US Army Corps
of Engineers
North Central Division

GREAT LAKES LEVELS
UPDATE NO. 64
NOVEMBER 2, 1990

Great Lakes basin precipitation was slightly to well-above average in 7 of the first 9 months of 1990. October followed in this trend with well-above average precipitation. The following tables show estimated precipitation for October and for the year to date.

Provisional
Great Lakes Precipitation (inches)

I. October

Basin	1990*	1900-89 Average	Diff.	% of Ave.
Superior	4.4	2.7	+1.7	163%
Mich-Huron	3.9	2.8	+1.1	139%
Erie	4.2	2.7	+1.5	156%
Ontario	4.5	3.0	+1.5	150%
Great Lakes	4.2	2.8	+1.4	150%

II. Year to Date (January - October)

Basin	1990*	1900-89 Average	Diff.	% of Ave.
Superior	28.5	25.6	+2.9	111%
Mich-Huron	31.3	26.7	+4.6	117%
Erie	39.1	29.0	+10.1	135%
Ontario	35.0	28.8	+6.2	122%
Great Lakes	32.0	27.0	+5.0	119%

* Estimated

During the past 12 months, total precipitation on the Great Lakes basin has been about 5.1 inches (16 percent) above average. Lakes Superior, Michigan-Huron, Erie, and Ontario have had total precipitation of 2.8 inches (9 percent), 4.7 inches (15 percent), 9.8 inches (29 percent), and 6.8 inches (20 percent), respectively, above average.

The National Weather Service is forecasting basin-wide precipitation during November to be below average, with temperatures also below average.

The water level of Lake Superior rose slightly in October with all of the other Great Lakes levels holding steady or declining only slightly. This was in response to the heavy precipitation; the lakes are normally in their seasonal decline. Lake Ontario is very close to its long-term average for this time of the year.

This month's update letter topic is Lake Erie outflow (see Figure 1). The flow of water from Lake Erie to Lake Ontario follows three routes: the Niagara River, the Welland Canal, and the New York State Barge Canal. We will discuss each one, in the order listed.

The Niagara River flows northward out of Lake Erie some 36 miles to discharge into Lake Ontario. In this short distance it falls about 326 feet, 180 of which is at the Niagara Falls. Over the past 90 years, the flow in the River has averaged about 205,000 cubic feet per second (cfs). There are no regulatory works to alter the amount of flow which naturally leaves Lake Erie. The flow amount is determined by the water level of the lake at the head of the Niagara River.

The Welland Canal (see Figure 2) bypasses the Niagara River to provide a deep-draft navigation link between Lakes Erie and Ontario. The canal water is also used for limited power generation, industrial and municipal use, and for water quality enhancement. The canal was built in 1829 and has been

reconstructed several times since then. The flow has averaged about 9,000 cfs in recent years, about 4-1/2 percent of the Niagara River flow. Studies indicate that the ultimate effect of the Welland Canal Diversion on Lake Erie's level has been to lower it about 5 inches.

The New York State Barge Canal takes water from the Niagara River at Tonawanda, New York, and returns all of it to Lake Ontario through several streams and the Oswego Canal. The intake for the canal is downstream of the head of the Niagara River. Therefore, the amount of water that flows out of Lake Erie through the Niagara River is not affected by the Barge Canal. Studies indicate that the yearly average flow that enters the Barge Canal is about 700 cfs. This is based on 1,100 cfs diversion during the navigation season and zero flow during non-navigation season.

The usage of water that enters the Niagara River is governed by a 1950 Treaty between the U.S. and Canada. The Treaty stipulates that a minimum of 100,000 cfs must flow over the Niagara Falls during the daylight hours of the tourist season (April 1 to October 31). At all other times, the minimum flow must be at least 50,000 cfs.

The flow distribution is controlled by an 18-gate control structure, which is 1 mile upstream of the Horseshoe Falls, and operated by the Power Entities (see Figure 3). This structure is not a dam which completely traverses the river, but a partial structure, extending about 2,100 feet into the river, or about half way across. It marks the downstream boundary of a portion of the river upstream of the Falls known as the Chippawa-Grass Island Pool.

The control structure aids in distributing directed hourly flow amounts to the various power plant intakes and helps to promptly change the flow over the Falls from 50,000 to 100,000 cfs and vice-versa. The operation of the control structure enables the water levels in the Chippawa-Grass Island Pool to be maintained within certain tolerances established by the International Joint Commission (IJC) and helps maintain the river's natural level upstream. The International Niagara Board of Control oversees the operation for the IJC.

