

FS-048

Erosion abatement tips, assessment, and assistance

CIRCULATING COPY
Sea Grant Depository



**Ohio Sea Grant
College Program**
The Ohio State University
1314 Kinnear Road
Columbus, OH 43212-1194
TEL 614/292-8949
FAX 614/292-4364

The Ohio Sea Grant College Program supports efforts to understand and wisely manage the nation's ocean, coastal, and Great Lakes resources by supporting university-based research, advisory service, education, and communication projects. Ohio Sea Grant works with universities, communities, industries, organizations, and government agencies.

Ohio Sea Grant, based at The Ohio State University, is one of 29 state programs in the National Sea Grant College Program of the National Oceanic and Atmospheric Administration (NOAA), Department of Commerce. Support is also provided by the Ohio Board of Regents, Ohio Cooperative Extension Service, other universities, industries, and associations.

OHSU-FS-048

by Frank R. Lichtkoppler,
Ohio Sea Grant Extension
District Specialist, and
Richard Bartz, Ohio Department of Natural Resources
1991

This publication is produced by the Ohio Sea Grant College Program (projects M/P-2 and A/EP-1 under grant NA90AA-D-SG496).

© The Ohio State University
Printed on recycled paper



Private shoreline property owners experience a high rate of failure in their efforts to abate shoreline erosion along the Great Lakes. A 1981 Canadian study at the town of Stoney Brook on Lake Ontario found that 71 percent of all privately constructed shoreline protection structures were destroyed within 10 years.

The three primary causes of the high failure rate include (1) the lack of neighborhood coordination in construction of erosion abatement projects, (2) inadequate design and construction of privately financed projects, and (3) the nature of the physical environment.

While not much can be done to change the nature of the physical environment, citizens can work to improve the cooperative efforts, design, construction, and financing of erosion control measures. The most effective way to deal with erosion problems is on a "reach basis" (a stretch of shoreline with a similar orientation and physical characteristics). Through a joint project along a reach of shoreline, residents can provide structurally and economically improved protection. In turn, municipalities may assist groups of coastal property owners in securing adequate financing for well-designed, well-constructed, group erosion control measures.

To increase your chances of a successful erosion abatement project, organize and work with your neighbors, learn as much as possible about the nature and causes of coastal erosion, and consult qualified experts and marine engineers.

Neighborhood coordination

Several Ohio Lake Erie shoreline communities (the cities of Lakewood, Rocky River, Bay Village, and Euclid) have succeeded in implementing innovative methods for financing shoreline erosion control measures. These municipalities were able to provide "loans" to shoreline residents at lower than market rates and at terms of up to 20 years for an erosion control measure. The shoreline residents submitted a petition to the municipality, which was signed by all the property owners involved and which requested a shore erosion project be constructed. The municipality treated the request like most any other capital improvement project, e.g. building sidewalks. The project was constructed by the municipality

and paid for by notes issued for the entire cost of the project plus the municipalities' costs through a special assessment property tax.

A more detailed outline of this process follows. The basis of authority for this project is Section 727.06 of the Ohio Revised Code. Before attempting to initiate this process, legal and bond counsel should be consulted.

1. Identify project area and landowners. Meet to determine type of protection and financing procedures. All shoreline property owners in project area must agree to type of protection and financing.
2. Obtain necessary local, state, and federal permits. Obtain lease of Lake Erie lands, if necessary.
3. Owners submit 100 percent petition to city council, including:
 - A. Grant City Easement
 - B. Right to Access
 - C. Right to Construct Improvement
 - D. Easement allows ingress and egress for installation and functions as a perpetual easement for further maintenance, if necessary.
4. If project includes state assistance, City Council adopts resolution allowing the City to act as an agent for the owners and applying for grant monies from the State and approving the petition and conditions thereof submitted to Council;
 - Adopt resolution allowing the Mayor to make application for grant monies to the Ohio Department of Natural Resources;
 - Adopt resolution allowing the City to accept State grant monies for Erosion Improvement Project;
 - Adopt Appropriation Ordinance authorizing the two-thirds balance of construction monies to be forwarded to the State of Ohio for release of payment to the contractor upon completion.
5. City Council adopts Resolution of Necessity declaring public improvement as being required.
6. Conduct public hearings for the purpose of answering questions and concerns regarding the proposed improvement.

7. Prepare and deliver preliminary assessments.
8. City Council adopts Ordinance to Proceed with public improvement and allows competitive bidding and the entering into contract for said improvement.
9. City Council adopts Note and Bond Ordinances for short and long-term borrowings.
10. City Council adopts Ordinance to Assess upon completion of public improvement.

There are some additional points that need to be mentioned.

