US Army Corps of Engineers
Detroit District

Great Lakes Update

Volume 197: High Water Concerns

Recent Water Levels

At the end of May, all the Great Lakes are above their long-term averages and above their levels of one year ago. Lake Ontario's level has set a new record high water level for the month of May and will likely see near record high water levels in June as well. Forecasts for the summer and through the rest of 2017 continue to show higher than average water levels.

This article will cover a few areas that may be of interest to those with lakeshore property. First, the process of erosion is discussed followed by some information on the permitting process should lakeshore property owners wish to perform work along the shorelines of the Great Lakes.

Erosion Processes

Erosion is defined as the wearing away of land by the action of natural forces. On the coast, the forces of erosion are embodied in waves, currents and wind. Surface and groundwater flow, and freeze thaw cycles also play a roll. Though erosion is a natural process, it can be influenced, both adversely and beneficially, by human activity.

There are a variety of general shore types in the Great Lakes region including high and low rocky bluffs; low flood plains and coastal marshes, high and low sand/till bluffs, sand dunes, and artificial coastlines. Of the erodible shore types, the two most common are sand/till bluffs and sand dunes. These shore types are comprised of material deposited by glaciers over ten thousand years ago.

The sand/till bluff shore type is most often characterized by an under layer of a less erodible, more compact material, such as clay or glacial till, overlain by a more erodible, less compact material, such as sand and gravel. Because of the presence of the compact under layer, these shore types have been referred to as "cohesive coasts". Due to the variation in depositional environments, the composition and erodibility of cohesive coasts may vary considerably over distances as short as several hundred yards.

The sand dune shore type is generally comprised of glacially deposited sands and gravels that have been reformed by winds. Although there are dune shore types that consist entirely of sand, very often the "dunes" sit atop an under layer of glacial till. The erodibility of this shore type can be more similar to a cohesive coast than to a dune shore type comprised entirely of sand.

Forces associated with waves which are created by the wind are the primary agent of erosion on the coastal area. The energy in a wave is related to meteorological factors such as wind speed and duration and is also determined by topographical and hydrographic factors such as the distance, or fetch, over which the winds blow, and by the depth of water in the area where the waves are generated. Water depths throughout the Great Lakes are much greater than necessary to support the largest waves that can be generated.

The most dramatic erosion often occurs as a result of storms, partially because the highest energy waves are generated under storm conditions. Added to this, storms often produce short term shifts in lake levels as water is pushed from one side of a lake to the other, called "setup". The effect of storms is also influenced by their duration and frequency of occurrences.
Bluff recession, or the landward movement of the bluff crest, is the most visible aspect of coastal erosion and receives the most attention. However, using only bluff recession as an indicator of erosion rates, or erosion forces, may be a poor indicator because of the length of

time, or lag that usually occurs between beach erosion and bluff recession.

Coastal erosion occurs over the area roughly from the top of the bluff out into the nearshore region to about the 30 foot water depth. As a result, erosion processes often do not become apparent as bluff erosion or bluff recession until days or even months later.

In addition, erosion, particularly bluff erosion and recession, do not occur at a constant rate. Over relatively short time periods of day, weeks, and months, the rate of erosion and recession may vary greatly. It is very common for a reach of coastline to have no bluff recession for months or years and then experience severe bluff recession over a period of days or weeks. Bluff recession is often the result of events that may have occurred months before, or gradually over a period of years. This makes it difficult to link bluff recession with the forces or influences that are responsible.

Variation in lake levels, whether short or long term, have little effect on the creation of waves, the primary erosion agent. Most waves are generated far offshore in deep water where such relatively small water level variations are insignificant.

As long as the long-term meteorological and hydrographic factors that determine wave energy remain the same, the long-term erosion rate would remain essentially unchanged. The lake level does, however, have an effect on where wave energy is dissipated on the beach profile, and thus may affect bluff recession rates over short time periods.

The lake level is only one of many factors influencing coastal erosion and recession. To date, the relative importance of lake level compared to the other influencing factors has not been fully quantified. Observations suggest that along much of the coast, storm duration and return frequency, and sediment supply have much more influence on coastal erosion and recession than higher lake levels do.

