A Map; A Plan; A Canal; a Beach - The *"Tragedy"* / *"Comedy"* of Crystal Lake!

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"The sea does not reward those who are too anxious, too greedy, or too impatient. To dig for treasures shows not only impatience and greed, but lack of faith. … One should lie empty, open, choiceless as a beach—waiting for a gift from the sea." -- Anne Morrow Lindbergh, Gift from the Sea, 1955.

"Patience! Life is a beach upon which waves wash fleeting thoughts upon the sand." -- "Archibald Jones"

Abstract

An attempt to construct a system of canals in Northwest Lower Michigan in 1873 led to the dramatic lowering of the level a very large inland lake and creation of a beach that insured its future as a prime recreational area (*). The historic lowering of Crystal Lake, which occurred while attempting to build a canal, is unsurpassed when compared to other large inland lakes in Michigan. Its unintended consequences have evolved from a perceived *"failure"* of an *"ill-advised project"* by an apparent scapegoat, to an unqualified *"success"* by a visionary celebrated as a local hero. Rediscovery of an historic map supporting the project allowed for quantitative assessment of the magnitude of this epochal event.

[(*) Revised from: American Canals, Bulletin of the American Canal Society, 45(3), 6-10 (Summer 2016); and based on *"The Comedy of Crystal Lake"* (2015), sequel to "The Tragedy of Crystal Lake" (1922). www.CrystalLakeComedy.com]

The History

**"If nothing else, the early history of Benzie County is the story of dreamers, entrepreneurs and developers …
The story has more than a little relevance to those who live and dream in Benzie County today."
--- *"The Tragedy of Crystal Lake"*, editorial comment, 1987 reprint.**

Crystal Lake is forever associated with the dream of building a system of canals to interconnect it with nearby Lake Michigan. As the levels of glacial Lakes Algonquin and Nippissing, precursors to Lake Michigan, fell over the millenia. prevailing winds and waves closed off the Crystal Lake embayment with high-ridged sand dunes containing it like a "big bathtub" high upon a hill. Other large inland lakes individually connected to drowned river mouths all along the west shore of Michigan share this commonality. As settlements grew in the early 19th Century, needs developed to improve rivers, lakes, and harbors for navigation; to build dams to provide water power for grist and saw mills; to drain farm lands; to build canals for transportation, and other structures to control floods, irrigate land, and supply drinking water. Unlike other large inland lakes, Crystal Lake was left separated from Lake Michigan by a narrow isthmus and uniquely perched 38 feet above the "big lake" with an abundant water source and a sufficient hydraulic drop – the future makings of a fine canal! While a canal never materialized at Crystal Lake, the attempt to make it so had a most profound effect upon its destiny!

Over geological time, a series of sandy terraces, i.e. "stair-step" landforms of gently sloping surfaces (treads) and steeper ascending slopes (risers), were formed extended from the bases of surrounding high moraines to the water's edge, together with other terraces submersed as shallow areas (shoals) beneath the lake surface (**Figure 1**).

The level of Crystal Lake, established by natural forces during glacial times, was subsequently affected by an epochal man-made event during early settlement times. The Benzie Co. River Improvement Co. (**BCRIC**) (Archibald Jones, President) (*) filed Articles of Association on 16 Aug 1873 intending to connect Crystal Lake with a system of canals – one of the first such filings in Michigan (MI Act 169 of 1869). An ambitious scheme was proposed by the **BCRIC** to connect Crystal Lake to nearby Lake Michigan with a system of navigable canals. Plans called for improving water-lots, opening a passage by straightening the outlet to the Betsey River, removing obstructions to navigation, and building a steamboat.

[(*) Archibald Jones (1811-1890), "the man who (*allegedly*) pulled the plug at Crystal Lake", was an entrepreneur of hardy Welsh stock, who worked on the Erie Canal as a young man becoming a "bootstrap engineer", with latter experiences in carriage building, fruit growing, lumbering, horse dealing, … canal building …, horse trading, and cattle ranching, as he, his wife, and eight children migrated across the Midwest in the mid-1800s from NY->OH->MI->IL->KS->IA.]

