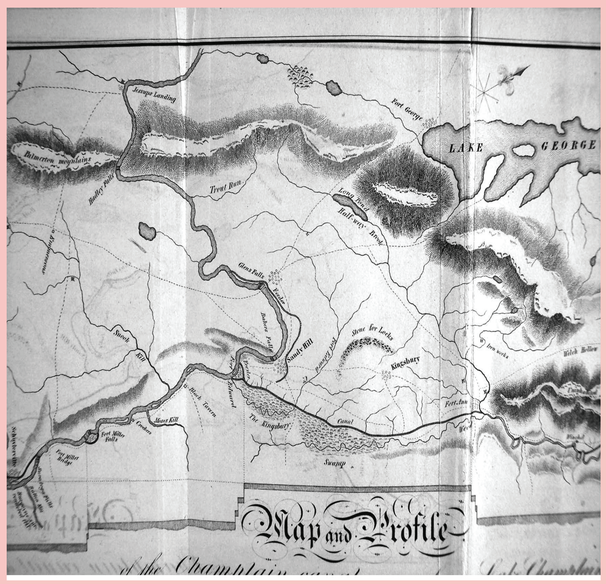
Constructing the Champlain Canal

Kevin M. Yochim

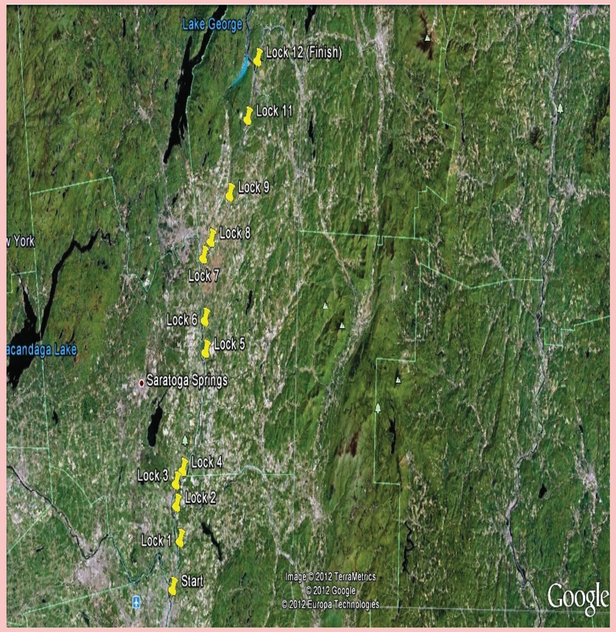
Overview

In the early 19th Century, the economy of northern New England was beginning to expand rapidly. The forests of Vermont and northern New York were virtually untapped, with an estimated fifty to two hundred cords of wood per acre (Williams, 1809). While people did not travel much on a regular basis, transportation routes became commodities when products, such as lumber and iron, started being exported to other parts of New England and Canada. There were few roads, so the primary mode of transportation was over water. Steam boats were being constructed to transport both goods and people on rivers and lakes. Lake Champlain, which stretches out over 125 miles from Whitehall, NY into Quebec, was home to a huge amount of trade due to its large area. The Hudson River begins in Newcomb, NY and travels 315 miles before it empties into the New York Bay, making it a very important route as New York City was still expanding and required many resources from the north. Because of this, it was decided in 1816 that a canal be built to allow for the navigation of ships between Lake Champlain and the Hudson River.

The main motives behind the construction of the dam were economic and militaristic in nature. Millions of feet of boards, planks, and square timber could be transported southward with ease, as they could simply be bound together and float out of the lake, through the canal, and down the river. Additionally, the vast amounts of wood around Lake Champlain could be sold in New York rather than "being driven to a doubtful market by a long and hazardous navigation to Quebec" (Noble, 1906). Iron could be transported easily down to New York to feed the almost insatiable demand. Politically, having a passage between the Hudson River and Lake Champlain would allow the Navy to bring boats up to the lake from New York rather than building them there – something that would have been very useful in the French and Indian War.



Early 19th Century map of the northernmost portion of the Champlain Canal. Oriented with west at top. Canal can be seen west of Kingsbury Swamp, with Glens Falls further to west. Fort Miller can be seen to south. James Geddes, 1825.



There are currently twelve locks on the Champlain Canal, as seen above. Nine were constructed between 1818-1823 and have been enlarged many times since, and three more were constructed in the early 1900s. Map modified from Google Earth.

