

Winter 5-1-2018

# A Comparison of the Development of the Salt Industries in Michigan and Ontario

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## Recommended Citation

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A Comparison of the Development of the Salt Industries in Michigan and Ontario

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HON 4998

April 19, 2018

The second half of the nineteenth century was a period of great social change. The industrialization that had begun in the previous generations reached new levels of influence and penetration of society. The societal dislocation that this caused created a multitude of new political and social movements. The boom and bust cycles and the cutthroat competition of capitalism was countered by growing collective movements advocating for radical equality of workers and managers and between social classes.

The North American geopolitical situation was particularly influential in the formation of new industries in this period. The mining rushes were a memorable sign of this influence. The California and Yukon gold rushes were the most famous, but other rapid exploitation of natural resources happened throughout the continent, such as the 1850s oil boom in Pennsylvania, the dominance of coal mining in the Appalachians, and the logging industry across the Midwest. Each of these caused industrial development, a massive growth in wealth for a few individuals, and serious environmental consequences. The salt mining industry reflected these geopolitical and economic realities, but followed its own course of development, which reflected its status as an industry that was generally dependent on another major industry to be visible. This paper will compare the development of the salt industries in Michigan and Ontario, the leading North American centers for the exploitation of this critical resource.

### Geology of the Region and Early Use of Salt

The salt deposits that exist in the upper Midwest are generally posited by geologists to have formed through the evaporation of a shallow prehistoric sea in the Devonian period, about 400 million years ago. These deposits exist more than a thousand feet below the modern ground level.<sup>1</sup>

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<sup>1</sup> John Serba, "Detroit's Salt Mines Are Michigan's Biggest Buried Secret," *MLive*, July 28, 2017, [http://www.mlive.com/entertainment/index.ssf/2017/07/detroit\\_salt\\_mines\\_inside\\_mich.html](http://www.mlive.com/entertainment/index.ssf/2017/07/detroit_salt_mines_inside_mich.html).

The Michigan Salt Basin extends in a rough circle from the bottom edge of Michigan's Upper Peninsula, Wisconsin's Door Peninsula, the northernmost parts of Illinois and Indiana, and underneath Ontario as far as the Niagara Escarpment, which bounds the deposit.<sup>2</sup> This means that all of Michigan's Lower Peninsula and Southwestern Ontario, as well as Lakes Michigan, Huron, and Erie, lie over this vast salt deposit. This had significant consequences on the development of industry in this region, particularly in Michigan and Ontario.

This salt comes to the surface in some places through natural waterways, forming salt springs and salt licks. These were well known to the native people of the region, although the Onondaga people in modern New York said that they did not use much salt before contact with the Europeans, despite living in a salt-rich area.<sup>3</sup> Research indicating the extensive use of salt resources by Native Americans in modern Louisiana has been carried out; however, very little archaeology of this kind has taken place elsewhere in the country.<sup>4</sup>

In the European tradition, salt was heavily used in the process of food preservation because of its ability to absorb the moisture that provided a habitat for microorganisms that caused decay. The European colonists quickly learned about the salt springs, but found them only of minimal use due to their low concentration. Some of the earliest salt works were built in Massachusetts, which processed salt taken directly from the sea.<sup>5</sup> In total, however, the production of salt was quite small, due to the nature of colonialism. Britain had a major domestic salt industry (such that generic table salt was sold in this period as "Liverpool salt"), and discouraged the development of salt works in its

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<sup>2</sup> Randall Schaetzl, "The Michigan Basin," *Geo.msu.edu*, accessed April 14, 2017, <http://geo.msu.edu/extra/geogmich/mibasin.html>.

<sup>3</sup> Mark Kurlansky, *Salt: A World History* (New York: Penguin Books, 2002), 241.

<sup>4</sup> Ian W. Brown, *The Role of Salt in Eastern North American Prehistory* (Baton Rouge, LA: Department of Culture, Recreation and Tourism: Louisiana Archaeological Survey and Antiquities Commission, 1981), <https://www.crt.state.la.us/dataprojects/archaeology/virtualbooks/SALT/salt.htm>.

<sup>5</sup> Kurlansky, *Salt: A World History*, 217.

colonies to create a market for export of its own salt.<sup>6</sup> Because of these colonial practices, salt was extraordinarily expensive in North America.

