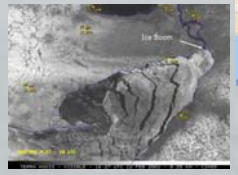

A Re-examination of the Climatological Impact of the Lake Erie-Niagara Ice Boom on Buffalo, NY

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Introduction

The Lake Erie Ice Boom was installed in 1965 to inhibit ice flows down the Niagara River and prevent ice jams in the power plant intakes down river. The ice boom is installed early in the winter season and removed in the spring season.

The ice boom spans 8,800 feet across the outlet of Lake Erie. It consists of 22 spans, each with a series of 13 steel pontoons. Each pontoon is 30 feet long, 16 inches high, and 22 inches wide, and it is anchored to the river bed at 400 foot intervals. The ice boom accelerates the formation of the natural ice arch, retarding the frequency and duration of ice flowing from Lake Erie.

In the years following the installation of the ice boom, a public perception developed that the ice boom had cause ice to form earlier, for prolonged periods, with impacts on fisheries, bird life, shore erosion, and climate (cooler spring time temperatures).

Studies in the mid to late 1970's, with the possible exception of Rumer, 1974) found no significant difference in Buffalo's mean monthly minimum and maximum air temperatures (March, April and May), as well as water temperatures, between pre- and post-ice boom years (Hassan and Sweeny, 1978; and Quinn (1980). The studies cautioned that there conclusions were based on limited post-boom climate data.

Objectives

To determine whether the ice boom has had any effect on Buffalo's climate during the Spring months, by replicating the methodology of earlier studies (mid to late 1970's), using a climate data base extended to the present (2003).

Methodology

Pre- and post-ice boom years were compared including inspectional analysis of graphed trends, a comparison of dates and mean values, and a statistical analysis to determine the significance of any differences. Air and water temperature data were subjected to difference of mean and variance tests (t-test and f-test) using Microsoft Excel. The null hypothesis was stated as "no significant difference".

Ice Out

The "ice-out" dates, are defined as the date on which the ice cover east of Long Point, Ontario occupied less than 250 mi^2. Ice out dates were obtained for the years 1905-2002 (with the exception of 1946-1950 when no data were obtained due to World War II).

The dates were divided between pre-and post-ice boom years. An average for each period was calculated by assigning each year's ice-out date a numeric value, with Feb 23rd (the earliest date) being 1, and May 31st (the latest date) being 99. The average numeric value for each period was compared to its corresponding calendar date.

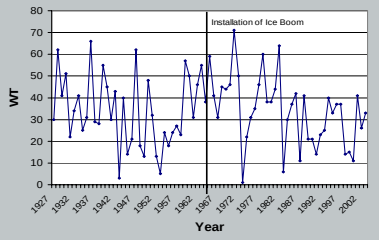
"Ice Out" Dates	Pre-Boom	Post-Boom
Mean Date:	**April 20th**	**April 20th**
Mode Date:	**April 30th**	**April 30th**
Range:	**Mar 11th-May 31st**	**Feb 23rd-May 31st**

No difference was noted between the pre- and post boom years. The average dates compare well with the mean dates of April 18th and April 20th (respectively), as reported by McLaughlin (1998), using a water temperature of 34ºF to indicate ice-out .

Water Temperature Parameter (WT)

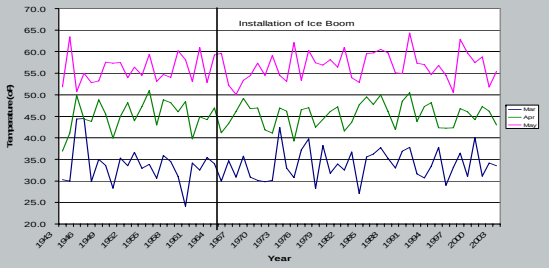
The Water Temperature Parameter (WT) is defined as the number of days past March 15th that the water temperature, as measured at the Buffalo intake, reaches a temperature 3ºF or greater than the coldest water temperature experienced from January 1st through March 15th. (Quinn et al.,1980).

WT is a measure of the onset of the spring rise in water temperature. A large WT number indicates a slow rise in water temperatures, that is consistent with a cooling influence attributed to the Ice Boom.



No significant difference between pre-and post-boom means or variance could be found. The results are consistent with the findings of Quinn et al. (1980).

Buffalo Airport Air Temperatures



Using temperatures recorded at the Buffalo Weather office at the Greater Niagara International airport no significant difference in March, April or May mean, minimum or maximum air temperatures (means or variance) could be found for the period before and after the installation of the ice boom.

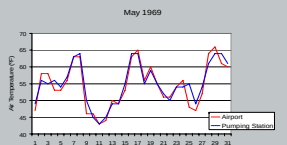
Buffalo vs. Rochester

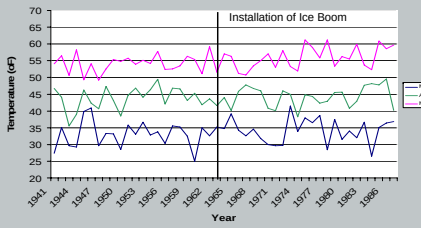
Rochester is a city influenced by similar climate controls as Buffalo, with the exception of the ice boom. A comparison of temperatures between the two cities fails to show the cooling influence of the ice boom. A comparison of pre- and post-boom temperatures for Rochester shows an average spring warming of 0.5ºF, while Buffalo shows an average spring warming of 0.6oF. The warming is likely indicative of a regional trend, and the ice boom does not appear to have dampened the warming.

Colonel Ward Pumping Station Air Temperatures

The Buffalo weather office (located at the airport) is 9 miles from the ice boom. It is likely that the climatological influence of the ice boom is confined to an area closer to the lake. A newly discovered temperature record (1941-1987) was found at the Colonel Ward Pumping station located on the shoreline.

The type and exposure of the thermometer used has not been determined. However, comparing the data with records obtained from the airport weather station validated the temperature data collected at the pumping station.





No significant difference between pre-and post-boom means or variance could be found, with the exception of a significant warming in post-boom May.

Conclusion

There is no evidence to support perceptions that the ice boom has retarded ice dissipation or has caused a cooling of air temperatures in Buffalo during the Spring months. Our findings are consistent with the research findings of the mid- to late-1970's and early 1980's.

References: Hassan, J., Sweeney, R. 1978. Great Lakes Laboratory, SUNY College at Buffalo, Buffalo, NY, Special Report #13, pp. 31.; McLaughlin, S. 1998. Lake Erie Ice Boom Public Information Statement, www.erh.noaa.gov/buf/iceboom.html; Quinn, F., Assel, R., Gaskill, D. 1980. An Evaluation of Climatic Impact of the Niagara Ice Boom Relative to Air and Water Temperature and Winter Severity, NOAA Technical Memorandom ERL GLERL-30, Ann Arbor, MI, pp. 31.; Rumer, R. 1974. Lake Erie-Niagara Ice Boom Study. Prepared for the International Board of Control, International Joint Commission, Acres Consulting Services Limited, pp. 59.

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