US Army Corps
of Engineers
North Central Division

GREAT LAKES LEVELS

Update Letter No. 66 January 3, 1991

1990 Annual Summary: The year in review

In this issue of the Update Letter, the past year will be reviewed with respect to precipitation, lake levels, the regulation of Lakes Superior and Ontario outflows, navigation, the International Joint Commission (IJC) Reference Study, and several other topics of interest. Water levels were relatively stable throughout the year, with a slight rising trend occurring at the year's end. There were few extremes of temperature, precipitation and lake levels.

Precipitation

Across the Great Lakes basin, the winter of 1989-90 began with bitterly cold weather in December 1989. This continued into January 1990, after which we had a relatively mild winter and spring. Precipitation was below average for December 1989 and March 1990. Total precipitation for December 1989 through April 1990 was close to average. The snowpack was slightly below average going into the spring snowmelt period, and there was little attendant flooding of rivers in the Great Lakes basin. Five of the remaining months of the year were wetter than average. Preliminary reports indicate that the winter storm at the end of December caused Lakes Erie and Ontario to set new precipitation records for that month. The total precipitation for 1990 on the Lake Erie basin was also a record. Lake Ontario's total 1990 precipitation was the fourth greatest total of the century. Overall, the total basin-wide precipitation for 1990 was about 6.0 inches

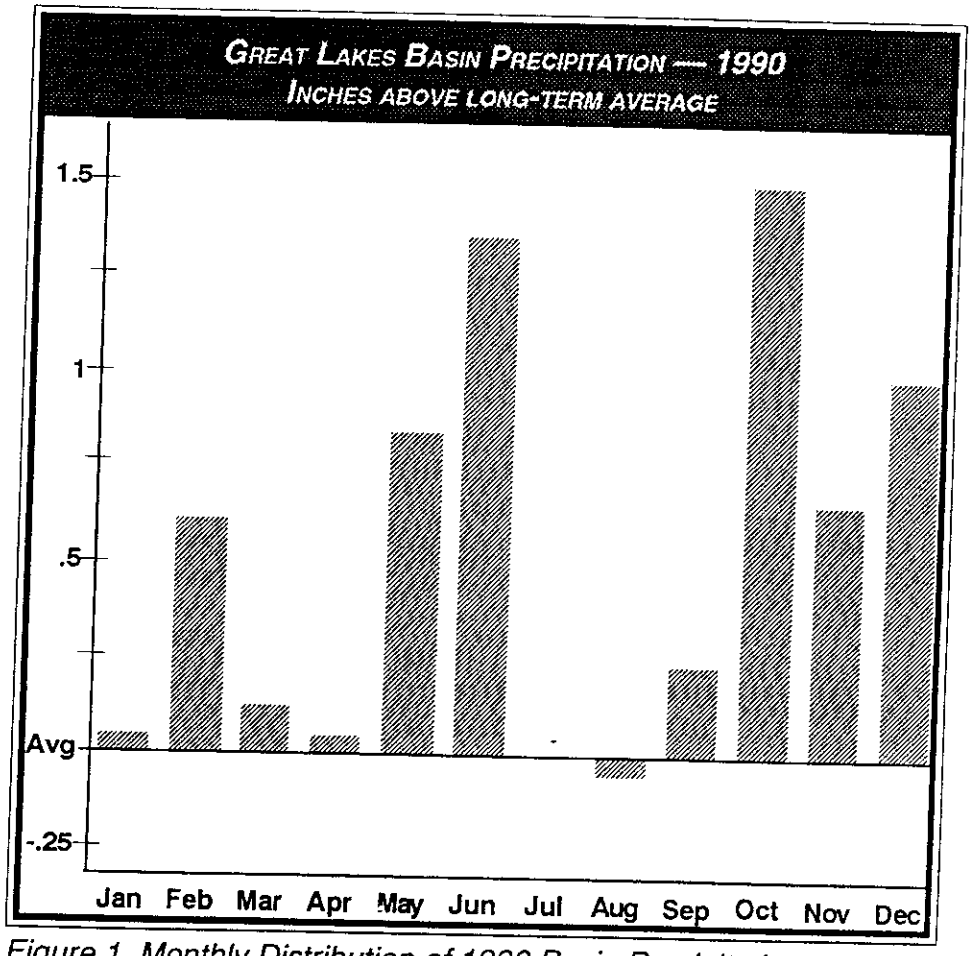


Figure 1 Monthly Distribution of 1990 Basin Precipitation

above average with each lake experiencing its own peculiarities. Figure 1 shows the departure from average, by month, for the entire Great Lakes basin. The precipitation by lake basin for December and their yearly totals are shown in Table 1.

