US Army Corps
of Engineers
North Central Division

GREAT LAKES LEVELS

Update Letter No. 90 **January 4, 1993**

1992 Annual Summary

The Great Lakes generally experienced a trend of above average levels in 1992. Except for Lake Superior, which finished the year about the same elevation as it started, the Great Lakes underwent a substantial rise. This rise ranged from 5 inches on Lakes Michigan-Huron to 19 inches on Lake Ontario. Much of the change took place in November 1992, when the Great Lakes basin had a near-record net basin supply for this century as a result of precipitation amounts 1.5 times the monthly averages. This issue of the "Monthly Bulletin of Lake Levels for the Great Lakes" illustrates how the seasonal declines of all the lower lakes were interrupted by the unusually wet basin conditions. The first six months of 1993 are projected to produce above average levels on Lakes St. Clair, Erie and Ontario, approximately half way between the long-term averages and the maximums of this century.

Precipitation

Across the Great Lakes basin, the winter of 1991-92 began with average to above average temperatures in December and January. Precipitation was slightly below average in December 1991; in 1992 below average precipita-

Great Lakes Basin Precipitation
Deviation from Long-term Average (1900-91)

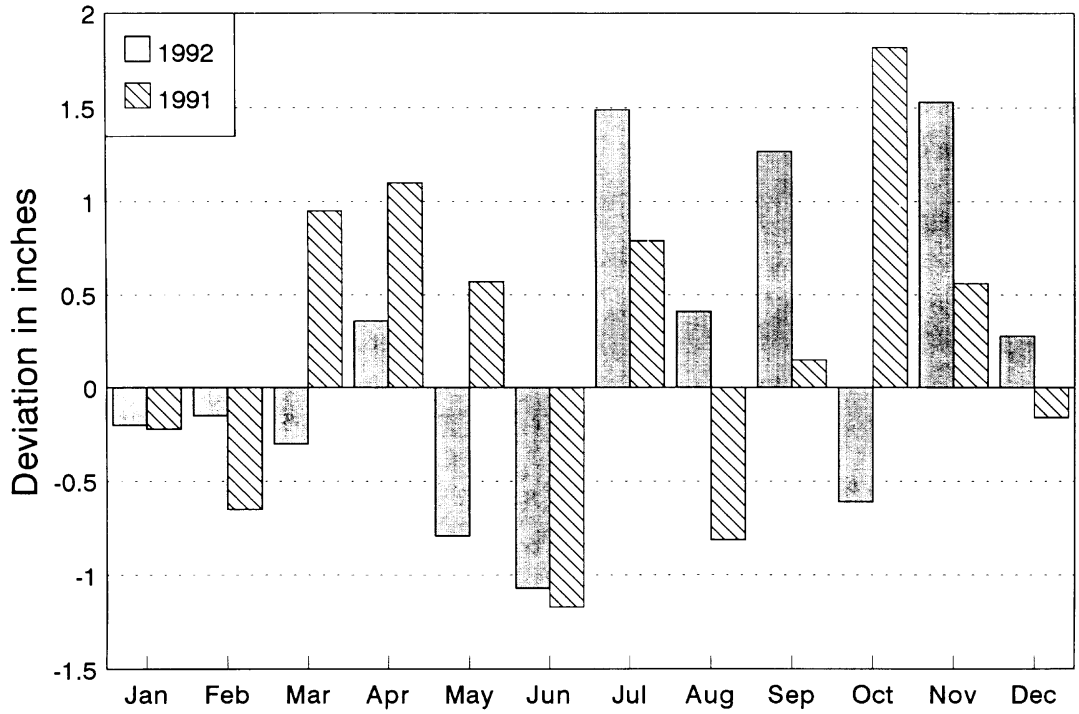


Figure 1

tion occurred for the months of January through March, May, June, and October, with the rest of the months experiencing above average precipitation. The total basin-wide precipitation for 1992 was 34 inches, about two inches above average. Figure 1 compares monthly precipitation for 1992 and 1991 to the long-term average for the entire basin. Since the 1992 water temperatures throughout the Great Lakes were generally lower than in 1991, evaporation rates were also reduced.

