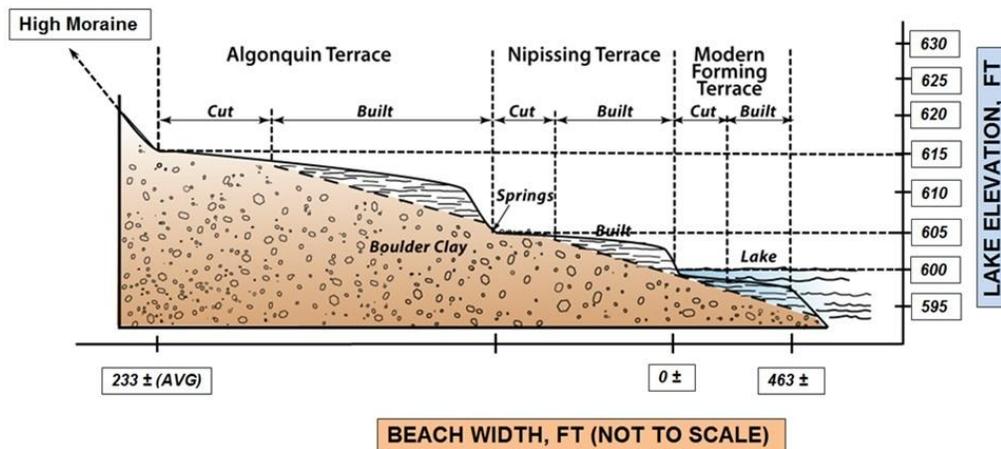


## The History of Crystal Lake Water Levels

Crystal Lake was originally an embayment of glacial Lake Algonquin (11,000 b.p.). As the glacier receded, it was left perched 38 ft above present Lake Michigan at an elevation of 615 ft. Its shoreline consists of exposed terraces (stairsteps) from the high moraines bordering the lake to the water's edge and underwater terraces (submerged shoals).



The level of Crystal Lake was lowered dramatically in 1873 when a severe storm washed out a temporary dam during an attempt to construct a system of canals to Lake Michigan. A torrent of water flushed downstream for three weeks. As the lake area was reduced, new beach was created. This allowed for the future coming of the railroad, installation of telegraph and telephone services, and development of a modern resort community in a prime recreational area. The perimeter of the Lake is now filled with ~1,100 cottages, numerous resorts, several church camps, a yacht club, boating access sites, a network of roads and trails, and the Village of Beulah.

The lake level initially dropped from 615 ft (1873) to 595 ft (~1873-1895) for a total drop of 20 ft (a total loss of 76 Bgal), and later rebounded 5 ft to 600 ft (its current level) for a net drop of 15 ft (a net loss of 61 Bgal). In subsequent years, the level was subject to large fluctuations of several feet as makeshift dams were intentionally removed or accidentally failed. A Geographic Information Systems (GIS) approach has now been used to compare dimensions of historic lake maps to better quantitate the magnitude of the event. It is now estimated that the Lake lost a net volume of ~ 51 Bgal (-16.7%).

The lake area of the project map drawn for the Benzie County River Improvement Company (1873) differed from the original survey map (1838-9) by only 70 A! The total drop of 20 ft (615 to 595 ft) reduced the lake area from 10,426 A to 8,714 A (-16.4%) and created a beach area of 1,712 A, equivalent to an "average" beach of 696 ft from the 5-ft shoal to the moraine. The net

drop of 15 ft (615 to 600 ft) reduced the lake area from 10,426 A to 9,843 A (-5.6%) and created a beach area of 583 A (net), equivalent to an “average” beach of 233 ft from water’s edge to the high moraines around the entire 21-mile lake perimeter. New LIDAR topographic data will be used to further refine these values in the future.

Crystal Lake was one of the first lakes in Michigan to establish a “natural level” (600.48 ft) (1909) and to build a permanent control dam (1911) to accommodate a growing population of cottagers adversely affected by low summer water levels insufficient to float boats, and high winter levels causing erosion of beaches. In 1980, dual control levels of (600 ± 0.25 ft) (summer high and winter low, respectively) were established. In July 2014, an automatic gauge was installed at the Outlet Dam to record lake levels for use in moderating the extremes of seasonal changes.

Lake level defines aquatic communities, determines water quality, and dictates watershed management. Crystal Lake is replenished by both precipitation and groundwater. It is affected by regional climate, but its level is relatively independent of that of Lake Michigan. Even on a calm day, however, its apparent level is affected by the Earth’s curvature. An observer standing at eye level peering across the widest part of Crystal Lake can see a bit beyond the horizon on the opposite shore (2.5 mi), but must stand atop a 44-ft hill to see the horizon across the longest reach of the Lake (8.1 mi).

– Stacy L. Daniels (2016)

[For more information, see Stacy Leroy Daniels, *The Comedy of Crystal Lake* (2015)]

**“MAP SHOWING SOURCES & COURSES of the PLATTE & BETSEY RIVERS, BENZIE COUNTY, MICH.,  
 Together With Some of the Obstructions and Proposed Improvements,  
 DRAWN for the BENZIE COUNTY RIVER IMPROVEMENT COMPANY,  
 by B.C. Hubbell, DRAFTSMAN, BENZONIA, MICHIGAN” (ca. 1873)**

