

SHORELINE EROSION: Questions and Answers

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Cover art by Monique Seibel

Structures And Effectiveness



1. **Q:** What should I know about erosion* control structures before I consider building a home or cottage?

A: With few exceptions, in areas where the effects of Great Lakes water levels and wave action destroy bluff and beach material, no low-cost erosion control method can insure permanent protection. Also, most erosion control devices are unsightly and make lake access difficult. The *best* way to eliminate property damage due to erosion is to move existing structures as far away from the shoreline as your property boundary will allow, and not to build new structures on erosion-prone coasts.

2. **Q:** What is the most reliable and effective type of erosion control device?

A: There is no single "best" protection. Factors such as littoral drift*, lake bottom configuration, beach and bluff material, and others determine what protection is best for a particular area. Look around in your area and see what is working best, or consult a professional engineer who is knowledgeable about your area.

3. **Q:** Why do so many seawalls* fail?

A: Seawalls fail for several reasons related to improper or incomplete construction. Since a seawall is vertical and has a flat surface, it reflects the full force of attacking waves. The energy of these waves is directed upward, downward, and along the shore. The downward energy lifts or scours bottom material away from the seawall, creating deep water on the lakeward side of the seawall. The along-shore component creates littoral currents. Toe protection* in the form of rock

*Asterisk indicates that the word is defined in the glossary at the back of this pamphlet.

must be used to prevent scour. Most seawalls do not have toe protection.

A second reason for seawall failure is the omission of "tie-backs." These are steel or wooden braces running from the seawall to piling in the bluff or bank. Without tie-backs, the seawall may push forward into the water due to back pressure from bluffs and water washing over the wall. Water flowing behind seawalls often carries material away, creating major erosion problems. "Cutoff" and "return" walls would inhibit this process (See Figure 1).

A third problem is the construction materials. Wooden timbers, steel sheet piling, and other materials are generally too short. Seawall material must be driven or jetted several feet into the beach or lake bottom. As a rule of thumb, 2/3 of the timber or piling should be buried and 1/3 should be exposed. An example of proper seawall construction is shown in Figure 1.

4. **Q:** Can an erosion control device restore my beach?

A: Several methods of erosion control are designed to restore lost beach material (to cause accretion). For example, some offshore breakwaters* allow sand to settle behind them in the protected area. One problem with the use of offshore breakwaters, however, is interference with littoral drift which may starve downdrift* areas from natural sand movement. Similarly, protection of the shoreline by groins* assumes that sand is available and moving along the shore. As with

offshore breakwaters, groins interfere with natural shore processes and may entrap beach materials. They should only be used in areas of substantial sand movement. A properly designed groin should be filled with sand to help prevent erosion problems. Additionally, artificial sand nourishment (See Question 5) or sand fill is a method of raising the level of a beach. By mechanically replacing lost sand, the bluff material is protected from direct wave attack. This method, however, is not permanent and may have to be repeated on a periodic basis (as needed), unless groins are installed to slow the movement of sand away from an area (See Figures 2, 3, and 4).

5. Q: Why do I lose vegetative material on my shoreline property and what measures can I take to restore vegetation?

A: Vegetation helps reduce the loss of sand and beach material from effects of wind, rain, ice, etc. However, high water levels, combined with wave action often destroy vegetation by removing the material in which it was growing. Surface runoff and human activity may also destroy beach area vegetation. Shoreline property owners should be aware that vegetation cannot remain in place during wave attack to the bluff. The life span of planted or natural vegetation may be as short as the period between major storms and periodic revegetation may be necessary. Information about shoreline vegetation is available from your local Soil Conservation Service representatives.

6. Q: What is one of the better methods of erosion control which will save my bluff?

A: Revetments* placed on the toe of the bluff to prevent scour due to wave attack. To be effective, revetments need toe protection,*provisions for drainage, and must be built high enough so that most storms' waves will not overtop them. Revetments may be highly effective if properly constructed, although they may require maintenance to restore rock and to replace materials which become displaced during storms (Figure 5).

