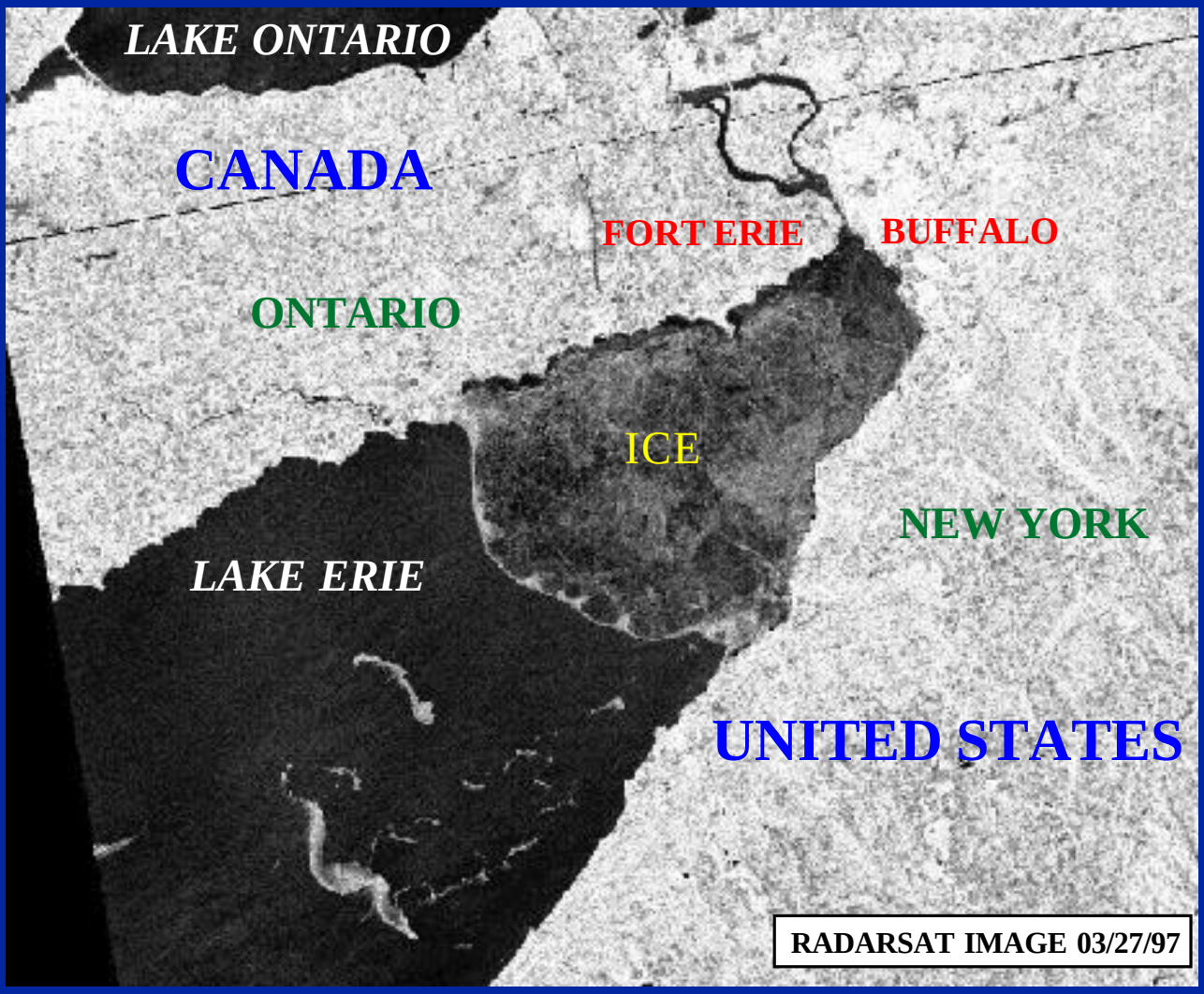
Lake Erie-Niagara River

ICE BOOM

INFORMATION SHEET



The International Niagara Board of Control
of the International Joint Commission

WHO?

