4487.9988	
		3487.8683	1080.9003	8920.1631	
		11297.6018	1441.2004	8426.3743	
		3917.7434	1441.2004	253.0469	
		6979.7531	882.1468		
		26554.6344			
		256.4483			**Total**
Total	32047.9260	54018.6234	11418.5275	32674.3627	130159.4396
Percentage	24.62%	41.50%	8.77%	25.10%	100.00%

Table 3 Vegetation types, mapped from 2010 aerial.

	Grassland	Shrubs	Turf	Trees (with understory)	Trees (without understory)	Hardscape	
	9292.6047	4734.3656	2754.1600	628.8910	2829.7940	33910.5489	
		6610.1994	19112.9959			-3210.8514	
	969.4706			880.4474	567.7064		
	507.5290	692.8651	6963.7926	155.2825			
	1167.4773			923.6893			
	4998.4017			2198.2333			
	9010.4846			458.8714			
	11652.5805						
	827.4923						
	336.6012						
	12473.8666						**Total**
Total	51236.5085	12037.4301	28830.9485	5245.4149	3397.5004	30699.6975	131447.4999
Percentage	38.98%	9.16%	21.93%	3.99%	2.58%	23.36%	100.00%

Table 4 2002 Biomass Density Index, from SITES "Guidelines and Performance Benchmarks 2009"

2002 Biomass Density Index			
Land cover/vegetation type zone	**Biomass density value* for this zone**	**Percent of total site area for this zone**	**Biomass density value x percent of total site area (column B x column C)**
A	**B**	**C**	**D**

Trees with understory	6		
Trees without understory (less than 10 percent herbaceous/shrub cover)	4	8.77%	0.3509
Shrubs	3		
Desert plants	1.5		
Annual plantings	1.5		
Grasslands and turfgrass	2	41.50%	0.8300
Wetlands**	6		
Impervious cover or bare ground not shaded by vegetation or vegetated structures	0	49.73%	0.0000
SUBTOTAL (sum of all rows)	n/a	100%	
ADDITIONAL VALUE for other horizontal and vertical surfaces covered with vegetation (e.g., green walls, trellises, pergolas), if applicable: Calculate the total surface area of the vegetated surface, multiply by a biomass density value of 1, and divide by the total site area.			
Existing Site BDI (sum of Subtotal and Additional Value)			1.1809

Table 5 2010 Biomass Density Index, from SITES "Guidelines and Performance Benchmarks 2009"

2010 Biomass Density Index			
Land cover/vegetation type zone	**Biomass density value* for this zone**	**Percent of total site area for this zone**	**Biomass density value x percent of total site area (column B x column C)**
A	**B**	**C**	**D**
Trees with understory	6	3.99%	0.2394
Trees without understory (less than 10 percent herbaceous/shrub cover)	4	2.58%	
Shrubs	3	9.16%	0.2747
Desert plants	1.5		
Annual plantings	1.5		
Grasslands and turfgrass	2	60.91%	1.2182

