Shoreline Protection for Inland Lakes

Shoreline Protection Considerations

Many waterfront property owners have the desire to install some form of shore protection. In some cases, there is a need to prevent continued erosion of the shoreline commonly due to wave and/or ice action, and recreational uses. In other cases, there is a need to replace an existing seawall that has deteriorated over time and is no longer effective. The information here provides guidance for planning a shore protection project. Keep in mind, however, that unless you are experiencing active erosion problems, it is best to leave the shoreline in its natural state.

Because root systems of woody vegetation typically act to hold soil in place, maintaining natural vegetation on your waterfront property can help avoid serious erosion problems and the need for costly man-made protection. Emergent vegetation in the lake, such as cattails and bulrush, function to diminish wave energy, thereby protecting the shoreline from the erosive forces of wave action while also providing habitat for aquatic organisms. Trees and shrubs along the shoreline provide wildlife habitat, enhance fish habitat through shading of shallow water, and provide privacy for the property owner. They also create a natural buffer that helps protect the lake from erosion and sedimentation during heavy rains. In many cases, maintaining good plant cover on your shoreline will keep it stable and prevent erosion.

In areas where there are few or no seawalls present, carefully evaluate the need to install shore protection. First, determine if there is a real need for protection or if it is merely a personal convenience. Consider the benefits of leaving the lake shore in its natural state, and ask yourself what attracted you to the parcel in the first place – was it the *natural* shoreline?

Permit Requirements

When planning a shoreline protection project on an inland lake, be aware that the following parts of the Natural Resources and Environmental Protection Act, 1994 P.A. 451, as amended (Act 451), regulate construction activities associated with such shoreline protection:

- ***Part 301, Inland Lakes and Streams***
- ***Part 303, Wetlands Protection***

These parts of Act 451 are administered by the Land and Water Management Division (LWMD) of the Michigan Department of Environmental Quality (DEQ). Permit applications are available from your local DEQ office, or by calling the LWMD in Lansing at 517-373-9244.

It is up to the property owner to select the design and material to be used for the construction of the shore protection when completing the permit application. The DEQ/LWMD staff reviewing the application must consider several factors such as the possible impacts to riparian rights, public trust in the waters, fish and wildlife, natural

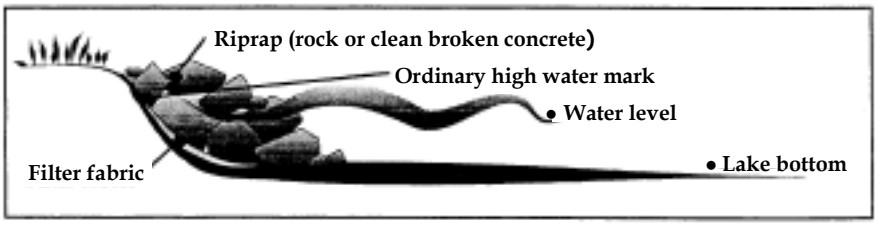
drainage, and aesthetics. They may make suggestions as to the appropriateness of the design and material selected once the site has been inspected.

There are several different types of materials used for shore protection. Among the most common are seawalls constructed with steel sheet piling, poured concrete, wood, and polyvinyl chloride sheet piling, as well as rock riprap shore protection. When considering a shore protection project, it is best to determine the cause of erosion (wave action due to wind, waves from boating activity, ice push in the winter), and then select the best design and a suitable material. For example, lake frontage experiencing serious ice push over the winter months may not be adequately protected with rock riprap alone. Steel or concrete, with rock at the lakeward toe of the wall, may be a better choice for a situation such as this.

Other factors to keep in mind when selecting the type of shore protection you wish to install include the potential for functional failure of the structure as well as the environmental impacts involved. Seawalls can fail in a relatively short period of time due to a combination of several factors, including but not limited to:

- *inadequate installation techniques*
- *undermining of the structure by wave action or surface water runoff*
- *hydrostatic pressure behind the wall*
- *ice damage.*

These failures often result in the deposition of fill and debris into the lake, as well as increased costs to the owner for removal of the old structure and construction of a new one.



Riprap is the preferred method of shoreline protection

Environmental Impacts of Shoreline Development

Environmental impacts associated with construction of seawalls include the loss of near-shore habitat that is valuable for production of aquatic food sources, fish spawning, and protection of fry and fingerlings from predator species. They create barriers preventing creatures that depend on both aquatic and terrestrial environments – such as turtles and amphibians – from gaining access to the upland or the water for day-to-day activities. Furthermore, they can cause increased erosion problems on unprotected shorelines of adjacent property owners. Choosing to install rock riprap shore protection can eliminate many of these problems.

Placement, or location, of the proposed seawall is another factor to consider when applying for a permit. Following are guidelines to keep in mind:

- *Seawalls should be constructed at the ordinary high water mark of the lake. The DEQ generally does not permit lakefront owners to reclaim property that may have been lost due to erosion over the years by placing a seawall out into the lake.*

- *If your neighbor on either side has a seawall in place, it is the general practice to connect your new wall to their existing wall.*
- *When replacing an old, deteriorated seawall, the old one should be removed and the new one constructed in the same location. Another option is to construct the new seawall directly behind the old one, and then the old one can be removed.*
- *When constructing a new seawall in front of an existing one, the new seawall should be constructed no more than one (1) foot lakeward of the old seawall.*

It is important that construction of your shore protection does not cause accelerated erosion or sedimentation on any adjacent, unprotected shoreline.

Most seawall projects require some amount of backfill. Should this be the case, locate a source of clean backfill material. In general, dredging for backfill should be avoided; finding an upland source is recommended.

Construction Methods

Depending on the type of shore protection selected, there are several design considerations that should be taken into account. Concrete walls often fail at the foundation due to undermining, if they are installed on the existing lake bottom. It is recommended that minor dredging of the lake bottom be conducted, enough to place the footings below the existing lake bottom.

Steel sheet piling is usually installed by driving the material into the ground. Steel Sheet piles can be driven into hard or soft soils, whereas aluminum is more suited to softer soils, such as sand and silt. The wall should be constructed high enough to avoid over-topping by waves, and the sheet piling should be installed so that one-third of the wall is above the lake bottom and two-thirds of the wall is below the lake bottom. For additional support, anchors consisting of timber or concrete should be installed, and should be attached to the outside of the pilings.

For either of these two types of retaining walls, supplemental drain holes through the face of the wall are recommended to ensure the structure does not retain excessive amounts of water in the soil behind it, causing hydrostatic pressure.

Protection such as riprap at the lakeward toe of a constructed seawall will help prevent undermining of the structure, provide habitat for aquatic organisms and allow lake ingress and egress for amphibians and reptiles. For these reasons, LWMD staff may require a portion of a permitted seawall be protected with riprap at its lakeward toe.

If constructing riprap shore protection, the riprap should be layered over a synthetic filter cloth. The outer rock layer should have different sizes or grades of stone, avoiding the use of fine material. Use of hard, durable and angular stone will best withstand external forces. Round stones may tend to roll, and may not adequately protect the shoreline. Soft sandstone should be avoided because it breaks down easily. Generally, riprap will provide long term protection of shorelines from erosion at a lower cost than retaining walls. Damage to riprap shore protection can usually be repaired at no cost or a much lower cost than a retaining wall by simply relocating displaced stones or adding additional ones where needed. As stated earlier, riprap also enhances fish and wildlife habitat, and can preserve or restore the natural shoreline aesthetics.

For more information regarding shorelines protection contact the LWMD at your local District Office of the DEQ or call the LWMD in Lansing at 517-373-9244.