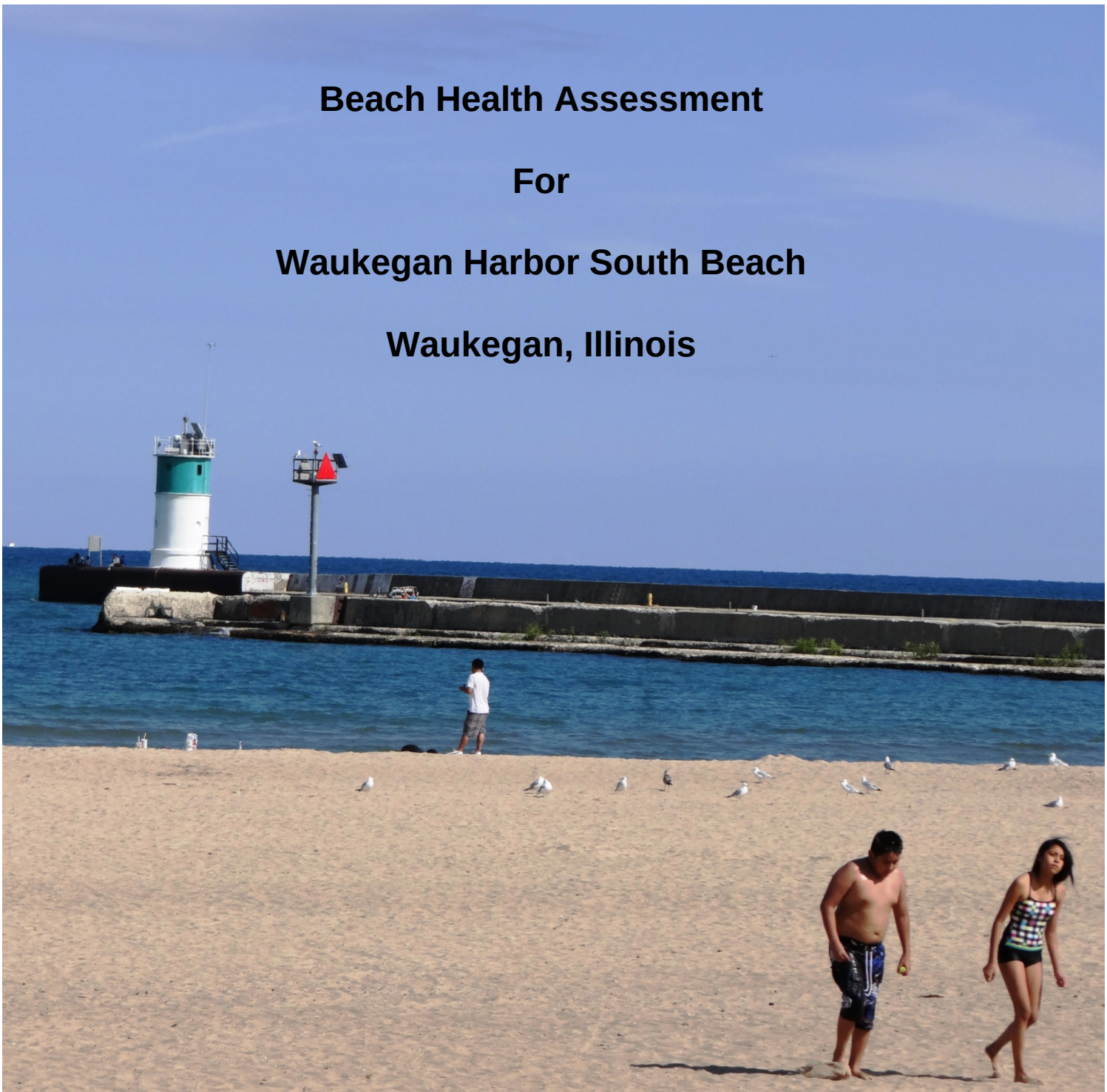
Beach Health Assessment

For

Waukegan Harbor South Beach

Waukegan, Illinois



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Waukegan Harbor Beach – South Segment (Waukegan, IL)

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1 INTRODUCTION

This beach health assessment report was produced at the request of the Illinois Department of Natural Sources, Office of Coastal Zone Management. The purpose of report is to provide additional information on likely sources of *E. coli* contamination and recommend mitigation and/or best management practices with the potential to improve nearshore surface water quality and reduce the number of beach advisories and closures. All recommendations take into account observed public uses of the beach. This assessment consisted of two visits, 6/25/13 and 8/4/13; the first visit occurring during a rain event, the second on a warm, sunny weekend day. By capturing both wet and dry periods we were able to determine potential sources of pollution as well as usage patterns by the general public.