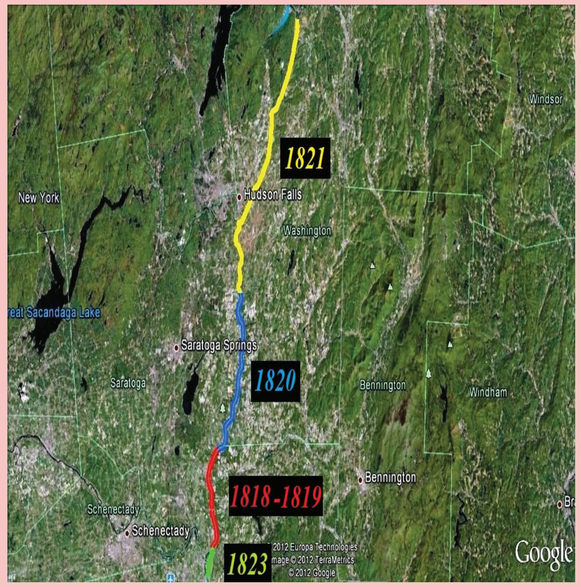
Geologic History

The land through which the Champlain Canal was dug is known as the Hudson Champlain Lowland. The elevation is quite low compared to that of neighboring areas, with the highest point being at about four hundred feet above sea level. The land is east and southeast of the Adirondack Mountains, and is underlain by sedimentary rocks, mostly dolostone and limestone of the Cambrian and Ordovician periods. There is also a wide belt of shale which underlies the lowland to the east. The predominant rock in the area is Potsdam sandstone, which was formed in the Late Cambrian period when the region was flooded by a shallow sea and ranges from 85 to 200 feet thick. It is coarse-grained and typically displays ripple-marked surfaces and cross bedding. The limestone was deposited in shallow tidal zones during the Early Ordovician period and features a wide variety of fossils. Chert was also deposited in small quantities during this time period. There is a smaller deposit of limestone from the Middle Ordovician period when calm, shallow seas flooded the area. Towards the end of this period, the Taconic Orogeny began and deposited shale and mudstone in the area, which are the youngest bedrock in the region. There are, however, many glacial deposits in the area, mostly sands and clays deposited in proglacial high level lakes. Two primary sets of normal faults dominate the region, one running almost north-west and the other in an east-west direction. The canal is located parallel to and just west of the Welch Hollow Fault from Smith's Basin to Fort Ann and also along the Battle Hill Fault and Dewey's Bridge Fault over its sixty mile course. Much of the rock is along the canal is faulted, with some of the Potsdam sandstone visible along faults whereas most of it is underneath Ordovician limestone and subsequent deposits. Additionally, a significant portion of the rock near the canal is folded into synclines and antisynclines.

Construction

In March of 1816, several "canal commissioners" proposed the building of the canal, outlining how beneficial it would be to the region and that the mistakes from previous attempts would not be made again. A month later, a law was passed and granted five men the means to "consider, devise, and adopt such measures as may or shall be requisite, to facilitate and effect the communication, by means of canals and locks, between the navigable waters of Hudson's river and Lake Erie, and the said navigable waters and Lake Champlain" (Whitford, 1905).

The survey for the canal was made by Colonel Lewis Garin in 1817. The total cost estimate given to the legislature was $871,000, a very significant investment for that time period (Whitford, 1905). Much of the land through which the canal would pass was voluntarily ceded to the State by landowners, as they recognized the canal's economic potential and were eager to see it completed. In 1818, construction on the canal began with a twelve mile segment between Waterford and Stillwater. Locks, waste-weirs, culverts, and embankments for this stretch were completed the following year, and water flowed through the canal for the first time. In 1820, seventeen more miles of the canal were completed to the engineer's satisfaction. By the end of 1821, all but a small portion of the canal was completed, going all the way from Lake Champlain to within several miles of the Hudson. In 1823, after several months of waiting due to a malfunctioning dam, three locks were constructed to finally connect the two bodies of water. In 1828, a feeder was completed at Glens Falls which greatly increased the volume of water in the canal, allowing the locks to work at their full potential and let large boats through. While countless modifications would be made over the next hundred and fifty years, the canal was finally open for business.



The Champlain Canal was channeled primarily in four segments, shown above. Construction began near Stillwater in 1818 and was completed in Waterford in 1823. Map modified from Google Earth.

Sign commemorating the completion of the Champlain Canal and its landmark status, available from bjdeming.files.wordpress.com/2011/12/img_1251.jpg

Geologic Influence

Surveyors spent countless hours planning a route for the canal, trying to ensure that they would have to excavate as little hard rock as possible. Because the canal only needed to be ten to twelve feet deep, in many places the contractors did not need to cut or blast into the hard quartz or limestone bedrock. Instead, they mostly dug through soil that comprised of vegetable mould, loam, and clay.

At the very north of the canal, limestone excavation was unavoidable. When breaking up the limestone and other hard rock, teams of workers used pickaxes to break up the rock. It was then hauled away by horses and oxen. Gunpowder was occasionally used for the softer rock, but it was dangerous and expensive (nitroglycerin had not yet been developed). The workers were careful to keep the rock in large segments as they also used it to construct the various locks on the canal. Clearing the rock was the most expensive part of constructing the canal because it was very slow (resulting in more labor costs) and excavating the occasional chert or other hard rock took a lot more manpower and effort. Dams were built to hold back water during construction, but there were several cases in which the dams were too weak and flooded the canal, erasing progress and delaying construction (O'Hara, 1951).

One of the main challenges of constructing the canal was water supply. Sixty miles worth of water had to come from somewhere, and as the architects found out, Lake Champlain was not an adequate source. The canal commissioners decided to build a feeder, which is a smaller canal that serves as a water source for a larger canal. The Glens Falls feeder was started in 1822, though it was not finished until 1828. It was seven miles long and connected a northwestern portion of the Hudson River to the canal about twenty miles south of Lake Champlain.

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Acknowledgements: Hans Raum, Curator, Vermont Collection, Middlebury College; Craig Williams, Senior Historian, New York State Museum at Albany