Lake Levels

At the beginning of 1990, the water levels of Lakes Superior and Michigan-Huron were below their respective long-term averages. The other lakes were all slightly above average. The peak levels for 1990 were less than the peak levels for 1989 for all of the lakes. The low levels were also lower than those of 1989, with the exception of Lake Ontario.

Lake Superior stayed below average the entire year, mainly due to near-average precipitation. The low for the year was in April, about a month later than usual, at a level of about 599.43 feet, 8 inches below average. The peak for the year was a foot higher (600.43) in October, also a month later than usual and about 5 inches below average. The level at the end of the year was slightly above the Low Water Datum (LWD) of 600.00 feet.

Lakes Michigan-Huron levels started the year about 7 inches below average. It steadily approached its long-term average throughout the year and finally reached it in December. The low for the year was in January, about a month earlier than usual, at a level of 577.22 feet, over 8 inches below average. The peak for 1990 was in July, the month it usually peaks, at a level of 578.39 feet, over 5 inches below average. The year-end level was slightly below the December average.

Lake St. Clair water levels started and ended the year above its long-term average. The low for the year was in January, also about a month earlier than usual, at a level of 573.18 feet, 4 inches above average. The seasonal peak was in July, when it usually occurs, at a level of 574.36 feet, nearly 4 inches above average. At year's end the lake was about 5 inches above the December average.

Lake Erie water levels began the year slightly above average, rose above average in February due to near-record precipitation, and remained above average the rest of the year. The low for the year was in January, a month earlier than usual, at a level of 570.18 feet, about 2 inches above average. The peak for the year was in June, when it normally occurs, at a level of 571.72 feet, about 6 inches above average.

Lake Ontario began the year about 1/2 inch below average, crossed over average in February, and stayed above average through July. August and September levels were slightly below average, with November and December again above average. The low level for the year was in January at a level of 244.03 feet. The peak was in June at a level of 246.00 feet, over 4 inches above average. The lake's level at the end of the year was about 10 inches above average.

Storms

The year 1990 was relatively calm with regard to storms. There was a fairly intense storm on November 28 - 29 which caused a fair amount of erosion along the eastern shore of Lake Michigan. This was the first damaging storm of the past several years for this area. A storm on November 5-6 caused the Lake Erie water level at Buffalo to rise about 6.2 feet above the average level for that month. This amount of storm

Basin	December				Total for 1990			
	1990*	Average**	Diff.	% of Average	1990*	Average**	Diff.	% of Average
Superior	1.5	1.9	-0.4	79%	31.8	30.0	+1.8	106%
Michigan-Huron	3.0	2.3	+0.7	130%	37.9	31.7	+6.2	120%
Erie	6.4***	2.6	+3.8	246%	47.4***	34.4	+13.0	138%
Ontario	5.1***	2.9	+2.2	176%	42.1	34.7	+7.4	121%
Great Lakes	3.3	2.3	+1.0	143%	38.0	32.0	+6.0	119%

Table 1 Precipitation Data * *Estimated* ** *1900-89 Average* *** *Apparent record*

rise is given about a 1-in-5 chance of occurring in a given year. However, there were no significant damages reported .rom this storm.

Lake Regulation

The two lakes whose outflows are regulated under the authority of the International Joint Commission (IJC) are Lakes Superior and Ontario. Update Letters 61 and 63 discussed the regulation in some detail.

During the first 5 months of 1990, the outflows for Lake Superior were in strict accordance with Plan 1977. Beginning in June, outflows were in accordance with the new Plan 1977-A. Although both Lakes Superior and Michigan-Huron remained below average throughout the year, additional precipitation in the basin caused Lakes Michigan-Huron to rise more rapidly towards the long-term average than did Lake Superior. As such, the balancing concept of both the Plans 1977 and 1977-A resulted in reduced Lake Superior outflows, in an attempt to bring that lake in synch with its average level targets. The outflows for the year were all within a narrow band, with a minimum outflow of 57,000 cubic feet per second (cfs) and a maximum outflow of 72,000 cfs. Since these flows were well within the capacity of the powerhouses, locks, and minimum fishery requirements, the gate setting in the Compensating Works was kept at one-half gate open. The monthly flow changes were accomplished by varying the amount of water allocated to hydropower production. Figure 2 shows the Compensating Works used for regulating the Lake Superior outflows. Also seen in this figure are ships in the West Lock Approach Channels at Sault Ste. Marie, Michigan in April 1990 and the ice boom at the head of Edison Soo Hydropower Canal.

