ENVIRONMENTAL
Fact Sheet

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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Perching Beaches to Lessen Impacts to Lake Quality

Owners of waterfront property often want to add a sandy beach for recreation along the water. This involves modification of the natural shoreline by clearing vegetation, excavating to prepare a surface, and applying sand. In accordance with state regulations (RSA 482-A), a permit from the New Hampshire Department of Environmental Services (NHDES) Wetlands Bureau is required for construction of a beach because it impacts areas within the banks of a surface water body. Beaches permitted by NHDES must also comply with the Shoreland Water Quality Protection Act (RSA 483-B). RSA 483-B requires, among other things, that a vegetated waterfront buffer be left intact in order to preserve the integrity of the shoreline and protect water quality. Other local and federal regulations also may apply to beach construction. This document explains some of the impacts that beach construction may have on the environment as well as the concept of "perching" a beach to reduce these impacts.

The Multiple Impacts of Sand on Lakes

Physical Impacts:

Lakes act as settling basins for their watersheds, collecting and accumulating materials that move downslope and drain into them. This process, which results in the gradual filling-in of lakes over thousands of years, is known as "lake aging." Lake aging is a natural succession from lake to marsh, to meadow, and eventually to dry upland. The processes that cause lake aging cannot be stopped or reversed but they can certainly be accelerated.

Any activity that adds more material to a lake than would be supplied naturally increases the rate at which a lake is filled in. Periodically adding sand to a lake, or lakeshore, where it will erode into the water, greatly accelerates lake aging. It's difficult to imagine how adding just 1 cubic yard of sand to a beach each year could damage a lake until one considers that in 10 years this equals an entire dump truck load of sand, and if you stop consider the other property owners that might be doing this, the numbers add up quickly!

If a shoreline *does not* have a natural beach, this is a clear indication that natural erosive forces such as wind and water will work to destroy any beach constructed on site. The eroded sand will either be carried along the shoreline until deposited on someone else's frontage or will settle out along the frontage it was placed upon. The sand may disappear from view, but it does not leave the system. It is added to the natural sediment load in the lake and accelerates the lake aging process. Compounding this problem, it often accumulates in channels or coves where it disrupts boat navigation and renders some frontages inaccessible by boat.

Biological Impacts:

The physical process of accelerating lake aging has major biological impacts. A shallower lake has a reduced volume of water to dilute and process incoming contaminants, such as phosphorus, which easily attaches itself to sand particles. Increases in phosphorous, combined with a shallower lake bed, often result in accelerated growth of aquatic vegetation and algae. This rapid growth, in turn, can cause water oxygen levels to decrease, which can suffocate aquatic animals, most visibly, fish.

In addition, as a lake becomes shallower, more of the lake bed is exposed to sunlight, resulting in increased water temperatures. Warmer water is less capable of holding oxygen and increased nutrients from the sand, and increases rooted aquatic plant growth, including exotic species such as milfoil.

Dumping sand along the shore of a lake can smother benthic (bottom dwelling) algae, invertebrates and other critical habitats, causing a disruption in the food chain of higher organisms that depend on them, including fish. Also, rather than sandy bottoms, many fish species rely on stony bed habitats for nesting and spawning purposes.

Increase in turbidity (reduced water clarity) caused by the addition of sand with a high content of finer materials may also interfere with normal fish behavior by clogging gills and impairing vision.

Chemical Impacts:

The mineral composition of sand is not consistent. Although clean, washed beach sand is primarily quartz, which is relatively inert, sand can contain other materials. In New Hampshire, iron is a common component of sand and gravel. Iron-rich sand will frequently result in the presence of iron bacteria. Although iron bacteria do not pose a health hazard, they do cause aesthetic problems by creating rust-colored slime deposits and oil-like films on the sand as they oxidize the iron.

Sand may also contain contaminants other than iron, all of which have the potential to wash out of the sand and into the water. Clay is a material that, if present in the deposited sand, can cause turbidity problems (reduced water clarity). Nutrients such as phosphorus, which readily attaches to sand particles, can contribute to increased macrophyte, algae and cyanobacteria growth in the water column.

Beach Location, Size and Configuration

A beach should be placed in a location on the lake frontage that poses the least environmental impact. When selecting an appropriate location, look for an area that requires the least amount of tree, vegetation, rock and soil removal. Ideally, you should choose an area where the slope of the land is naturally more flat. Shoreland Protection rules prohibit the construction of beaches in or on slopes steeper than 25%. The slope is calculated by dividing the total increase in the height of the land from the lowest point of the project to the highest point of the project. This is measured from the lakeward most edge of the project to the landward most edge of the project, and then multiplied by 100. Beach construction in wetland areas such as emergent,

marshy shorelines is prohibited. Be certain to locate an area of the shoreline where the adjacent lakebed is not mucky and has little aquatic weed growth. In addition to being an area for which a permit may be granted, it will provide better conditions for swimming and less disturbance to the lake habitat and water quality.