On 23 Aug 1873, the whitecaps of 'Cap Lake breached a temporary dam at its Outlet leaving the future canal "high-and dry" (the *"Tragedy"*) but exposing a new beach (the *"Comedy"*). The level of Crystal Lake was lowered dramatically by 20 ft (15 ft net) over a three-week period as its waters, pent-up for centuries, were released, as 76 Billion gal (61 Bgal net) flushed downstream to Lake Michigan. The Lake dropped from a high-water level (615 ft) to a low-water level (595 ft) before rebounding 5 ft to its present level (600 ft). The lake level was then subjected to intermittent fluctuations of several feet as a series of makeshift dams were haphazardly built and removed to allow passage of logs during the lumbering era.

The Map

"… Long thus, and various, ev'ry riv'let strays, Till closing, now, their long meand'ring maze,
Where in a smiling vale the mountains end, Form'd in a crystal lake the waters blend:"
-- The Lusiad of Luís Vaz de Camões, Book IX, Lines 573-576.

A very unique map was drawn for the Benzie Co. River Improvement Co. (**BCRIC**) by B.C. Hubbell (*) in 1873 (**Figure 2**). It was "rediscovered" by Florence Bixby, former curator, in the Benzie Area Historical Museum (BAHM) in late 2011 after a serendipitous conversation with this author. It had residing there uncateloged and forgotten 30 years after it had been donated to the BAHM in 1980 by William E. Milliron, a local resident. He had found it hidden within a wall (!) during the renovation of an 1870s farmhouse built by John Bailey, a Benzonia pioneer, and Vice President of the **BCRIC**, who also served the Co. as a surveyor, and later platted the "Beulah View and Crystal City Resort", which emerged from a swamp to become the future County seat. The map may have been retained in hopes that the canal might be reconsidered!

[(*) Buel Case Hubbell (1848-1924), the third of four children, assisted his father in constructing and operating the first grist mill in Benzie Co. on Cold Creek, the principal tributary to Crystal Lake. He later became a prominent local businessman engaged in the lumber business. Ironically, in 1874, when the beach on Crystal Lake was at its widest, he was unsuccessful in claiming 160 A of the new beach land as a homestead!]

The map shows outlines of the lakes; sources and courses of the rivers; proposed canals; wagon roads; township, county, and section lines; town corners; obstructions to navigation - logs, rocks, snags, etc."; and rocks and rapids".

Three canal routes were considered, proposed, and/or attempted from Crystal Lake to Lake Michigan:

(1) **"South" Canal** (proposed, surveyed, and attempted in 1873 by the **BCRIC**) from the Outlet of Crystal Lake into the Betsey River and on to Betsey Lake and Lake Michigan at Frankfort;
(2) **"North" Canal** (proposed and surveyed in 1873, but never attempted by the **BCRIC**) from Platte Lake through Rush Lake, Long Lake, and Round Lake into Crystal Lake; and
(3) **"West" Canal** (considered sometime prior to 1873, but independent of the **BCRIC**) to run directly from Crystal Lake across the isthmus of Point Betsey.

The Hubbell map (1873) was patterned after the original government survey map by Albert and Alvin Burt (1838-1839) and later repliciated by Alexander Winchell (1860), the State geologist of Michigan who conducted field work for the second state geological survey. After restoration, the map was formally unveiled at the 3rd Annual Archibald Jones Day, 25 Aug 2012. A handsome two-sided bronze marker was dedicated to commemorate the historic event on 22 Aug 2015.

The three canal routes can be compared (**Table I.) (***)

Table I. Comparisons of Three Canal Routes.

