

# Summary of Development of a Binational Flood Forecasting and Real-Time Flood Plain Mapping System for Operational Implementation

by the Hydrology, Hydraulics and Mapping and Flood Management and Mitigation Measures technical work groups

International Lake Champlain-Richelieu River Study Board

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The international Lake Champlain-Richelieu River (LCRR) Study Board is pleased to release a new report on Binational Flood Forecasting and Real-Time Flood Plain Mapping. The Study Board was established by the International Joint Commission in 2016 to investigate possible solutions to flooding along Lake Champlain and the Richelieu River. Part of the Study Board's mandate was to develop and make recommendations for the implementation of an operational, real-time flood forecasting and flood inundation mapping system for the basin. The report describes the new forecasting tools developed throughout the study.

## Improved Forecasting

As part of the Study, experts undertook an assessment of the current flood forecasting systems and consulted flood forecasters and emergency responders in the basin to determine their needs to better prepare for floods. The assessment highlighted a desire for short-term flood maps that include probabilities of flooding that may occur in areas and long-term water level and flow projections that can contribute to better flood prediction.

One of the key ways of reducing the impacts of flooding in the basin is by improving flood preparedness.

A flood forecasting system regularly provides water level and wave height projections. These inform estimates of flood depth and extent. These projections can range from simple short-term forecasts of water levels at specific locations to more complex products such as maps that include probabilities of the occurrence and extent of flooding.



**Waves cause Lake Champlain to spill its banks.** *Credit: Matt Sutkoski*

Enhanced flood forecasting in the basin will aid local planners and emergency responders to prepare communities in the days and hours before floods occur. During the study, the separate flood forecasting systems in the US and in Quebec were evaluated and enhancements were made to both, including the development of a flood forecasting system that predicts flooding up to 5-days in advance.

Improved hydrological models were also created for forecasting in the LCRR basin. This includes modeling tributaries with much higher resolution. This results in better predictions of inflows into the lake and eventually, into the Richelieu River. Although not yet fully operational, the new forecasting tools in the US and Canada will be integrated into the existing forecasting systems over the coming years. The models simulate processes such as snow accumulation, snow melt, inflows from tributaries to Lake Champlain and outflows through the Richelieu River, as well as wind and wave conditions. All of this information is used to improve the accuracy of forecasting water levels in the basin.

## Wave and Wind Modelling

One of the findings of this Study was that spring 2011 flood damages were exacerbated by storm surges and wave events on Lake Champlain. To better understand how these forces contribute to flooding, the National Oceanic and Atmospheric Administration (NOAA) has integrated new modelling of wind and waves on the lake into their forecasting system. Surge and wave conditions are critical to public safety for recreational and commercial activities on the lake, such as boating and swimming, and for predicting coastal flood impacts at the shoreline where waves can run up and significantly impact infrastructure. Although not yet fully operational, the new flood [forecasting system for Lake Champlain](#) is available on an experimental basis through NOAA's Great Lakes Environmental Research Laboratory (GLERL).

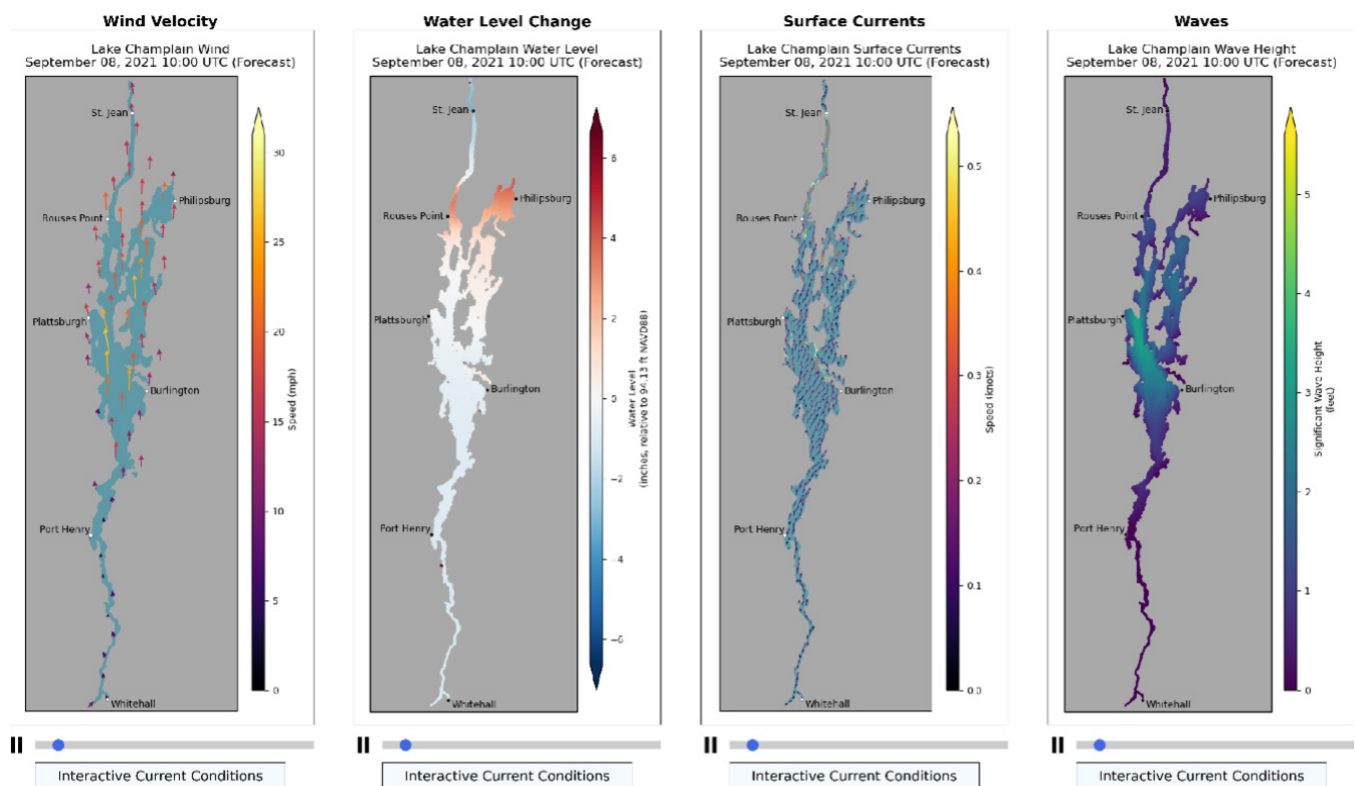
The new system will inform future operational flood forecasts for the basin and support inundation mapping as well as recreational forecasts. It will provide input, particularly water level data, for Canadian flood models of the Richelieu River basin to improve binational

flood forecasting. It will also provide real-time forecasts several times a day to predict lake level, currents, wind, and waves. The output of these models for the entrance to the Richelieu River will then be used to predict water levels in the Richelieu River and inform forecasting there.

## Two Systems, Good Coordination

Due to the binational nature of the basin, there are two agencies responsible for providing flood forecasting services, the Ministère de l'Environnement et de la Lutte contre les

Changements Climatiques (MELCC) in Quebec and the National Oceanic and Atmospheric Administration (NOAA) in the US. Operational flood forecasting is conducted by officially designated agencies in both the U.S. and Canada using a variety of data sources, including observations of current conditions and a wide range of specialized environmental forecast models. These agencies share data to enhance the accuracy of forecasting systems across the basin. Continued cooperation between agencies is supported by the Study Board's findings.



Modeled NOAA Wind, Wave and Water Levels on Lake Champlain