- The petition should state that the maintenance of the structure is the responsibility of the upland owners. The sponsoring municipality is not responsible for any maintenance costs.
- The more people involved, the more cost-efficient the entire project will be (more property owners equals less cost per property). The municipality's costs are fixed whether it involves 3 or 12 properties. These costs include staff time for the City Engineer, Finance Department, Development Director, and legal counsel.
- Depending upon the design of the structure, not all properties have to be contiguous. For example, the installation of precast concrete modular breakwaters with shore returns allowed a property within one project area not to be protected and did not affect the integrity of the structure or protection of other properties.
- The municipality's role in the project is only to provide financial assistance. The property owners must choose the design of the erosion control measure with certain criteria from the municipality, i.e., the life expectancy of the structure should be 25 years.
- The special assessment petition and property easements are the only special documents that need to be prepared. The other documents to be approved by City Council are "routine," such as the Resolution of Necessity, certificate for the life of the improvement, certificate relative to borrowing funds, and an ordinance to provide for the issuance of notes.

Design and construction of projects

Inadequate design and construction can be traced in part to the limited financial resources of most private property owners. The cost of erosion control measures is very high. Depending on the site characteristics and the design, erosion control measures can cost between \$150 and 1,000 per linear foot for residential property. Offshore breakwaters protecting harbors can cost over \$2,000 per linear foot. Most coastal residents are not able to finance erosion control measures with their own resources. In many cases, financial institutions are not willing to provide loans for shore erosion control measures.

In the 1978 pamphlet, *Help Yourself*, the U.S. Army Corps of Engineers provided basic construction and maintenance guidelines for shoreline protection structures.

These guidelines are reproduced here in an effort to help shoreline property owners avoid common errors in the construction and design of structures for shoreline erosion abatement.

1. *Provide adequate protection for the toe (base) of the structure that faces the water so that it will not be undermined.* Most failures of shore protection works result from erosion that occurs under the lowest part of the structure. Check for signs of failure such as the lake-ward movement of the structure and/or erosion behind or at the ends of the structure.
2. *Secure both ends of the shore protection works against erosion.* Erosion will continue adjacent to your structure. Tie the structure directly into the bluff at both ends, and check for signs of failure at the ends.
3. *Check foundation conditions.* Soft foundation material may result in excessive settling of the structure. Check for settling or excessive displacement. Water pressure due to groundwater seepage may cause some types of impermeable walls to move towards the lake.
4. *Use material that is heavy and dense enough that waves will not move individual pieces of the protection.* Waves have tremendous power and can move a great deal of material in a short time. Small stones will be quickly carried away in a storm. Use material and stone large enough to prevent your protective structure from washing away.
5. *Build your protective structure high enough that waves cannot overtop it.* Spray overtopping is all right, but not green water. Many failures have occurred because the structure was not built high enough and wave erosion continued behind the structure as if it were not there.
6. *Make sure that voids between individual pieces of protection material are small enough that underlying material is not washed out by waves.* A filter material, such as nylon filter cloth, must be placed on a highly erodible embankment to prevent the fine material from washing through the voids in the rock revetment.

Construction of shoreline erosion control structures is a costly but popular alternative to shore erosion. Careful attention to the six rules above will insure that the structure will perform up to its maximum design capabilities.

Once a structure is properly built, it must be properly maintained if it is to serve its intended purpose satisfactorily. Frequent inspection of your structure is necessary to spot signs of failure or damage. Inspect shore-protection structures after every storm, and repair any damage immediately.

Protecting the base of the bluff from wave erosion is only a partial and incomplete solution to the complex problem of shoreline erosion. Bluff drainage and surface erosion problems due to wind and rain must also be properly managed. Dumping rock, broken concrete, old tires, autos or

other debris over an eroding bluff violates most of the above rules and will not prevent or halt bluff erosion. Erosion and failure of the bluff may even be increased due to the added weight of the debris.

If you are considering any work, such as construction, dredging, or filling that will involve the public waters of Ohio or the navigable waters of the United States, you must have the proper permits.

Permits are necessary to:

protect the quality of Ohio's water resources, prevent obstruction of navigable waters of the United States, and control dumping of dredged materials, fill materials, or refuse into public waters.

Protect yourself. It is illegal to proceed with work before the proper permits are issued. And, obtaining a permit takes time! Apply a minimum of 120 days prior to the start of planned construction. If there are problems, up to a year may pass before permits are issued. Violators of the permit programs are subject to fines and/or imprisonment and offending structures may be removed.

Some of the information required to obtain permits includes construction plans drawn to scale, location of property, location of proposed structure on the property, names and addresses of adjacent property owners, dates construction will begin and end, and the applicant's name and address. Be sure to **apply before you build and apply early.**

The U.S. Army Corps of Engineers requires a permit for any work or structure along the shoreline of Lake Erie including adjacent wetlands. These are considered "navigable waters" of the United States and fall within their jurisdiction.