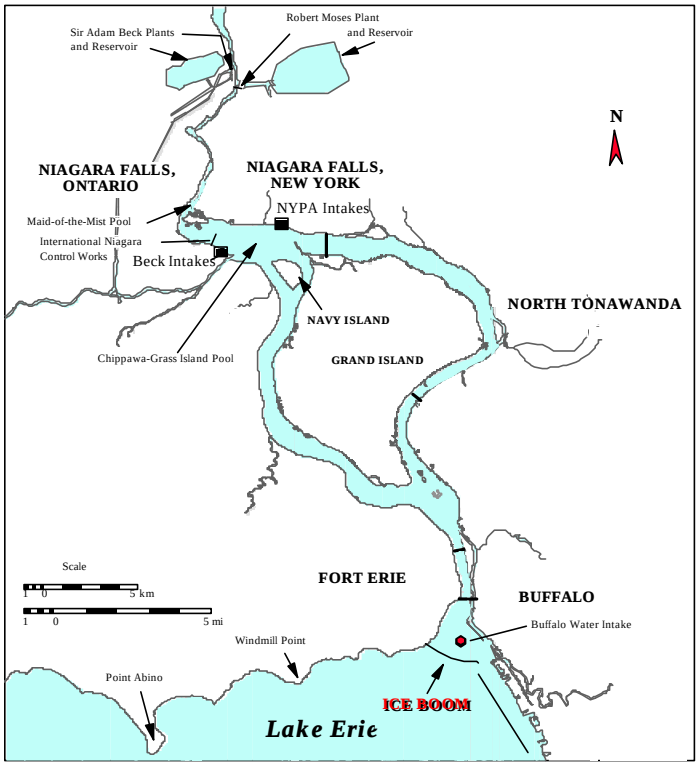
The International Boundary between Canada and the United States passes through Lake Erie and the Niagara River. The International Joint Commission, a bi-national body created under the 1909 Boundary Waters Treaty, has jurisdiction over certain works, such as the Lake Erie - Niagara River Ice Boom, in the boundary waters between the two countries. The Commission's International Niagara Board of Control oversees the annual installation, operation, removal and maintenance of the boom. The Power Entities, the New York Power Authority and Ontario Power Generation, are joint owners of the boom.

WHERE?

Each winter since 1964, the ice boom has been installed at the eastern end of Lake Erie. It extends about 2680 metres (8,800 feet) from the outer breakwall at Buffalo Harbor almost to the Canadian shore.

WHY?

The ice boom reduces the frequency and duration of ice runs from Lake Erie into the Niagara River. This, in turn, diminishes the probability of large-scale ice blockages in the river which can cause flooding, ice damage to docks and shore structures on the river and reductions of flow to the hydro-electric power plant intakes.



Ice Boom Location Map

Keeping the electricity flowing means keeping the Niagara River running. This can be challenging during the winter months, when sub-zero temperatures produce an ice cover on Lake Erie that can be pushed around by winds to produce ice accumulations up to 3.5 metres (12 feet) thick in places. Winter winds can push chunks of ice into the upper Niagara River, where they flow downstream and tend to jam up and obstruct water intakes for the region's hydro-electric projects. To maintain river flows, the Power Entities conduct a carefully co-ordinated ice management operation that includes regular icebreaker patrols, continual surveillance of river conditions and the use of the Lake Erie-Niagara River Ice Boom.

Ice accumulation in the Maid-of-the-Mist Pool below Niagara Falls - April, 1997

The ice boom can restrict, but not eliminate, the release of lake ice into the Niagara River. In early winter, a stable ice cover about a half metre (one- to two-feet) thick usually forms in front of the ice boom, near where Lake Erie empties into the upper Niagara River. This allows water to keep flowing underneath the ice towards Niagara Falls and the intakes for the hydro plants.

Sustained winds in excess of 50 kilometres (30 miles) per hour can push some lake ice over the boom, forcing part or all of its spans to submerge at times of high ice force. The boom is designed so that when the pressure is relieved, once a storm subsides, the buoyancy of the pontoons enables the boom to resurface and restrain ice which otherwise would flow into and down the river. Although the boom does release some ice into the river, it has substantially reduced ice damage, flooding, and power generation losses compared with conditions before its use.