Lake Levels

The "Monthly Bulletin of Lake Levels for the Great Lakes," which accompanies this Update, graphically shows the fluctuation of water levels on the Great Lakes for 1991 and 1992. Generally, the level of Lake Superior remained below or near its average level throughout 1992. Lakes Michigan and Huron were near average until the end of 1992 when they rose; Lakes St. Clair and Erie were above average the entire period and Lake Ontario started the year below average, yet finished the year above average.

Lake Superior's level paralleled its normal seasonal cycle. The lake declined through the winter and early spring, reaching its lowest level of the year in April, when it was about the same as the long-term average. The lake then began its seasonal rise which continued until peaking in October. Lake Superior ended the year near its long-term average.

Lakes Michigan and Huron began 1992 slightly above the long-term average level. The lakes were at their lowest yearly level in February, slightly above the long-term average. The lakes then rose in May. However, from May through September the lakes fluctuated very little. Several factors contributed to this, including a minimal contribution from snowmelt and spring precipitation, which usually sustains a levels rise into July. In July the lakes were about 4 inches below long-term average. Following a wet fall, the lakes ended the year about 4 inches above their December long-term average level.

Lake Erie started 1992 about 7 inches above its January long-term average level. The lake followed the normal seasonal rise until May, when it began to flatten out, losing the normal cyclical drop during the late summer and fall months. The lake peaked in August, about 1 foot above its long-term average. Even though the lake had begun its seasonal decline, the level at the end of the year was about 19 inches above the long-term average December level.

Lake Ontario began the year about 4 inches below its average January level. The lake then began to rise in February, and has been above average since April. The lake peaked in May at almost 5 inches above average. In July the lake began trending upward from its long-term average. It ended the year about one foot above its average, due to the above average precipitation received in the latter part of the year, and the increased inflows from Lake Erie.

Storms

On January 24, 1992, sustained southwest winds over Lake Erie, ranging from 30 to 40 miles per hour, prevailed over the newly formed unconsolidated ice cover in the Buffalo-Fort Erie area. This caused the largest Niagara River ice run and the worst ice jam since the January-February 1985 jam.

Lake Regulation

In 1992, Lake Superior outflows (Figure 2) were essentially those specified by Regulation Plan 1977-A. During the first half of 1992 the levels of Lakes Superior and Michigan-Huron were above or near their respective averages, and, relatively speaking, Lake Superior was higher than Michigan-Huron. As a result, the Lake Superior outflows for the first six months of the year were above average, as the plan was attempting to release the extra water on Lake Superior to balance the two lakes. During February, March and April, to satisfy the Order of Approval for the regulation of Lake Superior, the outflow was set slightly lower than that prescribed by Plan 1977-A, but still above average. From June through September, the levels of the two lakes were below their average levels, but Lake Superior was slightly lower than Lakes Michigan-Huron, considering their historical range of levels. Therefore, the outflows from Lake Superior were slightly below average during that period. This conserved water on Lake Superior to help bring the two lakes into balance as compared with their averages. For the last three

Lake Superior Outflows
1992 Monthly Mean
and Long-term Average (1900-1989)