Figure 2. Lake Superior's Compensating Works, Locks, Powerhouses and ice boom in the St. Marys River

Figure 3. Brigadier General Patin on inspection tour of Eisenhower Lock's Traffic Control Center

The IJC-prescribed regulation plan for Lake Ontario is Plan 1958-D. The outflows prescribed by Plan 1958-D are influenced by precipitation over the basin, the level of the upstream lakes, and the levels downstream at Montreal. The regulation of outflows is carried out by the International St. Lawrence River Board of Control. Brigadier General Jude W. P. Patin, Commander, North Central Division, is the U.S. Chairman of this Board. As part of his responsibilities, General Patin carried out both ground and aerial inspections in July of the St. Lawrence River control structures and operations from Massena-Cornwall (see Figure 3) to

Montreal.

During January and the first half of February, Lake Ontario outflows were in excess of strict adherence to Plan 1958-D. This was in order to eliminate about 4 inches of water temporarily stored on Lake Ontario from the Board's discretionary actions in 1989. Both accumulating and eliminating these outflow deviations are within the Board's discretionary authority.

For the rest of the year, outflows were generally in accordance with Plan 1958-D. In November, the Board agreed to discharge less than Plan flow because of power plant maintenance at Montreal (see Figure 4). These underdischarges were then continued until the second week of December, at which time about 3-1/2 inches of water was stored on Lake Ontario. During the last half of December, much of this discretionary deviation was released. At the end of 1990, the amount of remaining storage was equivalent to less than 1-1/2 inches on the lake. This is expected to be eliminated entirely by mid-February 1991.

A survey of boating facilities was conducted between July and September to identify critical sites along the U.S. shoreline between Youngstown, New York (on the Niagara River) and Massena, New York on the St. Lawrence River. The results will be evaluated in conjunction with the ongoing update of Lake Ontario's Regulation Plan.

Commercial Navigation

For the first 11 months of 1990 there was a slight decline in commercial navigation on the Great Lakes as compared to 1989. This was the case for both the Corps locks at Sault Ste. Marie, Michigan and the Eisenhower and Snell Locks on the St. Lawrence River. A future feature article will cover the various navigation facilities, both U.S. and Canadian, on the Great Lakes and their connecting channels and will discuss the effects of fluctuating water levels and the activities of the International Lake Superior, Niagara, and St. Lawrence River Boards of Control.

Navigation usage for 1990 is as follows: the data available at press time are totals for the year to the end of November. Starting with Soo Locks, a total of 4,444 cargo vessel transits locked through. Of these, 2,662 were U.S.-flagged vessels, 1,489 were Canadian-flagged, and 293 were foreign vessels (ocean-going or "salties"). Of the U.S. and Canadian vessels, some of these "lakers" made a number of trips during the navigation season. The total number of cargo vessel transits was 44 less than in 1989, through November. The total tonnage reflected the number of vessel transits and lower water