The Onondaga salt works of upper New York became the preeminent source of salt in the United States after independence.<sup>7</sup> This area lies over a salt deposit that is connected to the Michigan Salt Basin, although it is not from the exact same formation.<sup>8</sup> The transport of salt from Onondaga to New York City was a significant factor in the building of the Erie Canal, which massively simplified transportation from the coast to the Great Lakes system.<sup>9</sup> Although there were other salt works, particularly in Louisiana and Massachusetts, the early U.S. remained dependent on imported British and French salt. The further inland the settlers moved, the more expensive the salt became. In 1792, John Graves Simcoe, a British Canadian surveyor, noted that salt was sixteen times more expensive in Detroit than Montreal.<sup>10</sup>

The significance of the salt resources in Michigan can be seen from before its statehood. Michigan's first constitutional convention proposed an ordinance within the first state constitution that said "All salt springs within the state, and the lands reserved for the use of the same, at least one section including each spring, shall be granted to the State, to be used or disposed of as the Legislature may direct." Thus the 1837 Act of Congress admitting Michigan gave state authorities the right to choose seventy-two sections as salt lands.<sup>11</sup>

Due to this, Dr. Douglass Houghton was appointed to the position of state geologist during the first meeting of the new state's legislature. He was tasked with mapping the resources of the state and specifically responsible for locating salt deposits and springs. Through his efforts, the first

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<sup>6</sup> Ibid., 219.

<sup>7</sup> Ibid., 241.

<sup>8</sup> Schaetzl, "The Michigan Basin."

<sup>9</sup> Kurlansky, *Salt: A World History*, 245-249.

<sup>10</sup> Gordon Muir, *Salt* (self-pub, n.d.), 4.

<sup>11</sup> Charles W. Cook, *The Brine and Salt Deposits of Michigan: Their Origin, Distribution and Exploitation* (Lansing, MI: Wynkoop Hallenbeck Crawford Co., 1914), 23.

artificial brine wells in Michigan were drilled. Houghton identified five groups of brine springs: near Grand Rapids, in Gratiot County, in Midland County, in Macomb County, and in Washtenaw County.<sup>12</sup>

He first tried to drill a well in 1839 in Midland County, which would soon become a center of salt production. This initial effort was abandoned after four years of intermittent work, when at only 139 feet it met rock that it could not penetrate. Houghton's second attempt at drilling a well took place in Grand Rapids in 1841. This well produced a flow of 130 gallons per minute, but it was not of a sufficient concentration to be worth manufacturing salt. Attempts to deepen the well were impeded by the density of the rock and it was abandoned.<sup>13</sup> Although Houghton's salt mining was less than successful, his work on the geology of the state, particularly its copper mines in the Upper Peninsula, led to the city of Houghton being named in his honor.

Until the 1860s, however, salt production in Michigan was quite small. This was in part attributed to Houghton's incomplete knowledge of the extent of the salt under the state, which geologists more fully understood by this time.<sup>14</sup> In February 1859 the state legislature passed an act exempting all property used for manufacturing salt from taxation, as well as a bounty of ten cents per bushel after the first five thousand bushels produced. Due to this, six wells were drilled in Grand Rapids, but again abandoned due to the weak concentration of the brine. In East Saginaw, on the other hand, the brine was found to be of a much higher and more usable concentration. In March 1859 the East Saginaw Salt Manufacturing Company was founded along the Tittabawassee River and first struck brine the next February. As soon as this was discovered, other companies sprang up to exploit the salt as well. By 1862 there were twenty-three companies in the Saginaw Valley

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<sup>12</sup> Ibid., 17.

<sup>13</sup> Ibid., 24.

<sup>14</sup> Ibid., 18-19.

extracting salt or building the wells to do so. The state, however, quickly realized the implications of such a large bounty on salt production and repealed the legislation in 1869. By this point, the salt industry was established enough to survive without it.<sup>15</sup> The rapid growth of this industry was spurred on not just by the discovery of the good salt of the Saginaw Valley, however. The political situation of the time had a major effect on salt manufacturing in North America as well.

### The American Civil War and Salt

The Civil War had a major effect on the American salt industry. In this era, salt was still being used primarily to preserve and season food. It was a staple part of any European-descended diet. Salt was one of the main goods that had to be traded for or purchased in an agricultural society if it was not produced locally. Cutting off this trade could have an enormous impact on a population. This is what happened during the Union blockade of Southern ports during the Civil War.