Dredging the lake-bottom and placement of sand in the water for beach construction for private residential use is not permitted. These are environmentally damaging activities and are activities that are only permitted for public facilities in rare and extenuating circumstances. Additionally, the beach and associated construction activities must be located at least 20 feet from property boundaries unless written permission is obtained from the affected abutter(s).

Single family residential beaches cannot impact more than 20% of the shoreline frontage with a maximum approvable beach width of 50 linear feet. The beach construction cannot result in the alteration of more than 900 square feet of bank and shoreline. Constructing beaches larger than this are considered only for public or community use and are classified as major wetland impact projects. The need for a larger beach must be well demonstrated.

Perched Beaches:

Current NHDES policy requires that all new beaches must be constructed in a "perched" position on the waterfront. A "perched beach" must have little or no slope and must be located entirely out of the water, above and landward of the existing undisturbed natural shoreline. Narrow, typically 4 ft. wide access steps to the water may be incorporated into the design. If steps are constructed, they must either be wooden removable steps over the bank or stone steps that are cut in and are completely recessed into the shoreline. All sand must be placed on the flat beach surface above the high water mark and out of the water. The construction of a beach in a perched position helps prevent the erosion of sand into the water and decreases the rate of lake aging. Perched beaches also require less maintenance, which is a direct benefit to the land owner.

Construction of a Perched Beach:

Construction should occur during the lake drawdown. If this is not possible, the work should be scheduled for when the lake is at its lowest level. Appropriate erosion and siltation controls must be installed prior to construction and maintained until all disturbed areas are stabilized. No machinery shall enter the water during construction.

The perched beach must be constructed in a manner that does not disturb any boulders along the shoreline. If the frontage is not naturally rocky, then a barrier of no more than 12 to 18 inches may be permitted and constructed landward of the high water mark. This barrier may be of wood or stone and should present a rough face to the lake in order to dissipate wave energy. Such a barrier often helps to raise the front edge of the beach, allowing it to be more level, and separates the perched beach from the water. If excavation into the bank is required, the project must incorporate an appropriate method to stabilize the landward side of the cut. A stone retaining wall is often used to stabilize this landward side. A low berm should be designed to run along the top of this wall to direct run-off around the beach and prevent erosion. Planting this berm with low-growing, woody-stemmed, native vegetation will help stabilize it and further reduce the transfer of nutrients from the shoreline to the lake.

Any sand placed in the beach area must be clean. Clean sand contains little or no silt or loam. Silt or loam can cause water quality problems if it enters the lake. Generally, not more than 10 cu. yd. of sand may be placed on a new perched beach. The depth of sand on the beach should not exceed six inches. This maximum should be considered when calculating the amount of sand to be used for new construction. Use of more than 10 cu. yd. will result in a higher wetlands project impact classification such as minor or major.

Access to Water from Perched Beach:
Steps leading to the water from the beach may be included in the design. They should be constructed so that they are cut back into the bank, rather than extending into the lake. If removable wood stairs are used, they should be constructed over the existing grade. Stairs that are constructed over the existing grade and are removable at the end of the season are the preferred design. Steps should be no more than four feet wide. Very limited dredging (less than one cubic yard) beyond the steps may be permitted when the need can be sufficiently demonstrated. Such dredging will result in a wetlands project impact classification of at least minor.

Surface Water Runoff Diversion:
Beach projects must incorporate methods for diverting surface runoff around the beach to prevent erosion of the sand into the lake during storm events. Some designs incorporate a shallow grass or stone-lined swale around the landward side of the beach. In areas where a high volume of run-off may occur, a combination of both a swale and planted berm should be considered. It is far more cost effective and beneficial to the lake to incorporate sound stormwater diversions in the initial design phases than having to reconstruct beaches and replenish beach sand in the future.

Beach Replenishment:
Replenishment of beach sand may be allowed once every six years, if needed. In general, it may not exceed more than 10 cubic yards. Applications for beach replenishment should incorporate methods for diversion of surface runoff around the beach area. This is required if requests for beach replenishment are too frequent or the migration of sand has resulted in the need to maintenance dredge adjacent areas.

Who to Contact

If you are interested in constructing a perched beach, please visit the Wetlands Bureau page: http://des.nh.gov/organization/divisions/water/wetlands/index.htm for more information and for permit application materials. You may also contact the Wetlands Bureau by phone at (603) 271-2147, or via email at shoreland@des.state.nh.us