Pigeon Lake Ice Damage – Winter 2020/21

The early winter of 2020/21 can be characterized as having little snow and a significant number of days with abnormally warm temperatures. These were ideal conditions for ice heaves to form causing considerable shoreline damage. This phenomenon results from thermal expansion of warming ice. While ice heaves are a common occurrence and only infrequently cause damage, high water levels have compounded the effects of the expansion and have resulted in significant damage along the shoreline of Pigeon Lake. In addition, we can expect future ice heaves to be more common because of the effects of climate change with generally warmer winters.

During the warm daytime periods, the ice warms and expands, creeping towards the shoreline. At night, as temperatures drop, the ice contracts and fractures. The resulting fracture fills with water, which freezes in the sub-zero temperatures. This process, commonly called ice jacking, continues on a daily basis, resulting in a wall of ice forming around the perimeter of the lake. In some cases this wall has become greater than 6 feet in height. As the ice expands, it pushes up onto the shore and, in some areas, also into the bank and any constructed shoreline features. We can expect considerable damage to be left behind when the ice finally melts at breakup.

This winter, the lake level was at a high level at freeze-up. As a result, the ice had a more significant impact on the shoreline than would be the case if the water level were lower. Shoreline damage from ice heaves is one of the risks of having high water levels in Pigeon Lake.

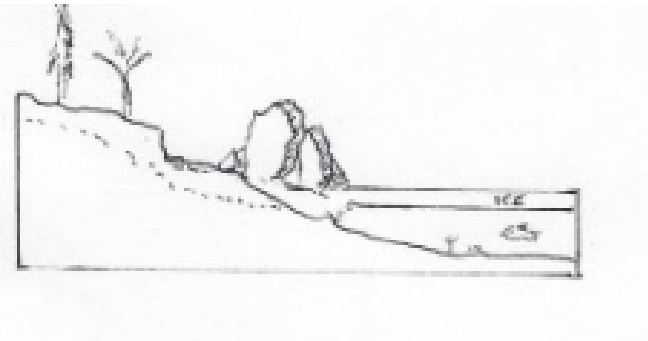

Figure 1: Ice heave with normal water levels. Ice ridge forms on shoreline.

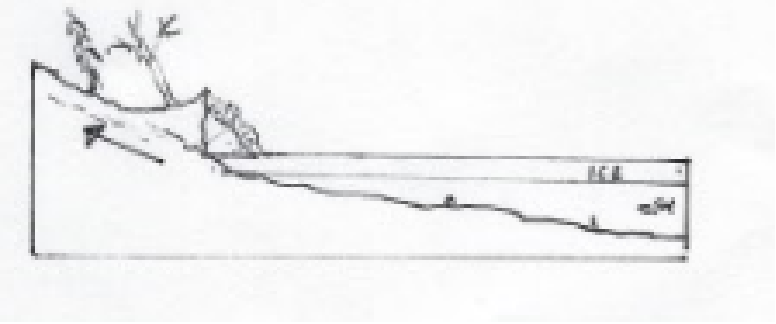

Figure 2: Ice heave during high water conditions. Ice directly impacts the bank.

The following photographs document some of the damage that has occurred during the winter of 2020/21 and the extent of the ice movement at the shoreline.

Photo 1: Ice heaves damaging shoreline infrastructure

Photo 2: Damage to shoreline retaining wall

Photo 3: Protective vegetation reducing ice damage

Photo 4: Infrastructure damage

Photo 5: Ice jacking caused by expansion/contraction of ice. Contraction fractures are shown.

Photo 6: Ice heaves causing uplift of bank

Photo 7: Shoreline push

Shoreline Restoration

Any work done on the shoreline, including restoration work, requires approval from Alberta Environment and Parks (AEP) as well as a Development Permit from the Summer Village. It is important to carefully research the best practice for restoring damage from ice pushes to avoid any detrimental effects on the lake and fish habitat. It is not just as simple as pushing the dirt back into the lake!

AEP has provided guidance documents for obtaining the necessary permits on its website. In addition, municipal building permits are required for grading of lots and shoreline development.

Here are some things to consider when planning restoration work and making application for approval.

1. Assess: It is important to assess the situation to determine the amount of restoration required. Remember that damage will appear much less severe after the ice melts.

2. Evaluate the restoration options: Vertical retaining walls are unlikely to be approved. For minor repairs, a ***Temporary Field Authorization*** (TFA) is most likely the degree of approval required. For more significant work, a ***Department Licence of Occupation*** (DLO) is required. The process to obtain this approval takes much longer than a TFA, and supporting documentation is much more extensive.

3. Decide on your restoration proposal. Carefully lay out exactly what work is to be done including the impact on the bank and shore. Prepare a sketch of the works. Photos would also be helpful.

4. Make application.

   - For a TFA, application should be made under the Public Lands Act to Cody Nahirniak (cody.nahirniak@gov.ab.ca). Also, further guidance can be obtained from Cody when assessing the project. The TFA application form is available online (https://www.alberta.ca/alberta-environment-and-parks-land-forms.aspx).
   - If required, applications made under the *Water Act* need to be submitted online through the OneStop system (https://www.alberta.ca/environmental-approvals-system-onestop.aspx). Questions about the Water Act process can be made to Angela Fulton (angela.fulton@gov.ab.ca).
   - Applications for a DLO must be submitted through the on-line Electronic Distribution System (EDS): Information can be obtained at (https://www.alberta.ca/assets/documents/ep-eds-disposition-application-user-guide.pdf) or (https://www.alberta.ca/electronic-disposition-system-overview.aspx).
   - For the Summer Village, development permits are obtained directly from the Summer Village Office with application forms found on the website (www.grandview.ca).

5. Remediation using "soft landscaping" should be the preferred option. This includes incorporating vegetation such as willows and natural shrubs rather than "hard landscaping" such as retaining walls. Generally, repairs done "by hand", minor recontouring, and planting of vegetation do not need approval, but be sure to check first. It has been found that, in addition to being lake friendly, vegetated shorelines are much more resilient to the forces of ice than hard protection.

—Prepared by the Summer Village of Grandview, February 2021 (updated March 3, 2021)