Northern leaders knew that the South depended on international trade to market its cotton and to receive goods that were produced in the North and overseas. A blockade of Southern ports was one of the earliest strategies devised to hamper the South's war effort. In the early part of the war, it was arguably the North's most successful action against the South. Salt was one of the goods that the South depended on outside trade to acquire. Although there certainly was local salt production in the South (especially in Louisiana and Kentucky), in general it depended on imports from Britain and France. When the Union blockaded Southern ports, the majority of this supply was cut off. When they realized how effective this was, the Union generals also made a policy of destroying any Southern salt works they captured.<sup>16</sup> The lack of such a staple foodstuff caused hardship and resentment on the Southern "home front." Combined with the general food scarcity that the South

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<sup>15</sup> Ibid., 25-27.

<sup>16</sup> Kurlansky, *Salt: A World History*, 261.

experienced toward the end of the war, the salt deprivation helped produce the conditions of dissatisfaction that led to the South's capitulation.

At the same time, Union salt production went up dramatically due to the war demand and to increasingly high tariffs begun in 1862. This happened to combine with rapid growth in the nascent Saginaw salt industry. H. M. Fitzhugh, president of the Saginaw Bay Salt Company, wrote that the manufacturing of salt grew from 4,000 barrels produced 1860 to over 500,000 barrels in 1864, which rapidly dropped off after the war but began growing again in 1867.<sup>17</sup> He noted that "In [1861] large investments were made in the new enterprise, and the growth of the business, stimulated by a war demand and war prices, was very rapid."<sup>18</sup>

Between 1866 and 1875, the price for a barrel of East Saginaw salt dropped from \$1.80 to \$1.10.<sup>19</sup> In that same period, salt production in Saginaw doubled from two million to four million barrels, which indicates the continued growth of the industry even after an initial drop-off in the aftermath of the Civil War.<sup>20</sup> Salt was sold to Ohio, New York, and Indiana, as well as to the West and Northwest. This trade was conducted through Great Lakes ports.

The leaders of the Salt Company of Onondaga, in the eponymous city in New York, whose industry was much more established than Michigan's, agreed that the Civil War had benefitted Northern salt production. Due to the blockade on the Mississippi River, shipments of salt were unable to reach the Midwest from overseas, but the existing industry in Onondaga was able to stretch itself to capacity and produce over 9 million bushels of salt in 1862.<sup>21</sup> This rate was able to be sustained even after the end of the war. These leaders also believed that the wartime tariffs had

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<sup>17</sup> *Facts Relating to the Manufacture of Salt at Saginaw, Michigan, and Onondaga, New York* (Syracuse, NY: Summers & Co., 1871) 10.

<sup>18</sup> *Ibid.*, 1.

<sup>19</sup> C. Rominger, *Geological Survey of Michigan, 1876, Vol. III.* (New York: Julius Bien, 1876), 215.

<sup>20</sup> *Facts Relating to the Manufacture of Salt*, 26.

<sup>21</sup> *Ibid.*, 18.

helped increase salt production. Before 1861, when the war began, there had been a small duty on imported salt, of which about 14 million bushels were imported, while only 12 million bushels were made domestically and mostly consumed locally – it was not even shipped from upstate New York to Albany. However, when the war began, increasingly high tariffs on salt were imposed. By 1871, imported salt had fallen to 12 million barrels while domestic production had grown to over 20 million. The Salt Company of Onondaga, which had previously sold salt only in upstate New York, now sent salt across all of New York state and New England. Thus they argued that the reduction of competition was cost-effective to the country as a whole.<sup>22</sup>

#### Goderich Development

At the same time as this industry was developing in the United States, the people on the other side of Lake Huron were making some significant discoveries regarding Great Lakes salt of their own. Oil had been discovered in the area around Sarnia in 1858. As Goderich is close by, people in the town started drilling to see if they could find oil there as well. In 1865, Samuel Platt, a wealthy mill owner, hired Peter MacEwan, who had drilled 20 oil wells in southwestern Ontario, to do exploratory drilling on his property along the Maitland River. However, before any oil was reached, MacEwan found salt at 984 feet, and continued drilling until he determined that the bed was sixty feet thick. The company that Platt had organized for the drilling project, previously called the Goderich Petroleum Company, reorganized as the Goderich Salt Company and began pumping brine by September 1866.<sup>23</sup> The brine was determined by a geologist from the Onondaga Salt Company of New York to contain less than 1% impurities, meaning that 21.6 gallons of brine could be processed into a bushel (or 56 pounds) of salt. This was confirmed by the Geological Survey of

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<sup>22</sup> Ibid., 22-25.

