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Great Lakes Update

Diversions in the Great Lakes Basin

The diversion of Great Lakes water to locations both inside and outside of the Great Lakes basin has been source of concern and questions for many years. This article will investigate the history of these diversions and highlight their present day use. The term "inter-basin" refers to diversions linking two completely separate watersheds. The term "intra-basin" is used to describe diversions linking two basins within the same larger watershed.

Two inter-basin diversions at Long Lac and Ogoki in Ontario, Canada divert water from the Hudson Bay watershed into the Lake Superior basin. The inter-basin Lake Michigan Diversion at Chicago diverts water from Lake Michigan into the Mississippi River watershed.

The intra-basin diversion at the Welland Canal in Ontario, Canada creates a navigation route between Lake Erie and Lake Ontario, bypassing Niagara Falls. The diverted water used for the Welland Canal, never leaves the Great Lakes basin. Figure 1 shows the location of each diversion within the darker shaded Great Lakes drainage basin.

Figure 1: Great Lakes Diversions

The Long Lac and Ogoki Diversions

During the 1940s two diversions into the Lake Superior basin were completed at Long Lac and Ogoki in Ontario, Canada. The two diversions operate under an exchange of diplomatic notes between the United States and Canada dating back to 1940 and under the Niagara Treaty of 1950. They enabled Canada to increase its electricity supply during World War II.

The Long Lac Diversion, completed in 1941, connects the headwaters of the Kenogami River with the Aguasabon River, which naturally outlets into Lake Superior 150 miles east of

Thunder Bay. The Ogoki Diversion, completed in 1943 connects the upper portion of the Ogoki River to Lake Nipigon and from there flows into Lake Superior 65 miles from Thunder Bay.

Control of the diverted water lies solely with the Canadian Government, although during times of emergency there have been consultations between the U.S. and Canada. Examples of cooperation occurred in 1952, 1973 and 1985, when Canada temporarily halted the diversions to combat problems caused by high water.

Today the Long Lac and Ogoki diversions continue to provide hydropower generation capability to northern Ontario. Ontario Power Generation (OPG) operates many power plants in the region from their facility in Thunder Bay.

Combined, the flow of water in the Long Lac and Ogoki diversions averages 5,000 cubic feet per second. The hydrologic effect of these diversions increased the net supply of water to the Great Lakes. The mean level of Lake Superior has been increased by 3 inches, Lakes Michigan-Huron by 4 inches, Lake Erie by 3 inches and Lake Ontario by 3 inches. The maximum criteria levels for the Lake Superior and Lake Ontario regulation plans are unaffected by the diversions.

The Lake Michigan Diversion at Chicago

Water has been diverted from Lake Michigan at Chicago since the completion of the Illinois and Michigan Canal in 1848. Early use of the diversion was navigation between Lake Michigan and the Mississippi River. Until 1900, water diverted from Lake Michigan averaged about 500 cubic feet per second.

The completion of the Chicago Sanitary and Ship Canal (CSSC) in 1900 and the Calumet-Sag Channel in 1922 allowed the diversion of flow to the Illinois River. Prior to the completion of these canals, raw sewage and heavily polluted water flowed into Lake Michigan via the Chicago River. The city's drinking water intakes were located just offshore in Lake Michigan and outbreaks of waterborne disease were common. In 1895 a major outbreak of cholera killed 90,000 residents. The new canals reversed the flow of the Chicago River, allowing the polluted water to be taken away from the drinking water source. Figure 2 shows the current configuration of the Chicago Diversion.

Figure 2: The Chicago Diversion

In 1910, Secretary of War Jacob M. Dickinson issued a permit allowing a maximum water withdrawal of 4,167 cubic feet per second. Use of this water was for domestic, sanitary and navigation purposes.

The Boundary Waters Treaty of 1909 was ratified to help resolve disputes concerning water quantity and quality along the boundary between the United States and Canada. Soon after the ratification of the Treaty, the maximum permitted amount of diverted water was exceeded. In 1913 Britain, on behalf of Canada sent a note protesting the increased diversion. This set off a decade's long legal battle.

