

Ice Jam Prevention & Mitigation



The GTA Flood Group has prepared the following Ice Management Info Sheet based on the River Ice Manual, MNR 1984.

Municipal Role vs. Conservation Authority Role

Under the Emergency Management and Civil Protection Act (Ontario Regulation 380/04), municipalities have the primary responsibility and authority for response to flooding and flood emergencies, and also for the welfare of residents and protection of property. While Conservation Authorities do not engage in ice management directly, they do operate a flood forecasting and warning program and can offer advice for ice jam prevention and mitigation.

Ice Jam Genesis

Each situation and location where ice jams form is unique. However there are a number of factors generally common to all ice jams and there are many similarities to be found in the conditions prevailing just prior to the jams, wherever they may occur.

Ice jam floods have historically been immediately preceded by rapid changes in weather and by colder than average winters. Likely sites for ice jams include areas where a widening or deepening of the river channel causes sudden reductions in the water velocity, and/or where there are sudden changes in the direction of flow, such as constrictions in the river channel or at bridges and their approaches.

Initial breakup is based on two factors, the number of accumulating degree-days of melting and the amount of precipitation during the melt. If the subsequent rise in water level is sufficient, it will pry the ice cover loose from the river banks; but it would not necessarily move the ice downstream or break it up. Ice cover break up depends on the velocities created or topography of the river, together with such restraints as islands, bends, or ice booms.

Summary of predictive techniques:

- Problems can be expected if there is an uninterrupted thaw of approximately twenty degree-days of melting during a very short period of time – 3 to 5 days.
- Problems are likely in the event of precipitation of 12 mm or more in 24 hours, especially if this follows several days of melting, or if the ground is still frozen, or if the watershed has a large urban area.
- Rising water levels and increasing velocities cause break-up – a preliminary indication of possible trouble. A rise of 1 metre in 24 hours often causes break-up, and will always cause break-up where velocities are greater than 1.0 m/sec.
- There is a specific break-up flow for every river, where large portions of the ice cover disintegrate generally. From limited information, it appears that the break-up flow is about 60% of the 100-year flood flow. **Due to variations in ice quality and weather sequences, this percentage may vary from 50 to 70 percent.
- Partial break-ups and local jams may occur due to broken pieces of ice accumulating in front of, and/or underneath, an ice cover, causing it to break by bending.

The worst combination for break-ups is a sudden thaw extending over four days, with rain. The resulting jams, however, will depend on how cold the winter has been, whether ice is hard or soft, thick or thin. In the final analysis, it is the sequence of weather events that is critical.

It is important to implement a monitoring program to gather information for the prediction of future ice jam events.





Preventive and Remedial Measures

It is best to approach ice jam prevention with caution. Without a properly formulated plan including a safe storage area, such as a lake, many preventative techniques can simply move ice jams creating larger problems downstream. Wherever possible, ice breaking should begin at the river mouth and work upstream.

Preventative and remedial processes include:

Weakening and/or breaking of ice

- Ice breaking by dusting
- Ice breaking by blasting
- Ice breaking by boat
- Combination of blasting and breaking by boat
- Ice breaking by air cushion vehicle

Control

- Control dams
- Ice booms
- Weirs
- Ice islands
- Ice Storage

Ice removal

- Ice cutting and mechanical ice removal

(Details on each technique are available from River Ice Manual, MNR 1984)

When is intervention appropriate?

- When there is a sufficient storage area and intervention will not create jams downstream.
- When ice removal is possible without damaging the riverbank or the environment.

What are some alternatives to intervention?

- Sandbagging
- Emergency planning (e.g., evacuations)



Ice Blasting

Blasting is used to break an ice cover into floes which can be transported by the water downstream or to weaken a solid ice cover prior to the arrival of upstream ice. The explosive charge is usually placed in the water underneath the ice.

The ideal time to release a jam is just after it has formed, starting at the outlet and moving upstream. If the flow has dropped, blasting the jam will be ineffective due to the lack of sufficient water to carry the loosened ice downstream.

Blasting ice jams is rarely effective and is dangerous to the blasting crew and neighbouring property. There are less expensive and more effective techniques to remove ice that have no environmental impacts, are safer for crews, and do not result in uncontrolled releases of river ice.



Your Conservation Authorities are here to help.

Please let your local Conservation Authority know of any preventative or remedial ice jam measures that your municipality may be undertaking.

For more information or advice please contact your local CA:

- Lake Simcoe Region Conservation Authority (905) 895-1281
- Toronto & Region Conservation Authority (416) 661-6514
- Conservation Halton (905) 336-1158
- Credit Valley Conservation (905) 670-1615
- Central Lake Ontario Conservation Authority (905) 579-0411
- Ganaraska Region Conservation Authority (905) 885-8173
- Nottawasaga Valley Conservation Authority (705) 424-1479
- Kawartha Conservation (705) 328-2271 or 1-800-668-5722