Ice induced collapse of the Honeymoon Bridge - 1938

When ice floes do make it into the river, icebreakers and specially equipped tugboats and careful operation of the power plants keep the floating masses moving away from the intakes and over the Falls. During the stormiest winters, ice management teams operate around the clock to keep the river – and the electricity – flowing.

Ice damage to boat storage facility and dock in the upper Niagara River - 1955.

WHEN?

Under the Commission's current Order of Approval, installation may begin on December 16th or when the Lake Erie water temperature, as measured at the Buffalo water intake, reaches 4° Celsius (C) (39° Fahrenheit (F)) whichever occurs first. The Order requires that the boom be opened by April 1st of each year unless there is more than 650 square kilometres (250 square miles) of ice remaining in the eastern end of Lake Erie. Extenuating circumstances may require a delay in ice boom opening beyond April 1st. The Commission's International Niagara Board of Control, established in 1953 to monitor activities concerning the levels and flows of the Niagara River, intensively monitors the ice situation each spring to determine when conditions are acceptable for boom removal. Boom opening is dependent on weather, ice conditions in Lake Erie and the Niagara River and other factors.

The average date for ice boom opening, under the present Order of Approval, is April 3rd with the earliest being March 5, 1998 and the latest being April 25, 1997.

WHAT?

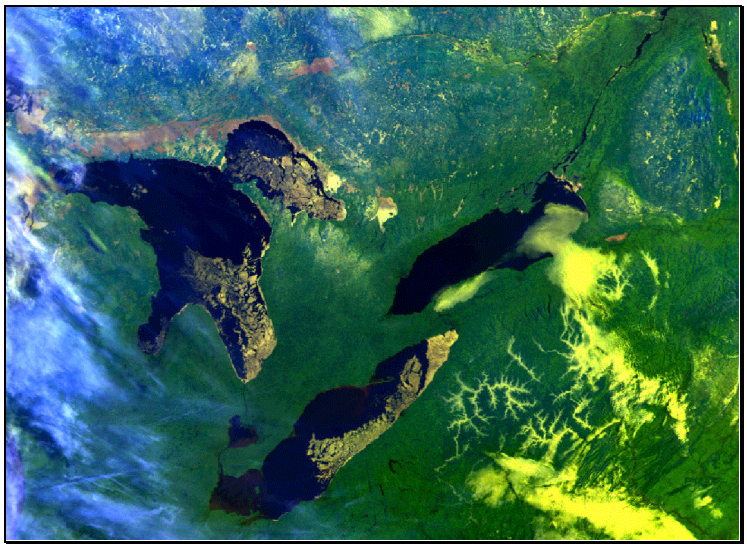
The boom is made up of a series of floating steel pontoons each 9.1 metres (30 feet) long and 76 centimetres (30 inches) in diameter. There are 22 spans, each consisting of up to 11 pontoons, anchored to the bottom of the lake at 122 metre (400 foot) intervals by 76 centimetre (2 ½ inch) steel cables. When in position about 3 kilometres (2 miles) upstream from the Peace Bridge, the ice boom spans the outlet of Lake Erie.

HISTORY

In 1964, the Commission granted the Power Entities permission to install the Lake Erie-Niagara River Ice Boom on a one-year trial basis. The boom was originally designed with 286 wooden timbers linked together by steel cable at a cost of $1 million. Commission approval for operation of the ice boom continued on a year-by-year basis until 1967, when subsequent authorizations covered multi-year periods. Presently, the approval is reviewed every five years with the most recent review completed in 1999.

In the 1970's, there was public concern that the ice boom adversely affected the weather in Fort Erie and Buffalo by prolonging the ice season. Studies found that Buffalo, as well as cities as far as 500 kilometres (300 miles)

away, had experienced generally colder winters reflecting a general climatic trend in this portion of North



Satellite image of ice cover on a portion of the Great Lakes

America. A 1983 United States National Academy of Sciences report concluded that "this is part of a regional cooling trend and is not caused by the ice boom".