Parameter	Original	"South Canal" (Attempted)	"North Canal" (Proposed)	"West Canal" (Considered)
Crystal Lake				
Elevation, ft (net)	**615**	**600**	**586**	**577**
Δ Elevation, ft	**0**	**-15**	**-29**	**-38**
Length, mi	**>8.5**	**8.1**	**8.0**	**7.8**
Width, mi	**>3.0**	**2.5**	**2.3**	**2.1**
Depth, ft	**180**	**165**	**151**	**142**
Area, Acres (*)	**12,356 (10,426)**	**9,854 (9,843)**	**7,883**	**7,095**
Volume, Bgal (*)	**303**	**242**	**193**	**174**
Δ, % Area	**+25**	**0**	**-20**	**-28**
Δ,% Volume	**+25**			
Canal				
Total, mi		**7.25 (8.948)**	**8.73 (8.522)**	**0.73 (0.635)**
Dredged, mi		**1.3 (1.410)**	**1.3 (1.490)**	**0.73 (0.635)**

(*) Areas and volumes based on topography and benthymetry agree with anecdotes from 1873, "when the waves were noticably much higher", the Lake had covered an area "some two thousand acres more of surface than at present". Estimates range from 7 to 35 ft total drop with a rebound of 5 to 10 ft - the consensus being 20 ft and 5 ft, resp. Provisional areas and volumes from 2016 are in parens ( ). Further refinements are pending with new LIDAR topo data.

The Analysis

"Regardless of how lakes are formed, their surface shape, surface area, underwater form, depth and the irregularity of their shoreline have a major impact on turbulence, lake stratification, sedimentation and re-suspension, and the extent of littoral-zone wetlands that determine lake functioning."
– Jacob Kalff, Limnolgy, 2002.

Knowledge of the morphology of Crystal Lake allows for a critical analysis of the magnitude of the event (**Table II.**).

Table II. Morphological Comparisons of Crystal Lake (Before, During, After the Event)

Source	**Description**	**Map Date**	**GIS Analysis**	**GIS Date**	**Lake Depth (ft)**	**Lake Area (Acre)**	**Lake Perimeter (mi)**	**Beach Area (Acre)**	**Beach Depth (ft)**
Before									
Burt & Burt	Original Survey	1838-39	Michalek	2016	615	10,496	21.526		
Winchell	Grand Traverse	1860	Michalek	2016	615	10,458	22.438		
Winchell	Grand Traverse	1860	Fusilier	2002	615	10,555	---		
Hubbell	BCRIC	1873	Michalek	2016	615	10,426	21.951		
Average	(All)					10,484			
Between									
McNamee	Bathymetry	1935-42	Michalek	2016	595	8,714	20.109		
After									
McNamee	Bathymetry	1935-42	Michalek	2016	600	9,843	20.622		
"	"	"	Breck	2004	600	9,869	20.830		
"	"	"	Fusilier	2002	600	9,880	20.533		
"	"	"	NWMCOG	2001	600	9,854	20.838		
"	"	"	IFR	1942	600	(?) 9,711	---		
Average	(Less IFR)					9,862			
Beach (avg)	Calculation				615->600			583	233
					600->595			1,129	463
					615->595			1,712	696
	Extrapolation				615->600			2,502	1,026

Three periods are noted: Before 1873; Between 1873-1904; and After 1904-present. Values for the area of the Lake before its lowering (Avg. 10,484 A) are in surprising agreement considering the technology of the early 1800s. The area of the Lake after its lowering (Avg. 9856 A) as determined by four different researchers using the the 1935 benthymetric survey is also in very good agreement. The area during the transitory time (~30 years) between the initial lowering and the building of the permanent dam was a period of fluctuating levels as a series of temporary dams came and went.

Refinement of lake areas allowed calculation of the "depth" of beach measured from the water's edge to the foot of the high moraines As the elevation of the lake surface lowered, more water area was lost as more beach area was gained. The analysis is still continuing. In 2016 aerial photography partners will have access to a State of Michigan managed secure imagery viewing service providing much higher resolution of topographic data as measured by LIDAR.