7. Q: What measures can I take to assure that my erosion control devices will last as long as possible?

A: All shore protection devices should be periodically checked for signs of failure. For example, a seawall may show lakeward movement, erosion behind the seawall or at the toe, or erosion at the end of the structure. If noticed early enough, these signs of failure can be corrected. In some instances, it may be worthwhile to have inspections conducted by professional contractors.

8. Q: If I don't want to install an erosion control device that will provide long-term protection, what other options are available?

A: If you have already constructed a building close to the bluffline, it may be possible to relocate your building away from the bluffline. However, this alternative can be costly and depends upon the size of your lot. If you are planning new construction, set buildings back far enough from the bluffline to assure protection for at least a 30-year period, based upon the average annual recession* of your bluff material.

Information about building setback can be obtained from the Department of Natural Resources, Division of Land Resource Programs, P.O. Box 30028, Lansing, Michigan 48909.

9. Q: What are some examples of shore protection devices that should be avoided?

A: Inadvisable solutions for shore erosion problems include debris dumped on bluffs, sewer pipe used as a bulkhead, small sandbag revetments, tires on poles or randomly placed large concrete blocks, small stone revetments and low-cost seawalls. Some of these poor protection methods, such as dumping debris on bluffs, are also illegal. Poor methods usually offer no effective protection, are unsightly, and may result in greater shoreline problems.

10. Q: What are some of the most common mistakes made by property owners who install erosion control devices?

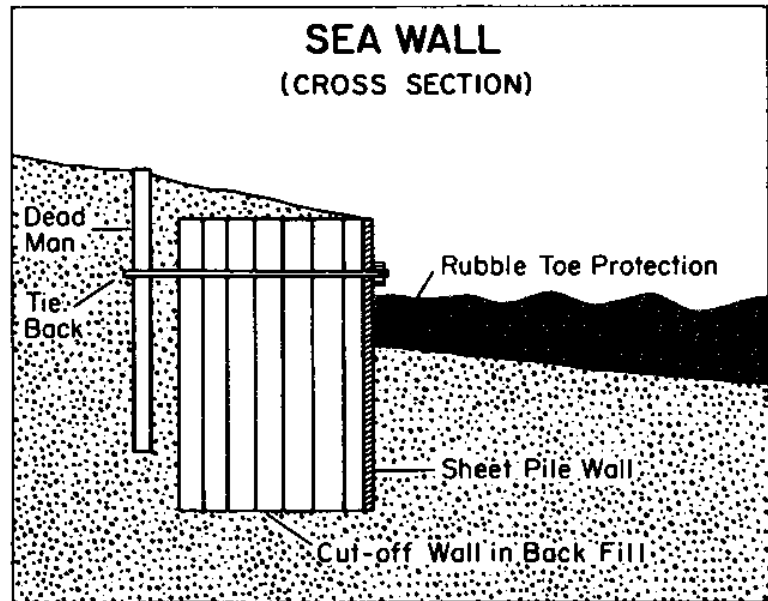
A: Problems frequently encountered during and after installation of an erosion control device include:

— **Improper planning:** often a property owner inaccurately assesses which method or methods of control will work most effectively. In many cases, a combination of erosion control devices are necessary. For example, when a property owner tries to restore a beach through artificial nourishment, it may be necessary to install groins to retard movement of the newly replaced sand away from the area.

— **Inadequate construction methods:** Unless a property owner has special building and shore process knowledge, it is unlikely that he or she can personally install an effective erosion control device without professional assistance. Poorly built control structures will fail in a short period and replacement can be more costly than if a professional installation expert had been initially contacted.

— **Improper maintenance and repair:** Even the most expensive and effective means of erosion control must be checked periodically and repaired if signs of failure exist. You should either consult a professional contractor or make frequent spot checks yourself.