Lake Erie has a surface area of about 26000 square kilometres (10,000 square miles) and is often completely ice covered during the winter. Field studies have shown that without an ice boom the Niagara River can pass about

The Lake Erie - Niagara River Ice Boom

520 square kilometres (200 square miles) of ice from the lake in an average spring. Thus, about 98 percent of Lake Erie's ice must melt in the lake.

Between 1992 and 1997, the New York Power Authority, with the support of Ontario Power Generation, studied alternative ice boom designs to further reduce the amount of ice being released from Lake Erie into the Niagara River. The studies were the result of a directive from the United States Federal Energy Regulatory Commission, which was interested in determining possible measures to reduce the potential for damaging ice jams in the river and the effects of ice on the operation of the New York Power Authority's Niagara Power Project.

The investigation led to a recommendation that the wooden timbers be replaced with steel pontoons to increase the resistance to ice over-topping the boom. Before replacing all of the timbers, the Power Entities conducted a field test during the winter of 1996-97 that substituted steel pontoons in five of the boom's 22 spans. At the same time, a video monitoring system for ice conditions was first installed atop Buffalo's Marine Midland Center.

The new pontoons proved successful, and the remaining timbers in the ice boom were replaced with steel pontoons for the winter of 1997-98. In 1997, the Commission modified its Order of Approval for the ice boom to remove any reference to the material for the ice boom's pontoons.

VIDEO MONITORING

The New York Power Authority and Ontario Power Generation ice management program includes continual monitoring of the area around the ice boom by two video cameras mounted on the roof of Buffalo's 41-story-high

Steel Pontoons that make up the spans

Marine Midland Center.

Time-lapse video recordings of ice runs and recorded digital images of the ice boom, combined with meteorological data, are key elements in evaluating the performance of the ice boom.

One camera covers a wide-angle view of the entire ice boom; the second camera is remotely operated by Power Entities' staff to view ice in the upper reaches of the Niagara River. The two views, transmitted via the Internet, allow Power Entities' personnel to keep a close watch on ice conditions at the ice boom and allow them to forecast conditions that might affect operations.

A personal computer with specially developed software is used to record and transmit images from the cameras every five minutes to the Internet. The high-resolution camera lenses allow clear images with only 0.1 lux scene illumination. The cameras are also equipped with environmental enclosures that include heaters, blowers and window defrosters to keep the view clear in sub-zero temperatures. Custom-designed brackets prevent the cameras from drifting in the sometimes 160 kilometres (100 miles)-per-hour winds that blow across the top of the skyscraper.

The public is invited to observe ice conditions near the ice boom. Viewers are able to select one of the following options to:

- View the most recent video image from the cameras,
- Select any image recorded within the last 10 days, or
- Download a video clip composed of 12 images recorded at five-minute intervals covering a one-hour period.

The Internet address is
http://www.iceboom.nypa.gov

PUBLIC INVOLVEMENT

If you have questions about the ice boom and its operation or have information which you would like considered by the International Joint Commission, you may express your views at public meetings held by the International Niagara Board of Control. The dates and locations of these meetings are announced in local newspapers and notices are mailed directly to Federal, State, Provincial and local government representatives as well as citizens and groups who have indicated an interest. You may also contact:

Canadian Section
International Niagara Board of Control
c/o Environment Canada
Water Issues Division
867 Lakeshore Road
Burlington, Ontario
L7R 4A6

Telephone: (905) 336-4947
Fax: (905) 336-8901

United States Section
International Niagara Board of Control
c/o U.S. Army Corps of Engineers
111 Canal Street, 12th Floor
Chicago, Illinois
60606-7205

Telephone: (312) 353-4333
Fax: (312) 353-5439

Commander, Buffalo District
U.S. Army Corps of Engineers
1776 Niagara Street
Buffalo, New York
14207-3199

Telephone: (716) 879-4134
Fax: (716) 879-4195

Visit the Board's WEB SITE at:
http://huron.lre.usace.army.mil/ijc/niagara.html