Regulatory Program

The mission of the Corps of Engineers' regulatory program is to protect the nation's aquatic resources and navigation capacity while allowing reasonable development through fair and balanced decisions. In the Great Lakes region, there is widespread recognition of the value of the Great Lakes for navigation, recreation, fish and wildlife, and the economy.

Property owners on the Great Lakes frequently want to conduct work in the Great Lakes or on the shoreline. Before work is started, a Department of the Army permit is required. Work such as docks, dredging, shoreline grading/grooming, and installation of shore protection structures require a permit from the Corps of Engineers. Water levels often influence the nature of work; dredging may be needed during periods of lower water levels and shoreline protection work during periods of higher water levels. Shoreline property owners wishing to conduct work in or on the shoreline of the Great Lakes need to apply for and receive authorization from the Corps of Engineers before they start work.

The Corps' authority to regulate certain activities on and adjacent to navigable waters of the United States is found in Section 10 of the Rivers and Harbors Act (Section 10), and Section 404 of the Clean Water Act (Section 404).

Under Section 10, a Corps permit is required for any structures or work in navigable waters of the United States. Navigable waters of the U.S. are defined as waters which are presently used, or have been used in the past or may be susceptible to use to transport interstate or foreign commerce. For example, the Great Lakes and connecting channels such as the St. Marys River and the St. Clair River are considered navigable waters. Examples of structures or work requiring Section 10 permits include beach nourishment, boat ramps, breakwaters, bulkheads, dredging, filling or discharging material such as sand, gravel or stones, groins and jetties, mooring buoys, piers (seasonal or permanent), placement of riprap, boat hoists, pilings, and construction of marina facilities.

The Corps' jurisdiction on navigable waters extends to a line on the shore known as the Ordinary High Water Mark (OHWM). The OHWM is the line on the shore established by fluctuations of water and indicated by physical characteristics such as clear natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, presence of litter or debris, or other appropriate means that consider the characteristics of the surrounding areas. On the Great Lakes, an established elevation contour corresponding with the physical features, is frequently used. Elevations are typically referenced to the International Great Lakes Datum, 1985.

In addition, a Section 10 permit may be required for structures or work outside or landward of the usual OHWM limits if it affects the course, location, or condition of the waterbody as to impact its navigable capacity. Shoreline protection work on the Great Lakes is continually subject to powerful wind, wave, and ice action. Because of these forces, structures initially constructed above or landward of a Great Lake's OHWM can, over time, be found at the water's edge or waterward of the shoreline, separated from land and posing a hazard to navigation. The dynamics of the Great Lakes warrants regulatory jurisdiction over most forms of shoreline protection work on Great Lakes' shorelines.

Section 404 requires a permit for the discharge of dredged or fill material into navigable waters of the United States and in wetlands adjacent to those waters. The area of Corps' jurisdiction under Section 404 extends to the OHWM, and to the boundary of adjacent wetlands. The Corps of Engineers defines wetlands as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Projects involving discharges may include homes and landscaping, causeways, roads, riprap, groins, breakwaters, revetments, and beach nourishment. Section 404 also regulates discharges of dredged material incidental to certain activities such as grading, mechanized land clearing, ditching or other excavation activity, and the installation of certain pile-supported structures.