In late 1911, Crystal Lake was one of the first lakes in Michigan to establish a "natural level" (600.48 ft) and build a permanent control dam under (MI Act 1202, 1911). A growing population of cottage owners were being adversely affected by low summer water levels insufficient to float boats, and high winter levels causing wind and ice erosion of beaches. In 1980, revised levels of (600 ± 0.25 ft) (summer high, winter low, resp.) were established. In July 2014, a continuous lake level gauge was installed at the Crystal Lake Outlet Dam to provide data at 15-minute intervals year-round that are telemetered, recorded, and evaluated to define seasonal changes, wind and wave surges, precipitation events, freeze-thaw (ice in/out) events, and seiches (tides). The intent is to provide data for better control of lake level and lessening the effects of extremes. The magniture of the 1873 event thus has now been reevauated in 2016. At the present level of 600 ft, the net beach area gained (net lake area lost) of 583 A is equivalent to an average beach depth of 233 ft. At the low-water level of 595 ft, the total beach area gained (total lake area lost) of 1,712 A would have been equivalent to an average beach depth of 696 ft.

Conclusion

"The event was so epochal in its nature and has such a permanent bearing on the subsequent development of Benzie County that it is rightly considered as one of the major incidents of the county's early history."
-- Leonard L. Case, A Bicentennial Reader, 1976.

The *"Tragedy" / "Comedy"* of Crystal Lake has led to many developments. The immediate creation of "new lands" spread around the lakeshore perimeter made possible the development of a modern recreational community: the founding of the Village of Beulah (the County seat), the coming of the railroad, installation of telegraph and telephone lines, lakeside resorts, and cottages, all connected by an infrastructure of perimeter roads and trails. The perimeter of almost 21 mi of sandy beach is sufficient to support a two-lane state highway around part of the Lake and other perimeter roads around almost all the rest of the Lake. The beach also supports ~1,100 cottages along one or both sides of the road (assuming ~ 100 ft beach frontage per lot), numerous resorts, several church camps, a yacht club, a state boating access site, and the village of Beulah (the county seat). The former railroad bed has become a popular trail for walking/biking to and from the nearby port City of Frankfort.

The event also precipitated a series of slowly evolving physical rearrangements of the landscape occurring along the new shoreline, within the depths of the Lake, and in surrounding wetlands. Previously submerged lake terraces became sandy beach and peripheral marshes became farmland. Resuspension and redistribution of lake sediments that had lain dormant in cohesive formations since subsidence of the last glacial period still continues to this day. Even after 143 years (as of 2016) underwater sandbars are still being reformed within the Lake. Former hydric soils are still subsiding as organic peat bogs are oxidized upon exposure to the air.

Canals have outlived their useful lifetimes, but also left a legacy of past transporation across North America. Some canals have involved natural and manmade events causing changes in lake levels. The challenge lies in evaluating past lake levels and determining what they should be in the future. As lake levels rise and fall they affect water quality and quantity; animal and plant life; recreational uses; property values; and environmental conditions. We cannot "turn back the tide", but we can "mind" our lakes by observing and assessing their levels for successful protection and management.