Waukegan Harbor Beach (south segment, Beach ID IL234945) is monitored by the Lake County Health Department four days per week during the swimming season. There have been nine to 20 beach closures for the years 2007 – 2011 (mean of 13). Although monitored, the results of the most recent test were not obviously posted directly on the beach at either of the beach visits. Several areas at the beach and surrounding land could be modified to proactively improve future water quality, beach health and public access.

Waukegan Harbor Beach, south segment, is bounded on either side by hard engineered structures, creating an embayment. Embayed beaches can be subject to decreased circulation patterns which serve to retain any pollutants delivered from shoreline or offshore sources to the nearshore waters. The Waukegan Harbor is to the south of the beach and continual boat traffic, primarily small recreational watercraft, was seen entering and leaving the harbor. While boater waste may not be a primary, offshore source of fecal pollution, it should be confirmed that adequate pump out stations are available and functioning properly. Boat traffic may also contribute to the resuspension of sediments into the water column; therefore, a no wake zone should be established. Water clarity, in the absence of significant wave action, was described as turbid near the shoreline during the August visit. Turbidity has frequently been linked to decreases in water quality.

Another potential source noted, that could lead to the degradation of beach health, is direct surface water runoff from adjacent paved surfaces, which flows directly onto the beach and, when sufficient, into the near-shore waters. Studies have shown that storm water contains many contaminants, including *E. coli*. Surface runoff includes not only paved surfaces but rooftops, decking and other impermeable surfaces. The structure at the south end of the beach does not

have any guttering, delivering runoff to the beach area. This structure also appears not to be in service as portable bathroom toilets were located along the back side. Between 100 and 150 people were observed at the beach but it was indicated that usage can be much higher. It should be determined whether or not the number of toilets present is adequate for peak usage. Hand washing facilities should also be made available.

There is some vegetation on the back beach, at the north end, mainly comprised of both posted dune and wetland areas. The designated wetland area had significant amounts of dead vegetation indicating that active invasive species management and control may be under way (Blue Dune Lyme grass was observed at the time of the site visit). The mid- and fore- beach is not vegetated and is flat and compacted with a large swash zone. Under these conditions it is not able to effectively infiltrate storm water and remains perennially saturated due to proximity to the water table. Wet sand tends to harbor bacteria, which can be easily washed into the near-shore water during rain events or transferred via high waves. No municipal storm water infrastructure was observed in the immediate vicinity of the beach.

Another source of contaminants is excrement from waterfowl that utilize the beach, adjacent parking lots and lawn areas. Over 100 gulls were observed on 6/25/13 and significant goose feces were noticed on paved surfaces (but no actual geese). The number of gulls is likely greater than that observed as there were sizable amounts of feathers and tracks along the beach face. At the 8/4/13 beach visit the observer could get within one foot of the gulls, indicating that they are acclimated to humans and potentially being fed by beach patrons. The non-resident parking lot also had several pools of standing water in the absence of recent rainfall, which can attract waterfowl. While litter bins and solar trash compacters are abundant adjacent to the parking lot and in the picnic areas there were only two observed on the beach itself. Beach patron proximity to a suitable waste receptacle may contribute to the amount of litter on the beach, which can serve as a further attractant for gulls. A direct correlation between higher bird counts and higher *E. coli* levels has been documented.

Several measures may be utilized to reduce the amount of storm water runoff and decrease avian sources of *E. coli* and other contaminants from reaching the beach. These modifications would provide several layers of protection to the beach area and include: the placement of rain gardens and gutters adjacent to/on the structure at the south end of the beach, bio-infiltration swales along the interface between the paved footpath and beach, the expansion of existing native vegetation, beach nourishment, better defined public access, and other non-engineered Best Management Practices (BMPs). Some elements are meant to reduce the amount of contamination that the storm water runoff picks up and others are designed to intercept and treat storm water before it reaches the beach. Defined points of ingress and egress will keep the public out of naturalized engineered control measures while providing ease of access. Examples of problem areas at the existing beach that need to be addressed are shown in Figure 1 below. The purpose for remediating each issue and the potential benefits thereof are discussed herein.