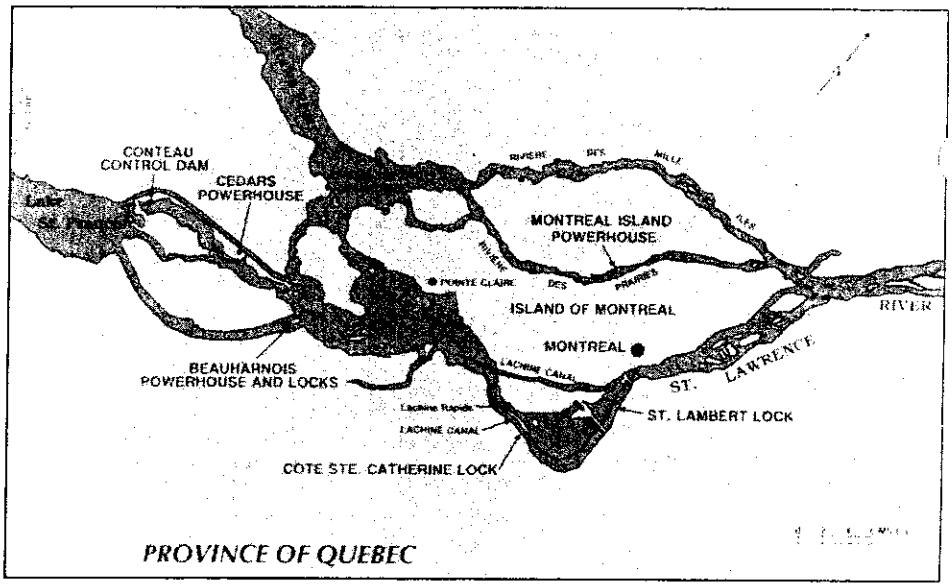


Figure 4. Map of Powerhouses and Locks at Montreal

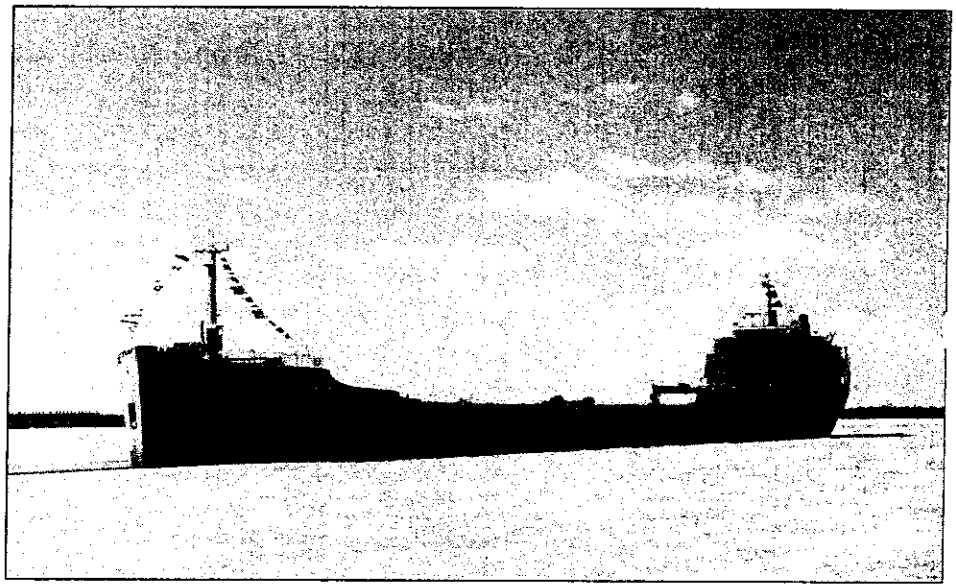


Figure 5. Ocean-going Vessel at Eisenhower Lock

levels. That is, over 57 million tons of cargo were carried through the locks on U.S. vessels, nearly 19 million tons were on Canadian vessels, and about 2.5 million tons were on foreign vessels. The total tonnage was about 200,000 tons less than for the same period in 1989. In addition to the cargo vessels, there were also 7,491 transits for other types of vessels, such as pleasure craft, Coast Guard, and scientific/research vessels. This was 761 transits less than in 1989.

On the St. Lawrence River, the commercial navigation season opened on March 28, with the passage of the "Silver Isle" through Eisenhower Lock (see Figure 5). The following data for transits are for the Eisenhower Lock in the International Section of the St. Lawrence River. As of December 21, there were 1,602 transits of "laker" cargo vessels, 911 transits of "salties", 2,913 transits of pleasure craft, and 258 transits of other noncommercial vessels. These are decreases of 178, 15, and 62 transits for "salties", pleasure craft, and non-commercial vessels, respectively, as compared to 1989. "Laker" transits increased by 170 as compared to 1989. Overall, however, the total transits were 85 less than in 1989. The last ocean-going vessel for 1990, the "Carribean Queen", cleared the Eisenhower and Snell Locks on December 21.

International Joint Commission

Phase II of the IJC Reference Study was formally initiated on February 12, 1990, with the issuance of a directive and a set of study objectives by the IJC. The directive established the Levels Reference Study Board, which is under the direction of cochairs Brigadier General Jude W.P. Patin, U.S. Army Corps of Engineers, and Mr. E. Tony Wagner, Environment Canada. In addition to the cochairs, the board is made up of two state and two provincial members, four representatives of the public, and a full-time Study Director. The four public members are also part of a Citizen's Advisory Committee (CAC), which consists of a total of 18 representatives of various public interests, 9 each from the United States and Canada.