Figure 1



6 3

Figure 2

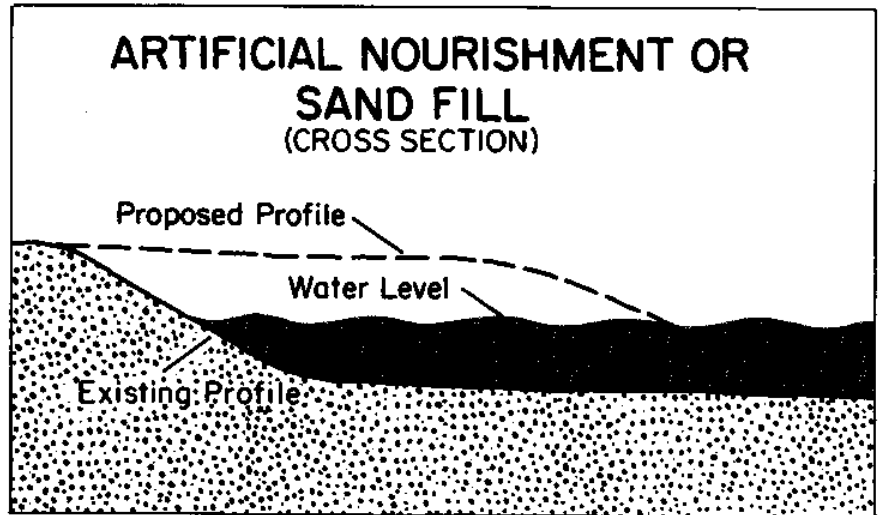


Figure 3

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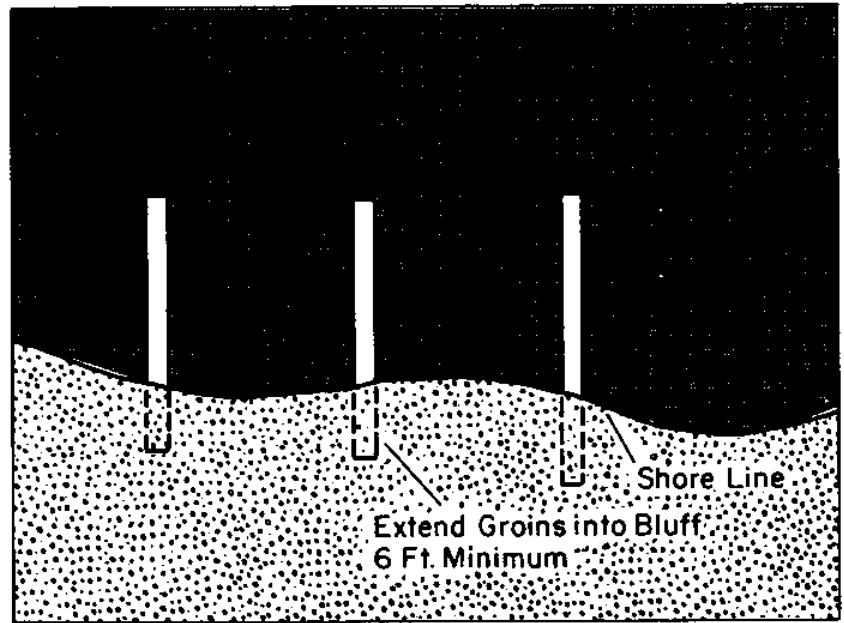