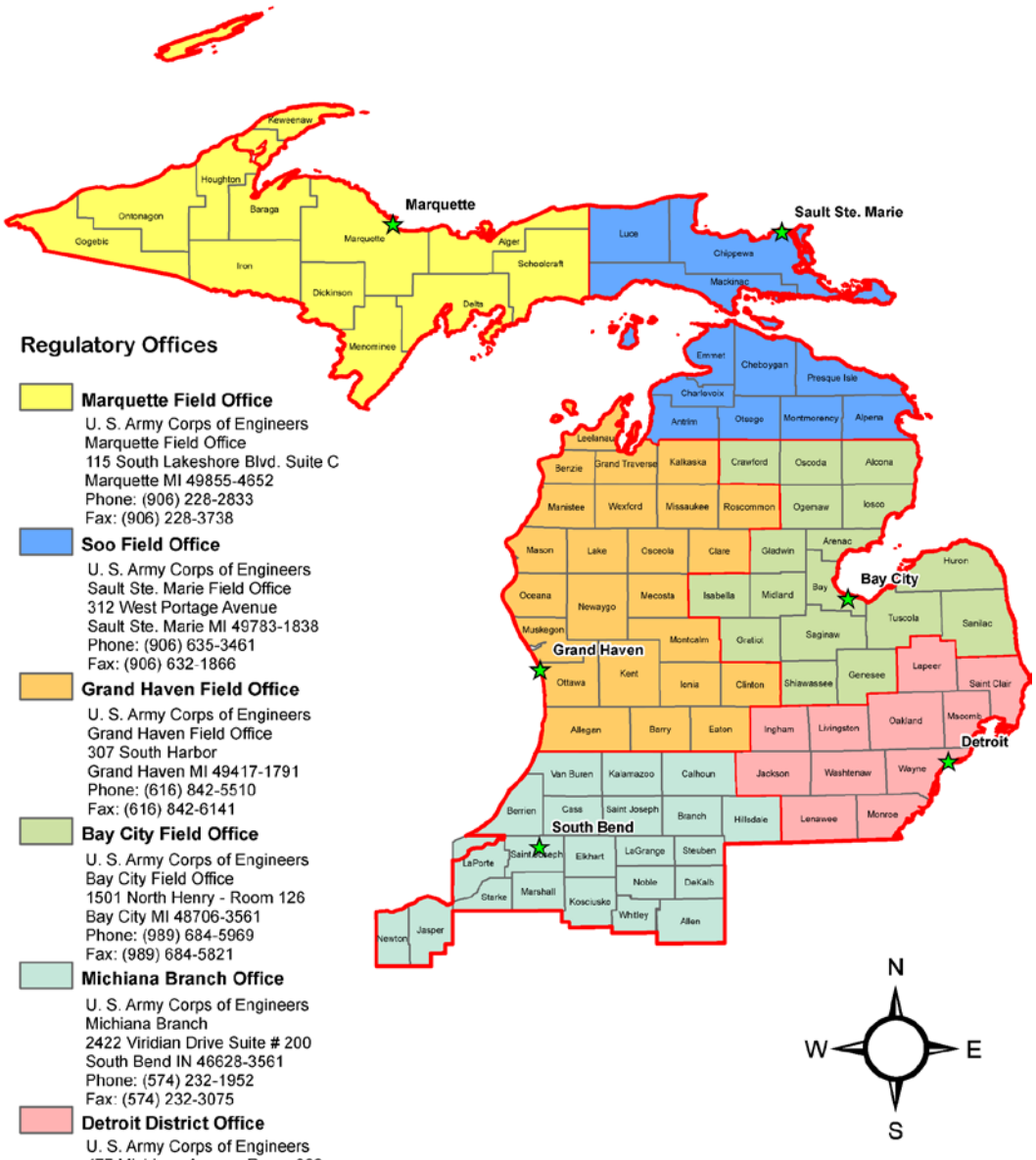
State and/or local governments may also have their own permitting requirements for work in or on the shoreline of the Great Lakes. Contact your nearest State office (in Michigan – the Department of Environmental Quality) and local government(s) for information on State and or local permits.

Shoreline property owners are encouraged to contact the local Corps of Engineers office in your area prior to submitting a permit application. In certain cases, a pre-application meeting may be beneficial between an applicant and Corps staff. Pre-application meetings may also include State and/or local government staff, interested resource agencies (Federal, state, or local), and, in certain circumstances, the interested public. The purpose of these meetings is to facilitate informal discussions about a project before an applicant fully commits resources to the project. The process is designed to provide the applicant with the Corps' views on measures to reduce impacts of the project, and to inform an applicant of factors the Corps must consider in its decision making process. Pre-application meetings often enable the Corps to more efficiently evaluate applications.

Early planning and submittal of permit applications will allow sufficient time to review projects. Applicants should plan their projects accordingly. The Corps of Engineers recognizes that certain immediate threats to life, property, or economic well-being warrant expedited review.

The Corps of Engineers is committed to assisting the public's understanding of the regulatory program. Corps' staff are available prior to, and during application review, and for outreach presentations to discuss the regulatory program. A map of the Detroit District regulatory boundary and contact information is on the next page. Corps' contacts for other states are also provided.

Detroit District Regulatory Jurisdictional Boundaries



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