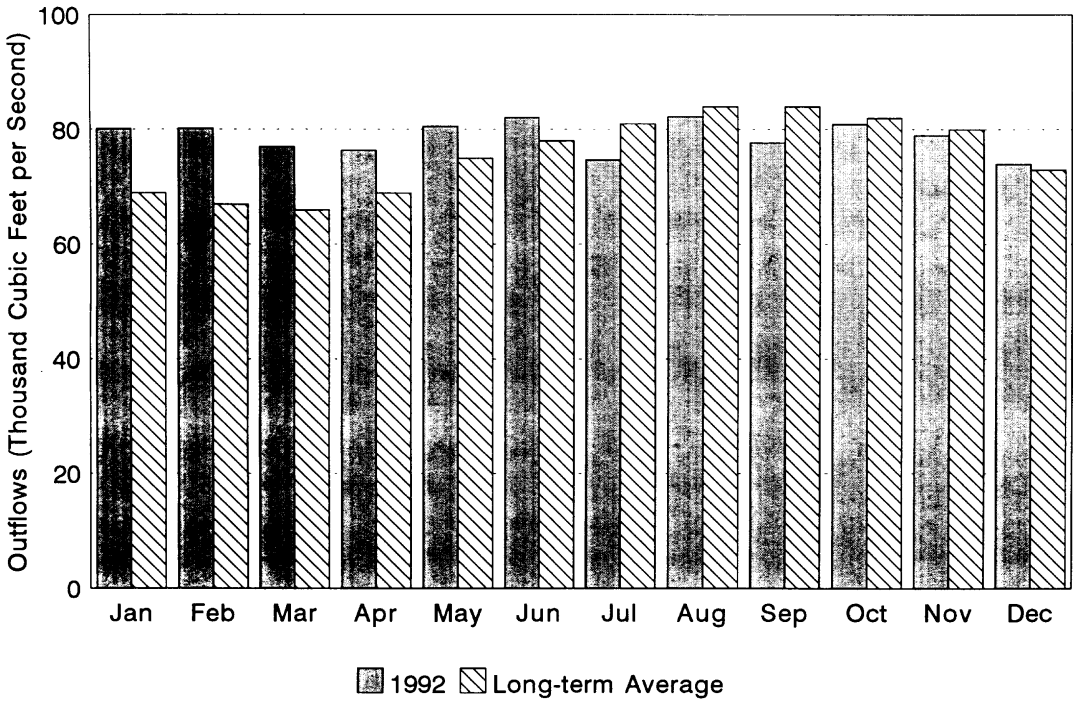


Figure 2

Lake Ontario Outflows
1992 Monthly Mean
and Long-term Average (1900-1989)

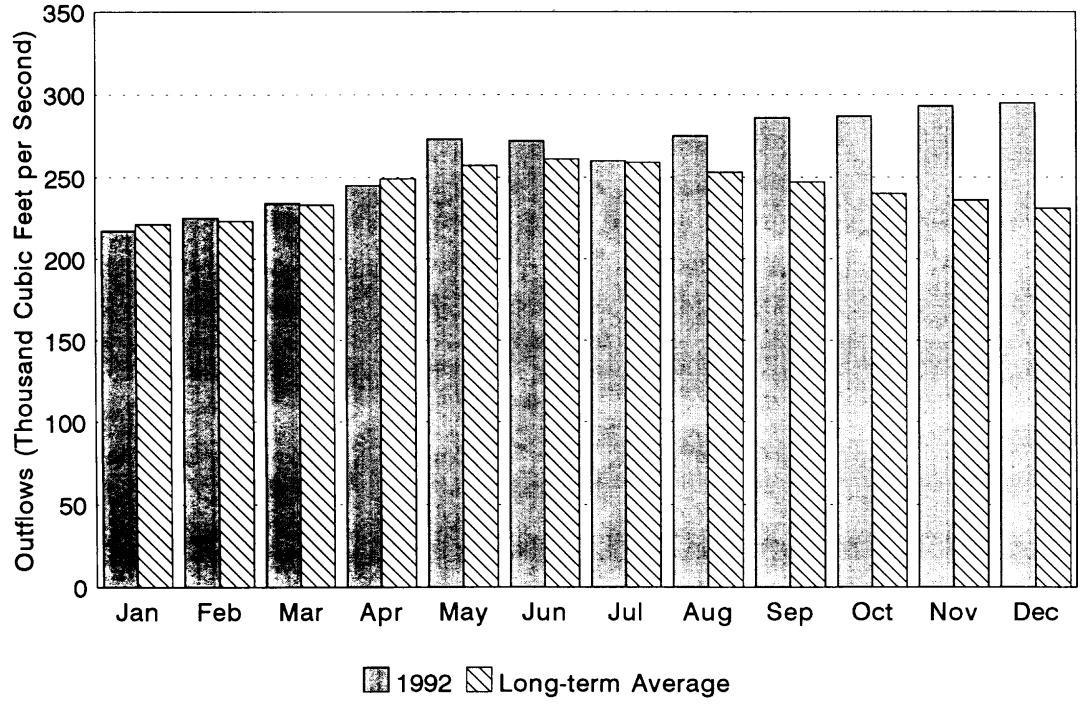


Figure 3

months of 1992, the outflows were near average.