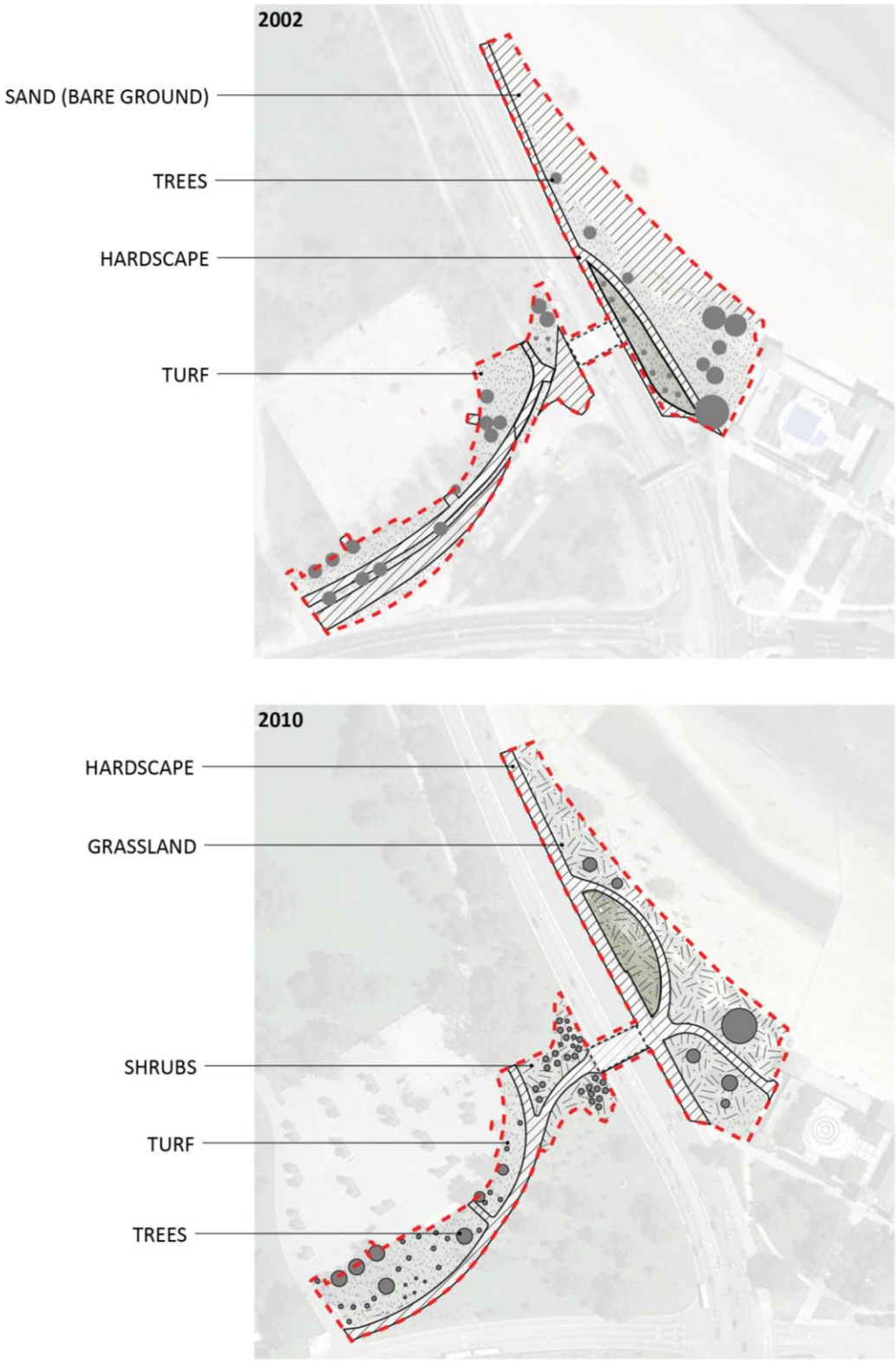
Wetlands**	6		
Impervious cover or bare ground not shaded by vegetation or vegetated structures	0	23.36%	0.0000
SUBTOTAL (sum of all rows)	n/a	100%	
ADDITIONAL VALUE for other horizontal and vertical surfaces covered with vegetation (e.g., green walls, trellises, pergolas), if applicable: Calculate the total surface area of the vegetated surface, multiply by a biomass density value of 1, and divide by the total site area.			
Existing Site BDI (sum of Subtotal and Additional Value)			1.7324

Sources:

"Guidelines and Performance Benchmarks 2009." 101-108. The Sustainable Sites Initiative. American Society of Landscape Architects, Lady Bird Johnson Wildflower Center at The University of Texas at Austin, United States Botanic Garden. Web. <http://www.sustainablesites.org/report/>.

McGrath, David. “The Role of Biomass in Shifting Cultivation.” Human Ecology, Vol 15, No 2 (June 1987), pp. 221-242. Accessed via: **http://www.jstor.org/stable/4602841**

Image 1 Biomass Density Index Diagrams 2002 (left) and 2010 (right).



Helped to reduce the number of swim ban days by 72% and swim advisories by 62% between 2009 and 2010 (2004 and 2010 Restorations).

Context:
The Chicago Park District issues daily swim bans or advisories, and the numbers above refer to a reduction in the number of days when these bans or advisories were issued.

Methodology:
Previous to the project, the 63rd Street Beach had many swim bans and beach advisories due to high levels of E. coli and other bacteria, attributable, among several factors, to the gulls free loafing on the beach. Swim bans and advisories along Chicago's shoreline are often attributed to combined-sewer overflow events in Lake Michigan, effluents deposited from long-shore drift or other currents from sources away from the site, or other source such as stormwater run-off from treated lawn areas, and are not widely known to be also attributable to wildlife presence and behavior. However, this was increasingly recognized as a contributing source, and water quality studies conducted in 2000 in the 63rd Street Beach area did find higher levels of E. coli in foreshore san areas where seagulls were known to concentrate. "*E. coli* concentrations in sand and water were significantly correlated, with the highest concentration being found in foreshore sand, followed by those in submerged sediment and water of increasing depth. Gull contributions to *E. coli* densities in sand and water were most apparent on the day following gull activity in a given area." (Whitman, 2003) This study revealed higher counts of E. coli in foreshore sand than within water, noting a decrease in counts moving from the foreshore toward the lake, and confirmed the foreshore sand as a regular contributor of E. coli to the water body.