Figure 4

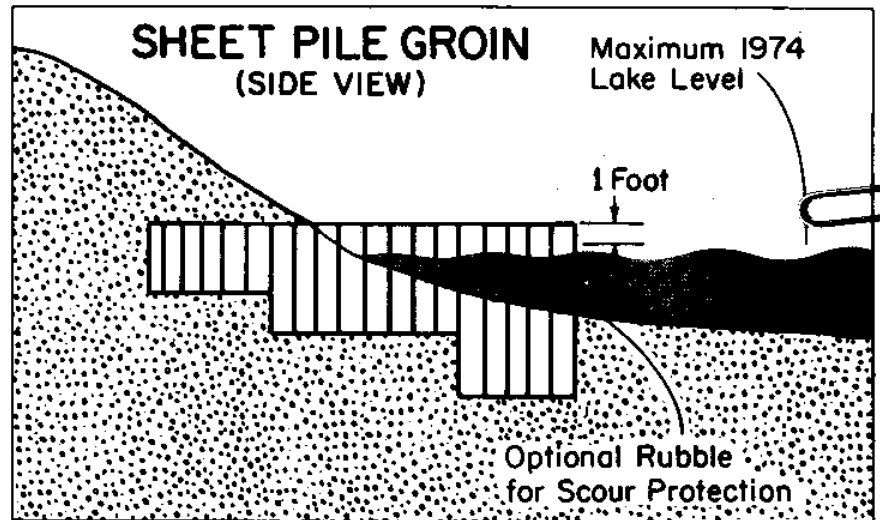
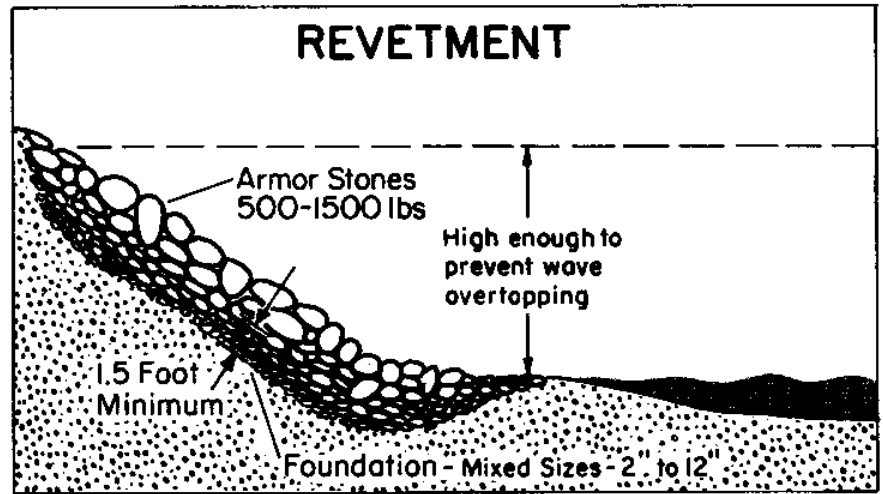


Figure 5



Permits
And Laws



1. Q: What type of permits are needed to construct a legal shore protection device on the Great Lakes, and where do I obtain a permit application?

A: In most cases permits are required by the State of Michigan and the United States Army Corps of Engineers before you can construct a legal erosion control device. Permit applications required by the State can be obtained from the Water Management Division, Submerged Lands Section, at the Department of Natural Resources in Lansing, P.O. Box 30028, Lansing, Michigan 48909. To receive a federal permit application, get a copy of "Permits for Work in Navigable Waters" from a Corps of Engineers office. It will provide information about federal permits for erosion control devices.

2. Q: How long will permits take to process?

A: In areas where the General Permit procedure is in effect, a permit can be obtained in about two weeks if the proposed work conforms to the provisions of a General Permit. In other cases it may take up to four months to obtain the necessary permits. (When demands for permits are unusually high, allow for a longer waiting period). If the work is urgent, it is possible to hasten the permit process by using emergency procedures.

3. Q: Is there Federal, State, or local governmental financial assistance to private property owners who wish to install an erosion control device?

A: Currently, no Federal, State, or local financial assistance is available to individual property owners who wish to install an erosion control device. Technical assistance, however, is available.

4. Q: Is any State financial assistance available for a Township which wishes to install an erosion control device?

A: Yes, there is current legislation, Public Act 148 of 1976. This act provides for the financing of public construction, maintenance, repair, or improvement of erosion control structures made by townships provided by the issuance of bonds. Owners of a majority of the total land area in this special assessment district must file a petition with their Township Board.

5. Q: Is federal flood insurance available for lake-shore erosion damage?

A: Yes, a community can apply to become a member of the National Flood Insurance Program (N.F.I.P.). To be eligible, the community must enact a local ordinance which would regulate construction in flood-prone areas. There are two program types under the N.F.I.P. The emergency program is for those communities lacking flood elevation information; coverage is limited to \$35,000. When detailed elevation data is obtained, a community can join the regular flood program which has a \$70,000 limit on coverage.

A homeowner may opt for private insurance, but it is costly and difficult to obtain. Currently, most shoreline counties are qualified under N.F.I.P. in Michigan.

Costs And Contractors



1. Q: What should I know before I sign a contract for installation of an erosion control device?

A: Make sure the contractor has previously installed erosion control devices. Some contractors may have difficulty with installation work because they underestimate the job, are inexperienced, or other reasons. It is important that a contract states exactly what will be built, how much material will be used, when it will be built, and at what cost. The contractor should provide drawings (plans) of the proposed structure and include the plans as part of the contract. It is best, however, to include the services of a consulting engineer when formulating the plans.