Throughout the year, the setting in the Compensating Works was maintained at one-half gate open, while 500 cfs of water flowed through Gate No. 1 to satisfy water requirements for the fish habitat located on the north side of the remedial wall. Any flow changes resulting from the monthly regulation of Lake Superior were accomplished by varying the amount of water allocated to hydropower production.

The lowest Lake Ontario level during 1992 occurred on January 3rd at 244.05 feet (IGLD 1985). Although this was the lowest level for the year, the lowest seasonal value occurred six weeks earlier on November 18th and 19th at 243.84 feet. The level remained flat throughout most of January and February, but began to steadily increase in late February. The level of the lake peaked on May 18th at 246.50 feet. The period saw a very wet July and August resulting in a second peak on August 11th of 246.34 feet after a brief decline. At the end of August, the lake was 0.47 foot above average due to heavy rainfall at the end of August, associated with the remnants of Hurricane Andrew. The lake was 0.75 foot above the September long-term average.

Figure 3 shows the comparison of 1992 outflows with the long-term average outflows. Flows throughout the year were at or below those specified by Plan 1958-D. Reductions were made to prevent flooding around Montreal Harbour during the April-May Ottawa River freshet, to assist, to a limited extent,

Update Letters

In 1992, the bulletin provided monthly Updates on various Great Lakes-St. Lawrence River topics. For 1992, these are as follows:

January	--	**1991 Annual Summary, No. 78**
February	--	**Regulatory Permit Program, No. 79**
March	--	**Zebra Mussels, No. 80**
April	--	**Niagara River Hydropower, No. 81**
May	--	**New Water Resources Management Technologies, No. 82**
June	--	**USEPA's Assessment and Remediation of Contaminated Sediments Program, No. 83**
July	--	**Great Lakes Flow Metering, No. 84**
August	--	**Great Lakes Flow Measurements, (Last of 2-Part Series), No. 85**
September	--	**Physiography of the Great Lakes, No. 86**
October	--	**EPA Releases Lake Michigan LaMP, No. 87**
November	--	**Shipwrecks of the Great Lakes, No. 88**
December	--	**Great Lakes-St. Lawrence Water Levels Reference Study Nears Completion, No. 89**

recreational boating on Lake Ontario and the Upper St. Lawrence River and to reduce spillage by the power entities during planned bank outages in September and October. Flows were also reduced on occasion during emergencies to assist shipping in November and December when easterly winds prevailed.

High supplies prevailed throughout the fall of the year. As a result of these supplies, and the operational reductions, -126,000 cfs-weeks of accumulated deviations were on the lake on December 22nd. The level on this date, 245.62 feet, was 1.1 feet above the December long-term average. In response to the relatively high end-of-year levels, the St. Lawrence Board formulated strategies which could be used to pay back the deviations and reduce the likelihood of excessively high levels in the spring. As an initial measure, the board approved the waiving of the Plan 1958-D l-limit for the last two weeks of December, thereby eliminating all negative deviations. Depending on ice conditions, additional water, above that specified by the Plan, will be released throughout the winter.

Commercial Navigation

Through November 1992, tonnage at the Soo Locks decreased 3.5 percent from the comparable figure for 1991. The U.S. and Canadian vessels carried about 55 and 19 million tons of cargo, respectively. The foreign vessels carried about 2.6 million tons. Through November 1992 a total of 4,202 cargo vessel transits passed through the locks. This was a decrease of 7.2 percent in comparison to the passages through November 1991. Of these, 2,402 were U.S.-flagged vessels, 1,518 were Canadian-flagged, and 282 were foreign (ocean-going or "salties"). In addition to the cargo vessels, there were also 6,429 transits for other types of vessels, such as pleasure craft, Coast Guard, and scientific/research vessels. This was 580 transits less than 1991. Figure 4 shows the passage of two vessels at the Soo Locks. The Corps has the authority to keep the Locks open until January 15.