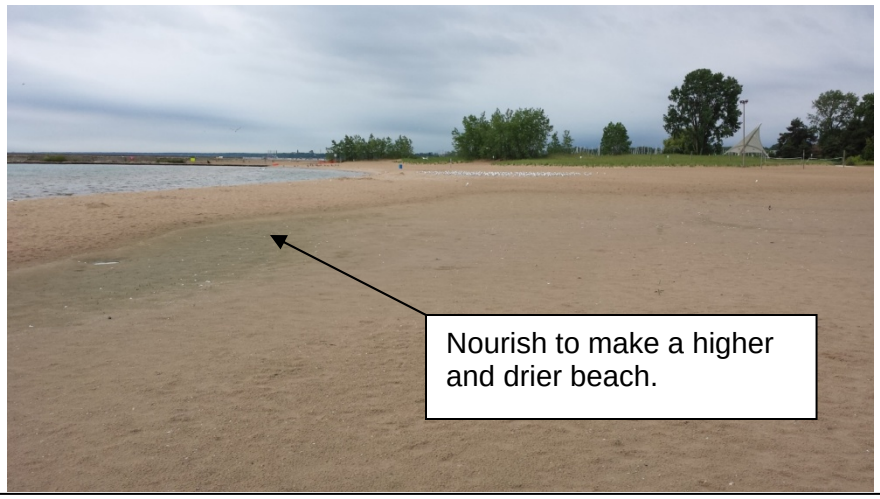

Figure 1 (A – C) *– Several hundred gulls and evidence of geese were observed (A). The bath house lacks guttering and there is no curbing to prevent sheet flow to the beach (B). The beach is flat, has a large swash zone and remains continually wetted (C).*

2 INFILTRATION PRACTICES

Rain gardens and bioswales both utilize infiltration to improve the quality and reduce the quantity of storm water runoff. As storm water infiltrates, sediments and debris are removed and other contaminants such as oils, heavy metals and bacteria are also filtered or treated as they move through the soil. At this beach, infiltration could be used to reduce non-point source pollution from entering the beach area through a sustainable, naturalized approach.

Compaction of soil in all infiltration areas (and on the beach) should be avoided during construction and at all other times. All vegetation for future projects should be obtained from a reputable supplier, and it is preferable to have a local ecotype of the species used. It is best to let the vegetation in rain gardens and infiltration swales become established before bringing the systems "online," but if this is not possible, more rigorous maintenance will be needed to establish vegetation and prevent erosion. When completed and established, rain gardens and bioswales will require periodic inspection and maintenance.

1.1 Rain Gardens

Rain gardens could be installed off the southeast and northwest corners of the structure on the south end of the beach to intercept and treat storm water runoff from the roof and patio areas. By preventing runoff from reaching the beach and/or near-shore water and filtering contaminants through an engineered soil mix, this type of design element will reduce one possible source of contamination. When properly constructed and maintained, rain gardens also provide temporary surface and subsurface storm water storage through the use of the engineered soils and a constructed depressed area. Rain gardens should be planted with native plants which will slow water flow, assist in infiltration and phytoremediation, improve aesthetics, and act as a vegetative buffer and a visual screen to discourage waterfowl.

Examples of a rain garden installed along the border of a beach parking lot.

1.2 Infiltration Swales (Bioswales)

Infiltration swales could be installed off the east edge of the existing footpath and parking lots to intercept and treat storm water runoff before it reaches the beach. By filtering contaminants through sand, this design element reduces another possible source of contamination. Infiltration swales also provide temporary surface and subsurface storm water storage through the construction of a shallow depression. Dune grass planted in the infiltration swales adjacent to the footpath would slow water flow, assist in infiltration and phytoremediation, and continue the natural aesthetic feel of the area. The "top end" of the infiltration swale (between the swale and the sidewalk) may be planted with native plants and shrubs that will act as a vegetative buffer as well as a visual screen to discourage waterfowl. The use of naturalized engineering measures would complement the existing dune and wetland areas that are in the process of being established. Engineered bio-filtration basins could also be used to capture and pre-treat stormwater from roadways to reduce the amount of "upstream" flow.

Infiltration swale vegetated with native grasses

3 NATIVE VEGETATION

Native vegetation is incorporated into many beach redesign elements for a variety of reasons. The root systems of most native plants are very deep and help water soak into the ground, thereby increasing water infiltration and reducing runoff. These root systems also hold soil in place, reducing erosion. Native species are also inherently low maintenance, resulting in saving of time, money and energy. They are adapted to local conditions, which makes them vigorous and resistant to most pests and diseases. Once these plants are established they require minimal care.

Example of native vegetation plantings

Both dune and wetland areas have been planted at this location in an effort to improve water quality, restore a funtional ecosystem and discourage waterfowl from using this area. Extension of these area using shrubs, native plant species, and additional dune grasses will provide a better buffer between impervious surfaces (such as the foot path, road and the parking lots) and the beach, increase infiltration of surface runoff, extend the visual screen to discourage waterfowl

from congregating on the beach, and improve aesthetics. Construction of these features should take into account foot traffic patterns.