Litigation between the U.S. Government, the Chicago Sanitation Department and the State of Illinois was joined by other cities and three other States. This dispute reached the Supreme Court of the United States and was settled by a series of judicial decrees. In its 1925 decree, the high court stated that the diversion be limited to 8,500 cubic feet per second. A second decree in 1930 called for a three-step reduction of the diversion. The first reduction was to 6,500 cubic feet per second in 1930, followed by another reduction to 5,000 cubic feet per second by the end of 1935. The final reduction to 1,500 cubic feet per second was required by the end of 1938. A Supreme Court decree, issued in 1967, allows a total diversion of 3,200 cubic feet per second for navigation, domestic water use and sanitation.

Modification of the 1967 decree occurred in 1980, but the diversion is still limited to 3,200 cubic feet per second. This modification gave the United States Army Corps of Engineers (USACE) the responsibility to audit the diversion. The Chicago District of USACE works in cooperation with the United States Geologic Survey, the Illinois Department of Transportation and the Metropolitan Water Reclamation District of Chicago during the audit process.

Figure 3 shows an aerial view of the Chicago Lock and Chicago River in downtown Chicago. Prior to the diversion the Chicago River emptied into the lake.

Figure 3: Chicago Lock and Chicago River

The Chicago diversion decreased the water supply to Lake Michigan-Huron and created an additional outflow channel from Lake Michigan. The St. Clair River is the natural outlet from Lake Michigan-Huron. The increased outflow has lowered the water level of Lake Michigan-Huron by two and a half inches. It also reduces Lake Erie's water level about two inches and Lake Ontario's water level by an inch. Under the current regulation Plan 1977A for Lake Superior, the diversion also reduces the mean level of that lake by one inch.

For more information on the Chicago Diversion, please visit the Chicago District of Corps of Engineers website at:

http://www.lrc.usace.army.mil/

The Welland Canal

The Niagara River is the natural link between Lakes Erie and Ontario. The world famous Niagara Falls lay 15 miles downstream from the head of the river and drop approximately 230 feet. The falls and a series of rapids create a navigation barrier between Lakes Erie and Ontario. Before the construction of the first Welland Canal in 1824, traffic wishing to travel between Lake Erie and Lake Ontario was limited to a portage route from Chippewa, Ontario to Queenston, Ontario.

The 1800s saw three different canal configurations, each made up of a series of navigation locks. The present canal was completed in 1932 and is a series of eight locks between Port Colborne, Ontario on the northern shore of Lake Erie, and Port Weller on Lake Ontario's southern shore. Seven of the locks allow navigation though the Niagara Escarpment and the eighth is a guard lock at Port Colborne to allow for fluctuations in Lake Erie's water level. The elevation change from Port Colborne to Port Weller is over 300 feet. Figure 4 shows vessels

navigating locks 4, 5, 6, and 7 of the Welland Canal.

Figure 4: Vessels in the Welland Canal (image credit to the Welland Library)

Over 40 million tons of cargo is moved through the canal on an annual basis. The shipping season runs from spring to early winter, but is largely dependent on ice and weather conditions. This year the canal is scheduled to open on March 31. Vessels using the canal are limited to a length of 730 feet and a draft of 26 feet 6 inches.

The flow of water in the Welland Canal varies over time, but averages approximately 7,000 cubic feet per second. Studies have shown that the added outlet from Lake Erie has permanently dropped Lake Erie's water level 5 inches. Since the level of Lake Erie affects the level of Lake Michigan-Huron and Lake Superior, their levels have been lowered by 2 and 1 inches respectively.

Diversion Impacts

Since the completion of the Long Lac and Ogoki diversions in the early 1940s, the amount of water diverted into Lake Superior averages approximately 5,000 cubic feet per second, or 2,000 cubic feet per second greater than the amount of water diverted out of Lake Michigan at Chicago. The net total of all the inter-basin diversions in the Great Lakes shows more water diverted into the lakes than out.

Upcoming Public Meetings

The International Lake Superior Board of Control will host a public meeting the evening of June 4, 2009. The event will he held at the Cisler Center on the campus of Lake Superior State University in Sault Ste. Marie, MI. There will be an 800 number provided to allow remote access to the meeting. Please check the International Lake Superior Board of Control's website below for more updates.

http://www.ijc.org/conseil_board/superior_lake/en/superior_home_accueil.htm