The Treaty of 1950 credits Canada the first 5,000 cfs to compensate for the Long Lac-Ogoki diversions into Lake Superior. Water in excess of the required Treaty Falls flow is shared equally between U.S. and Canada for generation of hydropower (see Figure 4). Five plants use water from the Niagara River (one U.S., four Canadian), and another plant in Canada uses water from the Welland Canal. Ontario Hydro is currently planning another generating station (Sir Adam Beck III) to better use their share of the water. The New York Power Authority is also improving the capacity and efficiency of the Robert Moses Plant and pumping generating station. Tables 1 and 2 list, respectively, for the U.S. and Canada, the capacities of the existing plants and future expansions.

Table 1. Existing Hydropower Plants

U.S	
Robert Moses Niagara Plant	2,275 MW
Pumping Generating Station	360 MW
Canada	
Sir Adam Beck No.1	488 MW
Sir Adam Beck No.2	1,312 MW
Pumping Generating Sattion	122 MW
Canadian Niagara Power Company	75 MW
Ontario Power Company	105 MW

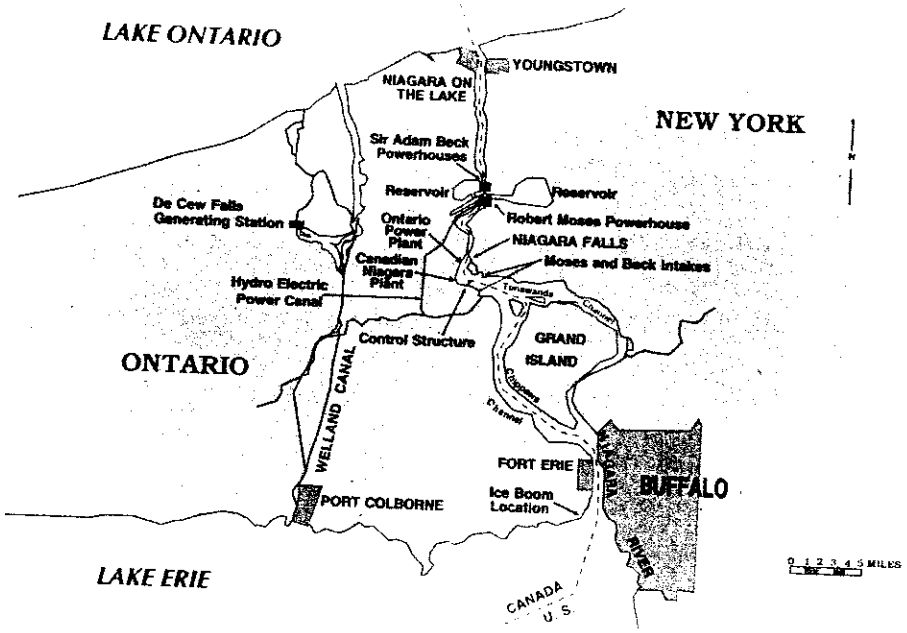


Figure 1 - Map of the Niagara River and Welland Canal

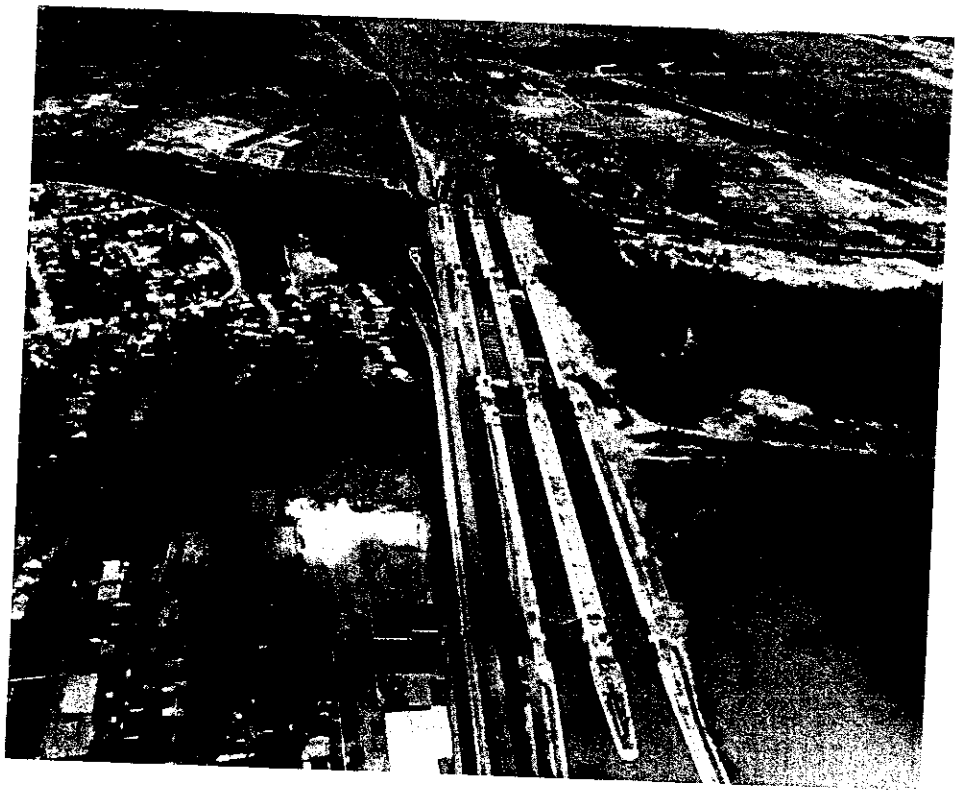


Figure 2 - Welland Canal

Figure 3 - Chippawa Grass Island Pool Control Structure

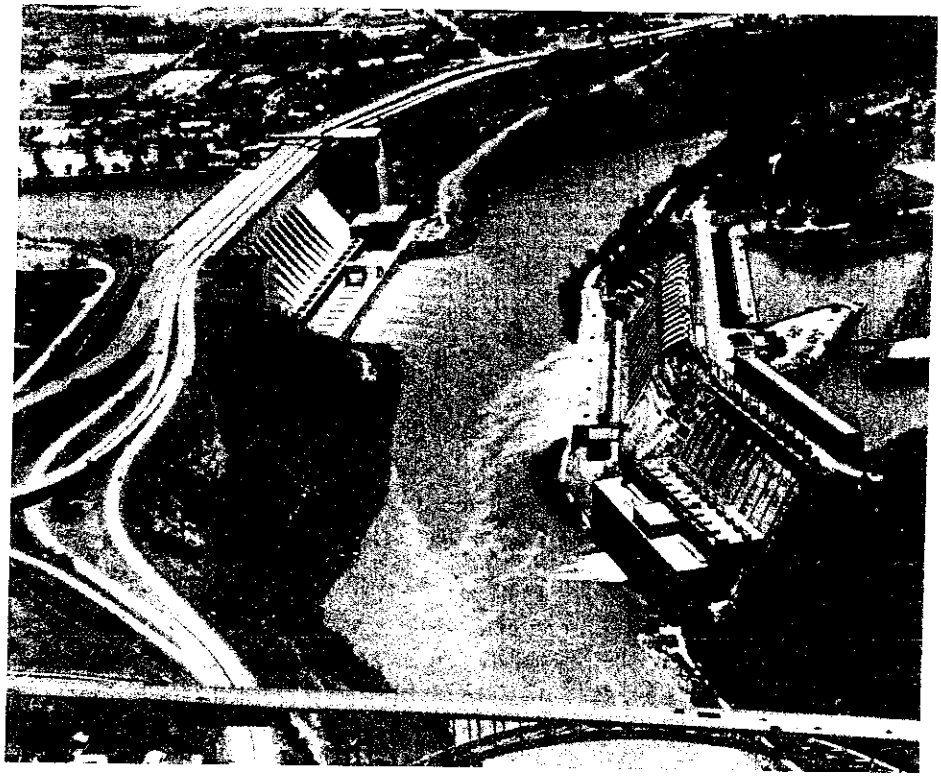


Figure 4 - U.S. and Canadian High Head Hydropower Plants on Niagara River

Table 2. Future Hydropower Development

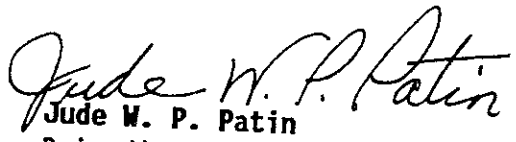
U.S.	
Robert Moses Plant (replacement units)	340 MW
Pumping Generating Station (additional units)	60 MW
Canada	
Sir Adam Beck No.3	1,050 MW

Phase II of the Reference Study

The Phase II Plan of Study was approved by the IJC in July 1990. The Levels Reference Study Board (Board) released it to the public in October. The tasks identified in the Plan of Study have been assigned to four Working Committees as follows: public participation and information; land use and management; existing regulation, system-wide regulation, and crisis conditions; and principles, measures-evaluation, integration, and implementation.

The first responsibility of the Working Committees' will be to prepare working plans consistent with available resources and timeframes for approval by the Board. These plans will address the issues raised by the Study Reference and IJC's Directive. The progress of this work will continue to be reported in future monthly updates. Copies of the Plan of Study may be obtained from: Study Director, IJC Levels Reference Study, 72 Lyme Road, Hanover, NH 03755-1280.

Finally, we have a number of topics in mind for future editions, such as storm surge and wave action, types and effectiveness of shoreline protection, shipping on the Great Lakes, recreation, and winter operations/ice booms. Please let us know your interests. Your suggestions can be sent to any of the addresses noted below or phoned to my Public Affairs Office, (312) 353-6319.



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