To obtain a permit application, request Engineering Form 4345 and *Permit Program: A Guide for Applicants* from:

The Commander, U.S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, NY 14207-3199
Attn: CENCBCO-S
Phone 716/879-4330

Upon receipt of an application, the Corps of Engineers will issue a public notice of proposed work to concerned agencies, groups, adjacent property owners, and others indicating an interest. Usually the information contained in the application for this permit is sufficient for other regulatory agencies to judge the environmental effects of your proposed works. These regulatory agencies include the Ohio Department of Natural Resources (ODNR), Ohio Environmental Protection Agency (OEPA), U.S. Fish and Wildlife Services, and others. If additional information is necessary, you will be contacted.

Ohio law requires a permit from the Ohio Department of Natural Resources before building a beach or any structure to control erosion on the Ohio shore of Lake Erie. Ohio law also requires that you obtain a water quality certificate from the Ohio Environmental Protection Agency before you do any work involving Ohio's water, including Lake Erie. The

shoreline property owner may also need a submerged land lease from the Ohio Department of Natural Resources, Office of Real Estate and Land Management, for the project.

The Corps of Engineers will issue a permit only if it is determined to be in the public interest. However, the Corps of Engineers cannot issue a permit if water quality certification from the Ohio Environmental Protection Agency or other state or local approvals are denied.

In addition, be sure to contact your local government (city, county, or township) for local permits that may be required, such as building permits, erosion setback requirements, or flood plain regulations.

The nature of the physical environment

The two primary shore erosion processes at work along Ohio's Lake Erie shoreline are wave erosion and mass wasting. For more information on this subject, request a copy of *Lake Erie shore erosion* (OHSU-FS-019) from Ohio Sea Grant (The Ohio State University, 1314 Kinnear Road, Columbus, OH 43212-1194).

Additional information on erosion available from Ohio Sea Grant includes:

Identify your shoreline erosion problems,

OHSU-FS-018,

Lake Erie water levels, OHSU-FS-025,

Questions to ask before you buy Great Lakes shoreline property, OHSU-FS-036,

Beaches are shore protection, OHSU-FS-020, and

Coastal erosion and the residential property market,
OHSU-FS-044.

For one to four copies of any of these publications, there is no charge. The charge for additional copies is \$1.00 for four publications, e.g., if you order one copy of four and two copies of a fifth publication for a total of six, the charge is \$1.00. Make checks payable to The Ohio State University.

For more information

Contact any of the three Ohio Sea Grant Extension district specialists or any of the other offices listed below.

Frank Lichtkoppler
Ohio Sea Grant Extension
Lake County Extension Office
99 East Erie Street
Painesville, OH 44077
216/357-2582 FAX 216/354-5928

Dave Kelch
Ohio Sea Grant Extension
Lorain County Extension Office
42110 Russia Road
Elyria, OH 44035
216/322-0127

Fred Snyder
Ohio Sea Grant Extension
Camp Perry, Building 3, Room 12
Port Clinton, OH 43452
419/635-4117

Division of Geological Survey
Lake Erie Section-ODNR
305 E. Shoreline Drive
P.O. Box 650
Sandusky, OH 44870
419/626-4296

Division of Water-ODNR
Fountain Square, Building E3
Columbus, OH 43224
614/265-6730

Office of Chief Engineer-ODNR
Fountain Square, Building D2
Columbus, OH 43224
614/265-6948

Office of Real Estate and Land Management-ODNR
Fountain Square, Building C4
Columbus, OH 43224
614/265-6413

Additional readings

- Help Yourself - A Discussion of Erosion Problems on the Great Lakes and Alternative Methods of Shore Protection.* 1978.
The Commander, U. S. Army Corps of Engineers, 1776 Niagara Street, Buffalo, NY 14207. 24 p.
- Permits program: A guide for applicants.* Pamphlet EP 1145-2-1.
The Commander, U. S. Army Corps of Engineers, 1776 Niagara Street, Buffalo, NY 14207.
- Instructions for Permits for Works to Arrest Erosion Along the Ohio Shoreline of Lake Erie.* Ohio Department of Natural Resources, Office of the Chief Engineer, Fountain Square, Columbus, OH 43224.
- Low Cost Shore Protection.* 1981. The Commander, U.S. Army Corps of Engineers, 1776 Niagara Street, Buffalo, NY 14207. 36 p.
- Low Cost Shore Protection, A Property Owner's Guide.* 1981.
Section 54 Program, U.S. Army Corps of Engineers, USACE (DAEN-CWP-F), Washington D.C. 20314. 159 p.