<sup>23</sup> G. Schnurr. *A History of Salt Wells in Huron County, 1865-1991*. (self-pub., 2016) 1.

Canada.<sup>24</sup> Salt from Goderich was displayed at the 1867 World's Fair in Paris and won the award for best taste.<sup>25</sup> Its quality was also (grudgingly) acknowledged by U.S. salt manufacturers, who wrote that its "extent and excellence is unsurpassed anywhere."<sup>26</sup>

Within a decade dozens of tiny salt brining corporations sprang up in Huron County, Ontario. Small joint stock companies funded initial drilling and remained in control for the first decade. The salt was marketed to buyers in Chicago and Milwaukee, both centers of the meatpacking industry, as well as to the eastern cities of Canada. The Stratford Salt Company, which began operations less than a month after the Goderich Salt Company, was able to provide its shareholders with 51% dividends in the first year.<sup>27</sup> By 1872, it was producing 21,000 barrels annually – and that despite operating a maximum of ten months out of the year.<sup>28</sup> (Most of the Goderich salt companies only operated during the more clement months. In the first decade of production, however, they were able to make profits despite only manufacturing salt for part of the year.) Peter MacEwan became the primary driller of salt wells in Huron County.

The salt was transported by rail or by boat. This was possible because a rail connection had been built in Goderich in 1858, just before the salt was discovered. In 1872, work began to transform the Maitland estuary into a proper harbor.<sup>29</sup> These improvements allowed salt to be rapidly transported throughout the region. Because transport by railroad, however, was considerably more expensive than shipment over the lakes, Goderich became dependent on the Chicago market rather than the Canadian markets further east such as Toronto.<sup>30</sup> Peter MacEwan, who had become wealthy through his drilling efforts, also owned a salt company. He was able to have the lowest

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<sup>24</sup> Ibid., 15-16.

<sup>25</sup> "Our Story," *siftocanada.com*, accessed April 19, 2018. <https://www.siftocanada.com/our-story>.

<sup>26</sup> *Facts Relating to the Manufacture of Salt*, 4.

<sup>27</sup> Ibid., 3

<sup>28</sup> Ibid., 4

<sup>29</sup> Dorothy Wallace, *Memories of Goderich: The Romance of the Prettiest Town in Canada* (self-pub., 1977), 50.

<sup>30</sup> Schnurr, *A History of Salt Wells in Huron County*, 16.

transportation costs of all due to purchasing his own schooner to transport his salt through the Great Lakes.<sup>31</sup>

The discovery of salt transformed life in Goderich. In 1873, the town's streets were rough and had no sidewalks and its wells were often contaminated due to a lack of sewers and salt in the groundwater, leading to frequent outbreaks of typhoid fever. The two schools had an average of sixty-three students per classroom. The salt wells brought prosperity, allowing the roads to be graded and paved, sidewalks to be installed, a town drainage system to be built, and general investment in infrastructure to be carried out. In addition to this, as stated above, the 1872 improvement of the harbor such that it could be designated a "Harbour of Refuge" as well as the 1880 dredging of the Maitland River channel brought commerce to Goderich. Supporting industries to the salt manufacturing included foundries to make the evaporation pans, barrel and shingle makers for the factories, and loggers to supply both building material and fuel.<sup>32</sup>

### Techniques

The technologies and methods used both in Goderich and Michigan were very similar. Both used brine wells, a technique that created an artificial salt spring. This involved pumping water into the solid rock salt underground, dissolving it, and pumping the highly concentrated solution back up to the surface. This solution was much stronger than the naturally occurring kind that could be found in salt springs, making it more economical. The water could be boiled off, leaving the salt behind to be packaged and sold.

There were several methods that could be used to cause the evaporation of the salt. The "kettle process" involved a "block" (essentially a wooden shed) that contained fifty to sixty kettles,

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<sup>31</sup> Wallace, *Memories of Goderich*, 50.