According to St. Lawrence Seaway Development Corporation's preliminary figures, 31.5 million metric tons of cargo moved

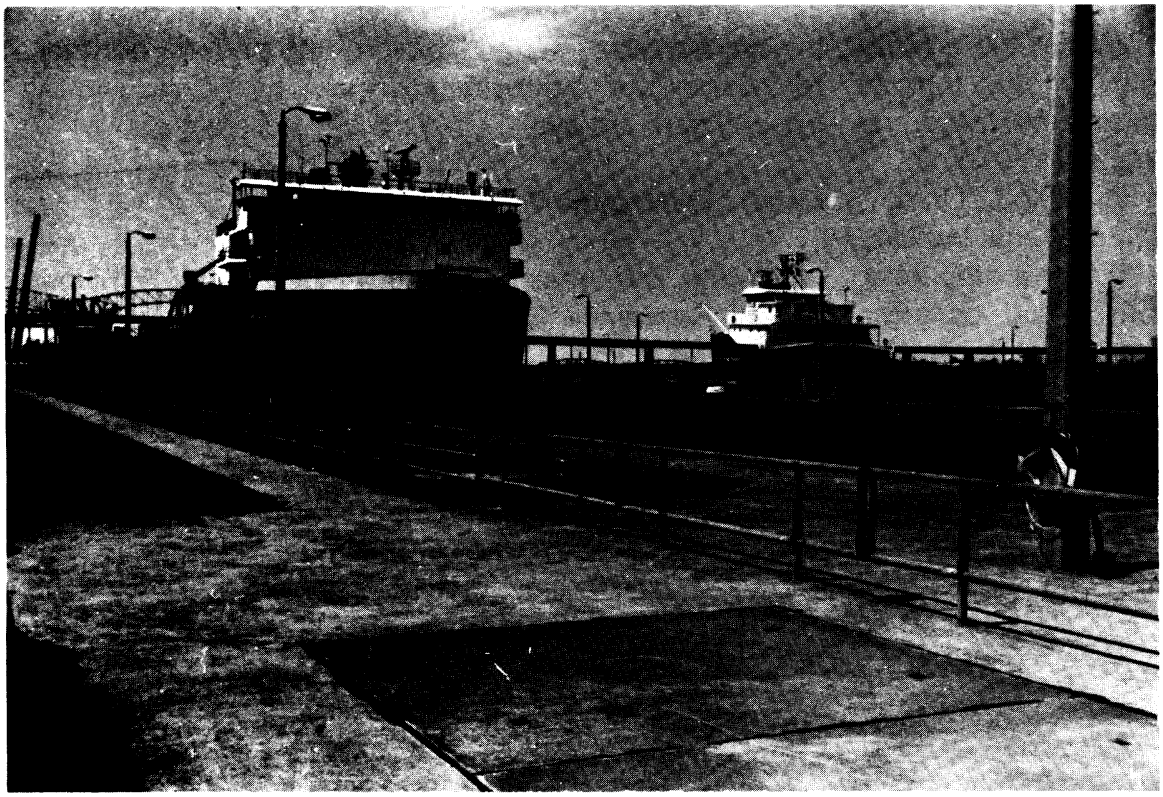


Figure 4. Transiting Vessels at the Soo Locks.

through the Montreal-Lake Ontario section of the Seaway in 1992. This total was 3.4 million metric tons less than 1991 due mainly to a sharp decline in Canadian grain exports. As of December 14, 1992, the total vessel transits were 2,440 for this year. (1603 lakers and 837 ocean vessels).

Seaway officials reported strong gains for a number of individual cargoes during the 1992 season including (preliminary): iron ore (up 4 percent to 8,820,000 metric tons); U.S. grain (up 34 percent to 4,552,700 metric tons); coke (up 40 percent to 703,000 metric tons); and petroleum products (up 206 percent to 110,000 metric tons).

A number of U.S. ports registered growth in international traffic during the 1992 season including:

*Port of Toledo, Ohio -- More than 1.3 million metric tons of cargo for international trade, up 8 percent over the 1991 total.

