

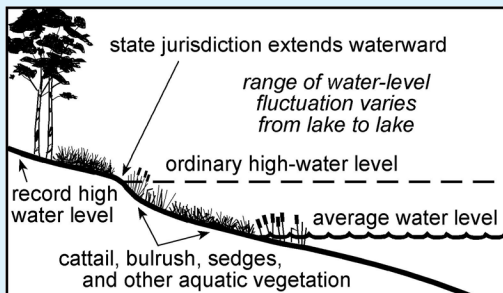
# Shoreline Alterations: Ice Ridges



## Is an individual permit required?

For most projects constructed *below* the ordinary high-water level\* (OHWL) of public waters, an individual Public Waters Work Permit is required from the Minnesota Department of Natural Resources (DNR).

*Ice ridges exception:* An individual permit from the DNR is not required for the grading or removal of an ice ridge if the conditions outlined on this information sheet are followed.



Shoreline cross section

If you have questions concerning the contents of this information sheet, contact your local DNR Area Hydrologist. See contact information on reverse side.

Please note that local units of government and other agencies may require a permit for this project.

\*For lakes and wetlands, the OHWL is the highest elevation that has been maintained as to leave evidence on the landscape. It is commonly that point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial. For watercourses, the OHWL is the top of the bank of the channel. For reservoirs and flowages, the OHWL is the operating elevation of the normal summer pool.

## What causes ice ridges and what can I do about them?

Property owners occasionally return to their cabins in the spring only to discover they are dealing with property damage caused by a phenomenon called "ice heaving" or "ice jacking". This powerful natural force forms a feature along the shoreline known as an "ice ridge". The result may include significant damage to retaining walls, docks and boat lifts, and sometimes even to the cabin itself.



Ice ridge formed along the shore of Shamineau Lake in Morrison County.

**How do ice ridges form?** Ice ridges are caused by the pushing action of a lake's ice sheet against the shore. Cracks form in the ice because of different contraction rates at the top and bottom of the ice sheet. This is especially true in years that the ice sheet lacks an insulating snow cover. Ice cracks also develop because the edges of the ice sheet are sometimes firmly attached to the shore. When water rises in the cracks and freezes, the ice sheet expands slightly. Rising air temperatures warm the ice, leading to additional expansion, which exerts a tremendous thrust against the shore. Alternate warming and cooling of the ice sheet leads to additional pushing action, causing the ice to creep shoreward and scrape, gouge, and push soil and rock into mounds (called "ice ridges", "ice pushes", or "ramparts").

**What can be done about ice ridges *after* they form?** Because ice ridges do provide ecological benefits (described below), the ideal reaction to the formation of an ice ridge would be to do nothing other than remove personal property from its zone of influence. However, this is often impractical. Ice ridges can impede use of the lake by a property owner or the users of public lakeshore facilities. Therefore, action may be taken to remedy the results of ice activity.

# Shoreline Alterations: Ice Ridges

Lake access can be obtained by ramping over or cutting through the ice ridge. There are circumstances, however, when it may be necessary to remove or grade an ice ridge. An individual Public Waters Work Permit is *not* required from the DNR to remove or grade an ice ridge if the work meets the following conditions:

- The ice ridge resulted from ice action within the last year.
- The project is either exempt from local permits or is authorized by issuance of a local government permit.
- Not more than 200 feet of shoreline is affected.
- All ice ridge material that is composed of muck, clay, or organic sediment is deposited and stabilized at an upland site above the ordinary high-water level (OHWL; see sidebar on page 1).
- All ice ridge material that is composed of sand or gravel is removed as provided above or graded to conform to the original cross section and alignment of the lakebed, with a finished surface at or below the OHWL.
- No additional excavation or replacement fill material occurs on the site.
- All exposed areas are immediately stabilized as needed to prevent erosion and sedimentation (see Lakescaping information sheet).
- Local zoning officials, the watershed district (if applicable) and the soil and water conservation district are given at least 7 days' notice before beginning the project.

Removal or grading of an ice ridge must not disturb emergent aquatic vegetation, unless authorized by an aquatic plant management permit from the DNR's Division of Fisheries.

**What can be done about ice ridges *before* they form?** The simplest means of avoiding ice-related damage to shoreline property is to ensure that personal property is out of wrath's path. State and local shoreland regulations requiring setback limits not only lead to improved aesthetics but also help to minimize personal property damage from ice action and wave-induced erosion. Engineering solutions are sometimes pursued to remedy ice ridge problems, but they can be expensive and ineffective. If an engineering solution is pursued, property owners should seek the advice of a professional.

**What are the benefits of ice ridges?** Ice ridges are natural berms that have formed around Minnesota's lakes over thousands of years. These mounds of material provide the lake with ecological benefits by creating a barrier to nutrient loading. Nutrients collect on the landward side of the mound, producing fertile soil where plants and trees thrive. The root systems of this near-shore plant community help to protect the shore from erosion and soak up additional nutrients. Shade and habitat offered by near-shore plants benefit organisms along the shore and in the lake, thus supporting nesting and spawning fish.

Ice ridges also work to protect the shore from the lake itself. For example, a small ice ridge formed one year is followed by additional pushes in ensuing years. The ridge is fortified by jamming rocks into it. The roots of the near-shore plant community bind together the soil and rock to form natural shoreline protection.

©2003 State of Minnesota, Department of Natural Resources. Prepared by DNR Ecological and Water Resources. Based on Minnesota Statutes 103G, Public Waters Work Permit Program Rules Chapter 6115.

## DNR Contact Information



DNR Ecological and Water Resources  
website and a listing of Area Hydrologists:  
<http://mndnr.gov/waters>

DNR Ecological and Water Resources  
500 Lafayette Road, Box 32  
St. Paul, MN 55155  
(651) 259-5100

*This information is available in an  
alternative format on request.*

## DNR Information Center

Twin Cities: (651) 296-6157  
Minnesota toll free: 1-888-646-6367  
Telecommunication device for the deaf (TDD): (651) 296-5484  
TDD toll free: 1-800-657-3929

Equal opportunity to participate in and benefit from programs of the Minnesota Department of Natural Resources is available regardless of race, color, national origin, sex, sexual orientation, marital status, status with regard to public assistance, age, or disability. Discrimination inquiries should be sent to Minnesota DNR, 500 Lafayette Road, St. Paul, MN 55155-4049; or the Equal Opportunity Office, Department of the Interior, Washington, DC 20240.