More Information



1. **Q:** What are the primary causes of erosion?

A: The principal source of erosion is wave action during major storms. Other causes are ice action, seepage, surface runoff, and wind. During periods of high Great Lakes water levels, wave action strikes the bluffs, resulting in increased erosion rates.

2. **Q:** Are Great Lakes water levels predictable?

A: No. Fluctuations of Great Lakes water levels are unpredictable and during times of high water, will continue to affect property by accelerating the rate of bluffline recession and loss of beach material, including vegetation. Water levels are primarily influenced by changes in the amount of precipitation and evaporation, factors which are difficult to predict.

3. Q: If I intend to purchase shoreline property, what are some of the most obvious indicators of erosion?

A: Common indicators of severe bluffline erosion include:

- amount of vegetation removed from bluff (25% or more)
- freshly exposed soil
- slumped material at the base of the bluff
- narrow beach
- turbidity (cloudiness) of adjacent water
- damaged erosion control structures
- damaged land structure
- presence of erosion protective works
- steep angle of the bluff
- deep water

Any one or combination of the above indicates that the property has potential for severe erosion problems (where the rate of bluffline recession is one foot or greater per year).

4. Q: Where can I find more detailed information about erosion control devices?

A: Contact the following agencies or order the free publications listed beside their addresses:

Michigan Sea Grant Program
The University of Michigan
2200 Bonisteel Boulevard
Ann Arbor, Michigan 48105

1. Buying Shoreline Property, MICHU-SG-75-101
2. Shore Erosion: What to Do, MICHU-SG-100
3. Shoreline Protection Guide for Property Owners: Insight No. 2
4. Shoreline Erosion: Special Problems for Realtors, MICHU-SG-76-302

Michigan Department of Natural Resources
Division of Land Resource Programs
Shorelands Section, Mr. Fredrick Clinton
Box 30028
Mason Building
Lansing, Michigan 48909

1. Michigan Demonstration Erosion Control Program, Evaluation Report, November, 1974
2. Michigan Demonstration Erosion Control Program, Update Evaluation, August, 1975
3. Michigan Demonstration Erosion Control Program, Update Evaluation, November, 1976
4. Low Cost Shore Protection for the Great Lakes, The University of Michigan, reprinted, 1975.
5. Beach Erosion in Michigan, an Historical Review

United States Corps of Engineers
Detroit District
P.O. Box 1027
Detroit, Michigan 48231

Coastal Zone Laboratory
The University of Michigan
1101 North University Building
Ann Arbor, Michigan 48105

1. Help Yourself: A discussion of the critical erosion problems on the Great Lakes and alternative methods of shore protection.

Glossary Of Terms



1. ANNUAL RECESSION
 2. BREAKWATER
 3. BULKHEAD
 4. DOWNDRIFT
 5. EROSION
 6. GROIN (British, GROUYNE)
 7. LITTORAL DRIFT
 8. REVETMENT
 9. SEAWALL
 10. TOE
1. the total horizontal retreat of the top of the bluff, measured in feet or meters per year; often presented as an average over several years.
 2. a structure protecting a shore area, harbor, anchorage, or basin from waves.
 3. a structure or partition to retain or prevent land from sliding. A secondary purpose is to protect the upland against damage from wave action.
 4. the direction of predominant movement of shore littoral materials.
 5. the wearing away of land by natural forces. On a beach, the carrying away of beach material by wave action, tidal currents, littoral currents, or wind.
 6. a shore protection structure built perpendicular to the shoreline to trap littoral drift or retard shore erosion.
 7. movement of sand parallel to the coast, through the combined forces of the longshore current and wave action on the beach.
 8. a facing of stone, concrete, etc., built to protect a steep slope, embankment, or shore structure against erosion by wave action or currents.
 9. a structure separating land and water areas, primarily designed to prevent erosion and other damage due to wave action.
 10. the lakeward, lowest portion of a steeply inclining bank (bluff)

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