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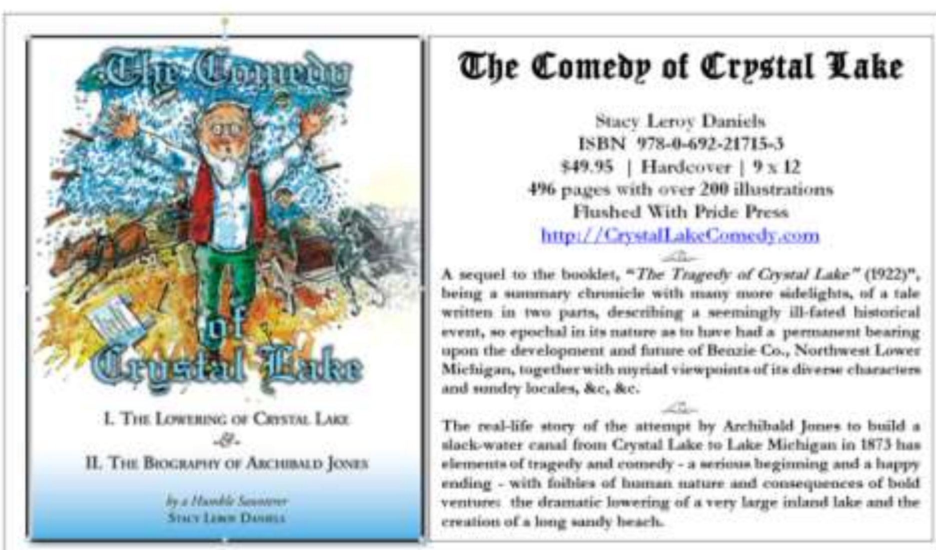
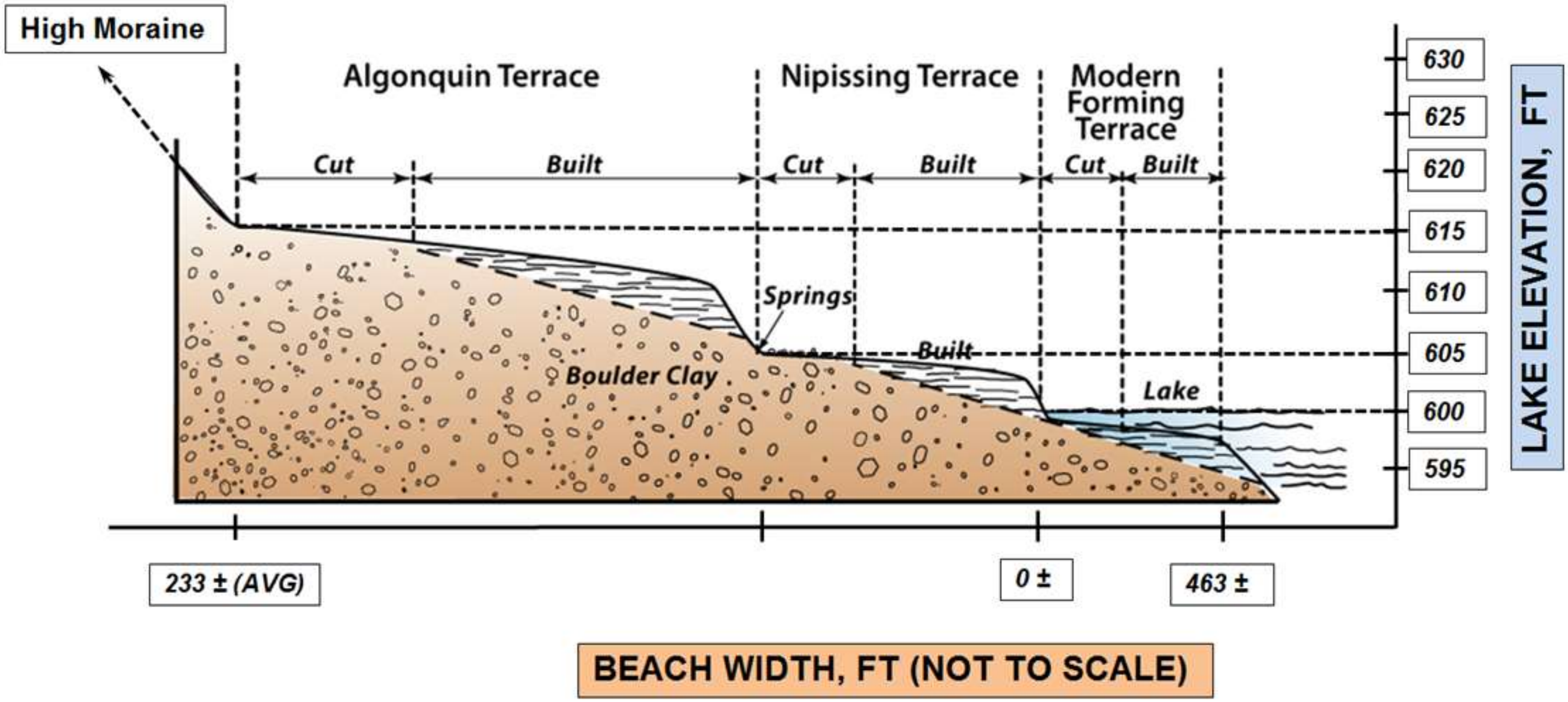


Figure 1. Crystal Lake Its Many Levels. (Adapted after I.D. Scott, Inland Lakes of Michigan, 1921.)



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