*Port of Cleveland, Ohio -- Increase in international traffic to more than 400,000 metric tons. Unique international cargoes through the port included hardwood logs exported to Germany and coal tar imported from Russia.

*International Port at Burns Harbor, Indiana -- Over 340,000 metric tons of international traffic, a 17 percent increase from its 1991 total.

*Port of Green Bay, Wisconsin -- 56 percent increase in international traffic versus 1991.

Monthly Bulletin of Lake Levels for the Great Lakes

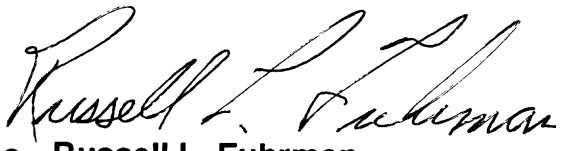
This past year has brought several revisions to the Monthly Bulletin. The levels are referenced to a new datum, International Great Lakes Datum 1985 (IGLD 1985), established at Rimouski, Quebec at the mouth of the St. Lawrence River. Metric units were also introduced in the table of monthly mean lake levels, as well as alongside each lake hydrograph. Conversion constants between IGLD 1985 and IGLD 1955 were provided in conventional as well as metric units. The background color for the maximum, minimum, and long-term average levels on each hygrograph was changed to blue to make the bulletin more appealing to the eye.

Levels Reference Study

During the year 1992, the Levels Reference Study Board conducted several Board and Working Committee meetings. Additionally, the Board conducted public forums to facilitate discussions with the public, both with individuals as well as public groups. Public forums were held in Thunder Bay, Ontario, on November 30; Milwaukee, Wisconsin, on December 1; Sarnia, Ontario, on December 2; and Watertown, New York, on December 3.

The Board discussed several progress reports on natural resource impacts of fluctuating levels; potential damages; erosion process of the shorelines, and land use and shoreline management; regulation scenarios; crisis water level conditions; evaluation criteria and draft study findings and recommendations.

The International Joint Commission (IJC) Levels Reference Study is on schedule for completion at the end of March 1993. A draft report will be completed in mid-January. Public Forums on the draft report will be held at Sault Ste. Marie, Ontario; Chicago, Illinois; Buffalo, New York; and Dorval, Quebec, during the period February 22-25.



Russell L. Fuhrman
Brigadier General, USA
Commanding

Great Lakes Basin Hydrology

The precipitation, water supplies, and outflows for the lakes are provided in Table 1. Precipitation data include the provisional values for the past month and the year-to-date and long-term averages. The provisional and long-term average water supplies and outflows are also shown.

Table 1
Great Lakes Hydrology[1]

PRECIPITATION								
BASIN	DECEMBER				YEAR-TO-DATE			
	1992*	AVG.**	DIFF.	% OF AVG.	1992*	AVG.**	DIFF.	% OF AVG.
Superior	2.9	2.0	0.9	145	30.4	30.2	0.2	101
Michigan-Huron	2.4	2.3	0.1	104	33.5	32.0	1.5	105
Erie	3.1	2.6	0.5	119	42.1	34.9	7.2	121
Ontario	2.6	2.9	-0.3	90	38.9	35.1	3.8	111
Great Lakes	2.6	2.4	0.2	108	34.5	32.2	2.3	107

LAKE	DECEMBER WATER SUPPLIES***		DECEMBER OUTFLOW[3]	
	1992[2]	AVG.[4]	1992[2]	AVG.[4]
Superior	35,000	-24,000***	74,000	73,000
Michigan-Huron	52,000	29,000	186,000[5]	183,000
Erie	27,000	17,000	233,000[5]	199,000
Ontario	57,000	27,000	295,000	231,000

*Estimated (inches)

**1900-90 Average (inches)

***Negative water supply denotes evaporation from lake exceeded runoff from local basin.

[1]Values (excluding averages) are based on preliminary computations.
[2]Cubic Feet Per Second (cfs)
[3]Does not include diversions
[4]1900-89 Average (cfs)
[5]Reflects effects of ice/weed retardation in the connecting channels.

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