Should this recommendation be implemented, all plant species should be chosen that are native to Lake County, which is especially important along a valuable ecological resource such as the Lake Michigan shoreline. Choosing native vegetation will also improve coastal habitat by providing food and shelter for songbirds, butterflies and other desirable wildlife. Invasive species management should continue, e.g. herbicide treatment of Blue Dune Lyme Grass.

4 BEACH NOURISHMENT

Beach nourishment is also recommended along the entire length of the shoreline, most critically at the north end. The purpose of beach nourishment is to steepen the beach to decrease “ponding” and to raise more of the beach above the water table, which results in a drier beach. Because bacteria do not survive well in dry conditions, beach nourishment helps to decrease bacteria levels in the sand.

Typically beach nourishment sand has a specified gradation as shown in Figure 2. The slightly increased size of the sand particles specified promotes greater infiltration, which provides for a higher and drier beach. Larger sand particles are also less susceptible to wind erosion, decreasing the amount of sand that will be blown off the beach.

An example of what a “healthy beach” should look like. Note the small dune features, dune grass, and sloping beach.

In addition to drainage issues, waterfowl tend to inhabit low, wet areas of beaches where bacteria flourish. By raising and drying the beach through nourishment, the amount of birds loafing on the beach should be reduced.

The dune feature on the upper portion of the north end of the beach should be expanded as part of beach nourishment. Dune grass is extremely effective in stabilizing dune features by trapping blowing sand above ground and by holding sand in-place with its below ground root system. This will result in a stabilized beach area with improved aesthetics. A permit from the Illinois DNR would be required for beach nourishment.

Another important aspect of the beach sand management is grooming. A beach is not a static environment, that is, wind, water, and people will move sand and introduce debris. To keep the beach clean, manage vegetation and maintain aesthetics, the beach area should be groomed regularly. Snow fencing can be used in the winter to retain sand on the beach until dune features have become established.