In requesting data on 21 June 2013 related to enhanced recreational activities for beachgoers, the Chicago Park District confirmed that there were issues in particular with gulls loafing on the beach contributing to poor water quality. The Whitman article actually highlights that sand/beach quality can be poorer than water quality for human exposure.

For the purposes of our research, we projected that the implementation of significant planting areas in the project site has reduced the area for gulls to loaf, which has reduced available area for this contributing behavior. CPD representatives agree that the increase in planting areas has reduced gull population, which is believed to have reduced E. coli bacteria presence and wash into adjacent waters. Note: it was alluded to that the occasional presence of dogs on site and the use of border collies as a gull deterrent, may also have an influence on the presence of gulls, but this has not been extensively studied.

Limitations:
The limitation of this research is that it is not proven what among the contributing factors has been most addressed through mitigation, and what has led to improved water quality and improved foreshore sand quality improvement. Although the extensive beach planting is considered a primary reason for reduction in gull loafing and therefore E. coli counts, there may be other practices related to human behavior improvements that resulted in improved water quality, particularly from off-site.

An important related note is that practices such as the use of border collie to limit gull activity may contribute to the reduction in loafing alongside the implementation of planting. Further, the use of the dogs may unfortunately have degrading effects on the presence of other more desirable bird species occupying this shore as an important habitat. Conversations with birder

Paul Clyne and ecology-specialist Shawn Sinn/CLS confirmed that the simultaneous objectives of creating and maintaining a habitat in an area that is also desired for human use lead to competing and conflicting outcomes, limiting the full satisfaction of either.

Sources:
"Foreshore Sand as a Source of Escherichia Coli in Nearshore Water of a Lake Michigan Beach." *American Society for Microbiology*. Applied and Environmental Microbiology, n.d. Web. 08 Aug. 2013. <http://aem.asm.org/content/69/9/5555.full>

"Escherichia Coli Sampling Reliability at a Frequently Closed Chicago Beach: Monitoring and Management Implications." *Environmental Science & Technology*. ACS Publications), n.d. Web. 08 Aug. 2013. <http://pubs.acs.org/doi/abs/10.1021/es034978i>.

"Gunderboom in Hyde Park Herald." Hyde Park Historical Society. 25 Dec. 2002. Web. <http://www.hydepark.org/parks/jpac/gunderherald.htm>.

"New 63rd Pollution Test Method." Hyde Park Historical Society, May 2013. Web. <http://www.hydepark.org/parks/jpac/new63rdtest.htm>.

For Current Swim Status and Water Quality Information:
http://www.cpdbeaches.com/beaches/63rd-street-beach/

Social

Increases opportunities for stewardship and learning (2004 and 2010 Restorations). The Great Lakes Action Days program, run by the Shedd Aquarium, conducts monthly stewardship days, which has involved over 200 volunteers annually since 2005.

Methodology:
While we believe there are other informal stewardship activities that take place at the project site, the following are formal programs that we discovered:

The Shedd Aquarium currently runs ‘Great Lakes Action Days, ‘ a conservation and beach maintenance volunteer-program that maintains trails, plants native plants and collects data from the site. The program holds events at the beach monthly in Summer and Fall. As part of the Alliance for the Great Lakes, this volunteer program visits the 63rd Street Beach five times (monthly visits) per year on site, as well as several other natural areas and beaches in the Chicago area. The program is open to the public, and since 2005 has had an average of 41 volunteers per visit and, since 2008, removed an average 194 lbs of debris from the 63rd Street Beach per visit. Volunteers have also acted as conservation ambassadors to educate beachgoers about the importance of keeping the beach clean during the clean-up days. “It [the Great Lakes Action Day at the 63rd Street Beach] is part of the Shedd Aquarium's "keeping the lake great" summer initiative. The goal of the program is to educate people on the unique freshwater habitat along the great lakes while providing a public service” ("Volunteers Cleaning up Litter, Gardening at 63rd Street Beach." ABC News.)