COCHAIRPERSONS OF WORKING COMMITTEES

United States		Canada
	Working Committee 1	
Jerome Delli Priscoli U.S. Army Corps of Engineers Fort Belvoir, VA		Doug Cuthbert Environment Canada Burlington, Ontario
	Working Committee 2	
George Stafford New York State Dept. Albany, NY		Pearl McKeen Ontario Ministry of Natural Resources Toronto, Ontario
	Working Committee 3	
Ben DeCooke Civil Engineer Farmington Hills, MI		Doug Brown Environment Canada Burlington, Ontario
	Working Committee 4	
Michael Donahue Great Lakes Commission Ann Arbor, MI		Michel Slivitsky Universite du Quebec Ste-Foy, Quebec

Figure 6. Study Board's Working Committees

The Reference Study Board completed a Plan of Study on May 15, which was given formal approval by the IJC on July 19. The Study Plan established four working committees to carry out a number of interrelated tasks: Working Committee 1 - Public Participation and Information; Working Committee 2 - Land Use and Management; Working Committee 3 - Existing Regulation, System-wide Regulation and Crises Conditions; and, Working Committee 4 - Principles, Measures Evaluation, Integration and Implementation. Figure 6 shows the cochairpersons of these working committees.

Detailed plans for each working committee are to be provided to the Reference Study Board later this month. The study is scheduled to be completed in late 1992. Future update letters will continue to keep you informed on the Study's progress and results as they unfold.

The IJC directed a policy in September to its boards that they implement public meetings at least annually. The Lake Superior, Niagara, and St. Lawrence River Boards of Control are presently in the planning stages for public meetings. Future update letters will inform you of the details as they are developed.

Water Resources Development Act of 1990 Overview

The Water Resources Development Act (WRDA) of 1990 (Public Law 101-640) authorized and modified water re-

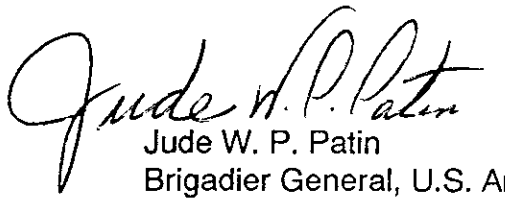
sources projects and programs of the Corps. Section 307 of WRDA of 1990 established an interim goal of no overall loss of wetlands for the Corps' water resources program. Section 309 directed the Secretary of the Army to report on the advisability of not participating in shoreline protection projects, unless the state has established a management program. Section 312 established a 5-year, $50 million environmental dredging program, with the stipulation that a non-Federal sponsor must agree to pay the disposal costs and 50 percent of the dredging cost. Section 401 authorized the Secretary of the Army to spend annually not more than $3 million to provide technical, planning, and engineering assistance to non-Federal interests in the development and implementation of Great Lakes Remedial Action Plans (RAPs) (non-Federal interests must contribute 50 percent of the costs of this assistance). Section 409 directed the Secretary of the Army to submit a report that identifies opportunities for enhancing wetlands in connection with the construction and operation of water projects. You can expect future update letters to cover some, or all, of these sections in more detail.

Other Activities

As was noted last month, the Corps jointly sponsored a symposium on Great Lakes water level forecasting and statistics. The proceedings are available for $20 by writing to: The Great Lakes Commission, Argus Building II, 400 Fourth Street, Ann Arbor, Michigan 48103-4816. Checks should be made out to the Great Lakes Commission.

For a number of years, the Corps has been working with the National Oceanic and Atmospheric Administration, the U.S. Geologic Survey, and federal agencies in Canada to update the datum plane for the Great Lakes. The current datum plane is the International Great Lakes Datum of 1955. Field measurements have been completed. The new datum plane is expected to be published this spring. Further details on this effort and what it means to the IJC Great Lakes Boards, the Corps, and the public will be discussed in a future update letter.

Great Lakes states and provinces have been preparing plans to restore and protect the environmental quality of the lakes. Remedial Action Plans (RAPs) are underway for the 42 areas of concern identified by the IJC. Civil and environmental organizations have been actively involved in RAP development. The Corps of Engineers has supported RAP development as a part of its missions to navigation maintenance and wetlands protection. Continued public involvement in RAP development and implementation will be necessary. Contact your state environmental agency or the USEPA Great Lakes National Program Office (312-353-2117) for more information on RAPs. We plan to address this and other environmental restoration programs in the Great Lakes basin in future update letters.



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