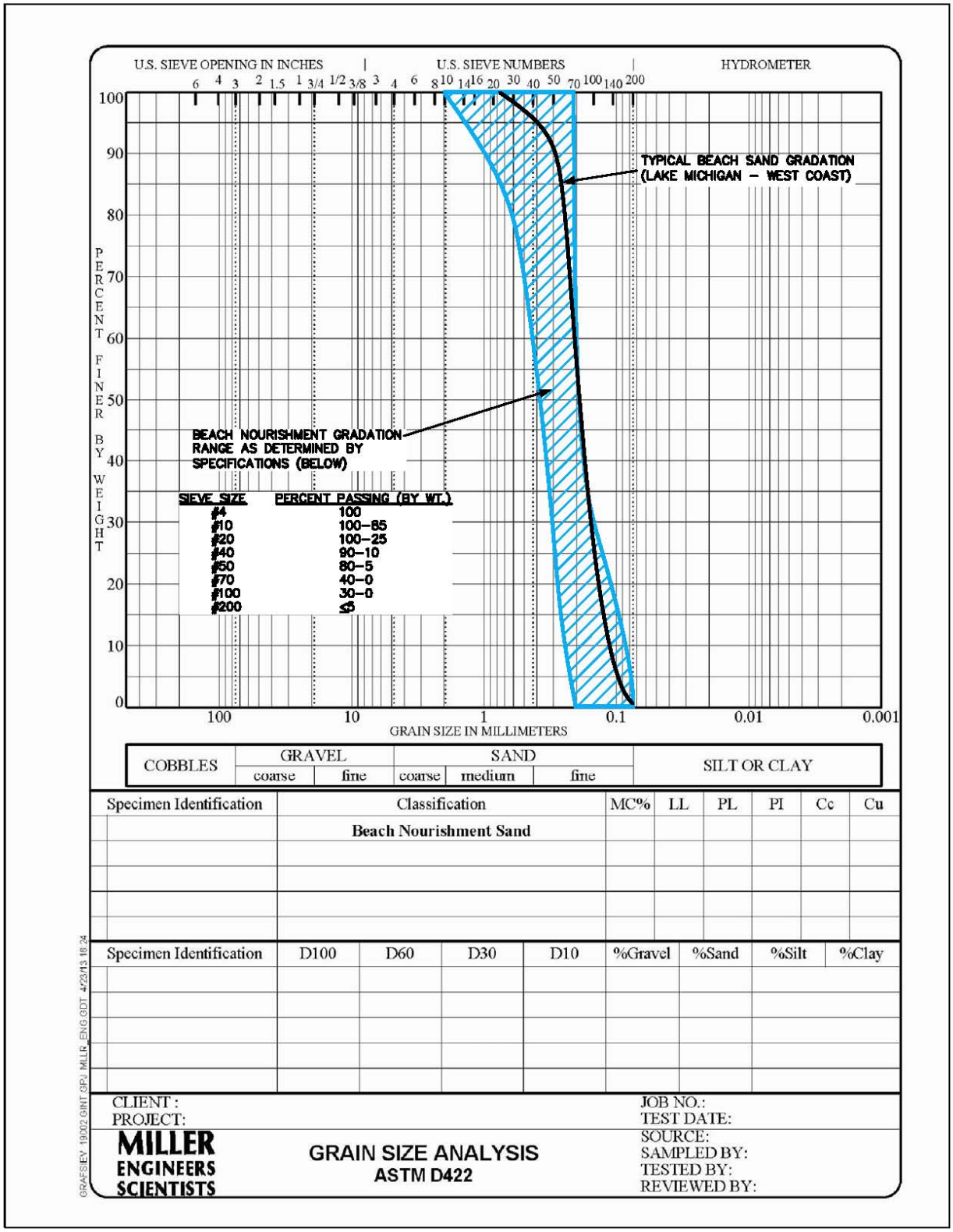

Figure 2 *– Example of sediment grain size analysis showing typical Lake Michigan and nourishment gradation ranges.*

5 PUBLIC ACCESS

Better defined public access points should be established to provide improved, controlled ingress/egress through the dunes and other vegetation while protecting these features from foot traffic (current signage is directed towards the beach rather than the parking areas). Paths should be designed to be "curved" to reduce the line of sight for birds, thus discouraging them from using the paths for access from the water to upland areas. One path to the beach area should be designated as a "tractor accessible" path, which would be used for beach grooming equipment as needed. ADA compliant access should also be provided. Specific recommendations include: 1) a cord walk path from the south end of the non-resident parking lot to the beach (above), 2) a cord walk path from the middle of the non-resident parking lot, along the pier, to the beach, 3) an ADA compliant path leading from the resident parking lot to the sandy portion of the beach with Mobi-Mat™ extension and 4) a weight-bearing path for use by a beach groomer.

6 BEACH USES

Waukegan Harbor Beach, south segment, appears to be a well used beach. On the 8/4/13 visit at least 150 separate individuals were counted over the approximate 1.5 hour observation period. Beach patrons represented a number of demographics profiles, with a high percentage of minority populations represented. Many beach patrons arrive by car. There were ~25 cars in the residential and 50 – 60 cars in the non-resident lots. Beach visitors were engaged in a variety of recreational activities: kite flying, beach volleyball, soccer, picnics, sunbathing, boating, jet skiing, swimming, sail boarding, fishing and relaxing in the park. The beach is also used as a therapeutic destination. The Lake County Public Health Department took behavioral health residents there for a day trip on August 4, 2013.

7 BEST MANAGEMENT PRACTICES

The purpose of non-engineered best management practices (BMPs) is to remove or reduce possible sources that contribute to contamination of the beach. These sources include storm water, waterfowl and other wildlife, debris, and pets. Using BMPs to eliminate or reduce possible sources of contamination is a low cost technique that will reduce beach contamination. In addition, BMPs can increase public awareness of water quality problems and engage the community in solutions. Implementation of the BMPs will require a combination of local government cooperation and coordination, and will require little capital investment (could use admission fees). BMPs recommended are:

- The parking lot areas should be cleaned quarterly (after snow melt, after spring rains/before beach opens, beginning of July, beginning of September).This can be accomplished by using a street sweeper or equivalent equipment.
- Remove accumulated *Cladophora,* aquatic vegetation and debris from the beach as required. A permit may be required from to do this.
- Additional garbage cans should be placed on the beach, especially mid-beach.
- Install bidirectional signs (and provide enforcement) in the park and beach area reading:
    - "Don't Feed the Birds"
    - "No Pets Allowed"
    - "Pick Up Trash"
    - "Wetland (or Dune) Area – Do Not Disturb"
- Routine beach grooming should be employed. Grooming will help to reduce strand accumulations and aerate the sand to promote drying in conjunction with beach nourishment.
- An invasive species management and control plan should be developed for the existing, and any future, dune and wetland areas (if one does not already exist).

Examples of existing dune and wetland signage, which are currently only beach facing.