The Chicago Park District stewardship program currently involves two volunteers, who perform maintenance and augment plantings periodically throughout the year. Of particular note, they aid the maintenance work performed by Pizzo & Associates (natural area managers for the 63rd

Street Beach). In an interview with Mitch Murdock of the Park District on 1 July 2013, the stewardship involvement on site is extremely important as it develops public appreciation for conserving plant and animal species.

The Jackson Park Advisory Council is extremely active in stewarding the natural areas in the Jackson Park Community, which includes the 63rd Street Beach. JPAC has three appointed stewards, which aid in coordinating with other groups and organizing activities such as trash clean-up and invasive plant removal in natural areas, educational nature walks, birding tours, working with the Park District to coordinate informational signage about natural areas, and monitoring the upkeep and safety conditions of natural areas.

Sources:
"Historical Litter Monitoring and Routine Visit Data." *Adopt-a-Beach*. Alliance for the Great Lakes. Web. <http://www.greatlakesadopt.org/Home/HistoricalData>.

Jackson Park Advisory Council. <http://jacksonparkadvisorycouncil.org/about-us.html>.

"Volunteers Cleaning up Litter, Gardening at 63rd Street Beach." ABC News, 20 June 2013. Web. <http://abclocal.go.com/wls/story?section=news/local&id=9146513&rss=rss-wls-article-9146513>.

Cost Comparison Research

Portions of the 63rd Street Beach that have been converted to grassland eliminate the need for sand grooming, or beachsweeping. The CPD utilizes standard beachsweeping practices elsewhere in the park, but the dune/swale planting area of the 63rd Beach project requires no sweeping. Additionally, because native vegetation was used to stabilize slopes instead of traditional retaining walls, the recreational trail that leads to the underpass does not require sweeping to remove accumulated sand, whereas trails at other Chicago beach sites do require frequent sweeping with heavy landscape equipment.

The Park District allocates $270/acre annually for the maintenance of a natural area in Chicago, IL. According to the Natural Areas Manager of the Chicago Park District, this maintenance cost is "much less" than sand grooming costs, though it is more than the cost of maintenance required for the more traditional turf-and-tree landscape in Jackson Park, located just west of 63rd Beach. The natural areas maintenance also requires the use of herbicides, whereas the Park District usually does not apply any chemicals to turf-and-tree landscapes. Therefore, the grassland planting reduces time and maintenance compared to beach grooming, but is more intensive than a turf-and-tree landscape.

Background Research:
Long-term maintenance of Chicago's beaches is estimated to consist of the following activities: water sampling, water monitoring, gull harassment, beach ambassadors, life guards, beach website upkeep, trash pick up, sand grooming (labor and equipment). As learned through conversations with Zhanna Yermakov, Natural Areas Manager at the Chicago Park District, it is very difficult to quantify or even estimate the precise amount of time and money saved by implementing a grassland versus a sand beach due to: "[T]hese costs [of different types of

maintenance] are not separated out by beach, but obviously vary with beach size and location…" and, "beach maintenance is implemented by several [CPD] departments" (Email from Zhanna Yermakov, 15 July 2013).

The Chicago Wilderness published a "Sourcebook on Natural Landscaping for Local Officials" in 2004 which, given a 5-acre sample planted area, states that a native prairie costs 53% less than a turf landscape over a five year period. Similarly, Applied Ecological Services, Inc. published "Natural Landscaping for Public Officials: A Source Book" in 1997 that states that the installation of native plants costs 57% less than installing seeded turf, with annual maintenance costing 85% less. Zhanna Yermakov noted that the cost data in AES's studies are associated with areas that are not in urban environments, and that natural areas in urban environments like Chicago face more environmental challenges, particularly during establishment, than non-urban areas. The GreenValues®Stormwater Toolbox, through the Chicago-based Center for Neighborhood Technology estimates that, on average, native plants cost 67% less than turf to maintain.

Sources:
"Natural Landscaping for Public Officials: A Source Book." Applied Ecological Services, Inc. Web. <http://www.appliedeco.com/Projects/NativeLandscapeSourceBook.pdf>.

"Sourcebook on Natural Landscaping for Local Officials." Chicago Wilderness. Web. <http://www.chicagowilderness.org/files/4413/3087/4878/natural_landscaping_sourcebook.pdf>.

"Original Green Values Calculator." Green Values Stormwater Calculator. Center for Neighborhood Technology. Web. <http://greenvalues.cnt.org/calculator/calculator.php>.