<sup>32</sup> *Ibid.*, 74-75.

each holding 100 to 120 gallons of brine, set over a number of fires. Brine would be conducted into the kettles through pipes and tended until the water boiled off, producing very fine-grained salt, since larger crystals would not have time to form if done properly. It was quick and relatively inexpensive, but not very efficient for removing impurities and was fairly labor-intensive, since the kettles needed to be stirred to prevent salt from crystalizing and caking around the edges.<sup>33</sup>

The “steam process” involved a series of wooden vats set over pipes carrying steam produced by a fire in another location. When the brine was piped into the vats, much of the water would be boiled off in an initial cistern. The remaining, more concentrated, brine was then piped into a second cistern where the solution would be allowed to settle, at which point impurities such as iron could be precipitated and removed. The remaining salt would be conducted to a graining vat, where it was processed and packaged. This technique necessitated more fuel but less attention, since the cisterns would be placed so that gravity could conduct the water from the first to second vat and only need to be carried by people in the final stages.<sup>34</sup> This was economical in Saginaw due to its use of the “offall [sic] of the saw mills.”<sup>35</sup>

A final, more experimental, method was to cause evaporation through the sun and natural air currents. Evaporating brine to produce salt by leaving it in the sun had of course taken place for thousands of years along seashores by this point, and in fact had been generally abandoned because boiling the brine produced salt much more quickly. The Saginaw Solar Salt Company, however, was founded with the idea that if shallow wooden vats were placed within properly constructed covers that allowed dry air to circulate, the brine could be conducted through a series of vessels that

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<sup>33</sup> Justus Adelberg, *Report Concerning the Manufacture of Salt at Works Proposed to Be Erected at Zilwaukee, by the Saginaw Solar Salt Co.* (self-pub., 1863), 14-17.

<sup>34</sup> *Ibid.*, 17-19.

<sup>35</sup> *Ibid.*, 18-19.

would allow various impurities to be removed, including iron, sulfates, lime, and gypsum.<sup>36</sup> The company's founders felt that this would be particularly efficient in the Saginaw Valley, which had an "uncommonly large percentage" of calcium chloride and magnesium present in the salt, which tended to give it a bitter taste.<sup>37</sup> They noted that it would only be feasible to use this method in favorable months (that is, April through September) but expected the process to be so efficient and productive that it would not be necessary to carry it out during the rest of the year.<sup>38</sup> The price of a barrel of salt in Saginaw in 1863, when the company's proposal for funding was written, was \$1.80 per barrel. With this method, they hoped to create so much salt that a barrel could be bought for a mere \$0.20 with the end of war pricing.<sup>39</sup> Such a large price drop did not materialize. However, the 1876 *Report on the Salt Manufacture of Michigan* stated that in 1869 over 15,000 barrels of "solar salt" were produced, which grew to 32,000 barrels by 1873.<sup>40</sup>

## Economics

The competition between the salt industries of Canada and the United States became apparent by the 1890s. Its price fell rapidly throughout the region as new wells were dug and the resource became widely available. With the end of the Civil War and the transition back to peacetime economics, the tariffs that had been introduced by the Union began to be rolled back and the owners of the various salt concerns began to fear the loss of revenue that had developed during the war.

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<sup>36</sup> Ibid., 20-24.

<sup>37</sup> Ibid., 25.

<sup>38</sup> Ibid., 34-35.

<sup>39</sup> Ibid., 48.

<sup>40</sup> S.S. Garrigues, *Report on the Salt Manufacture of Michigan, Prepared to Accompany Volume III of the State Geological Survey* (New York: Julius Bien, 1876), 50-51.

The salt industry had an inherent problem due to its connection with the lumber industry. At first, it had seemed that salt could be profitable by itself. However, the manufacturers quickly realized that buying enormous amounts of wood to boil the water off the brine led to uncompetitive prices. Since both Michigan and Ontario were heavily forested – and heavily logged – in this period, the salt industry became “a mere parasite of the lumber manufacturer.”<sup>41</sup> In this way, sawmills could dispose of their scrap wood in a way that could make a profit. This was the model of business in Goderich and Saginaw, where the salt was beneath their feet and the woods were all around them. Some of the manufacturers in Goderich had coopers’ shops in addition to their salt and sawmilling activities.<sup>42</sup> Peter MacEwan’s International Salt Works had all of these as well as a grain mill, which was powered by water from the Maitland River.<sup>43</sup>

By the 1870s, though, it was well known that lumber was on its way out. The forests that provided it were expected to be exhausted within ten to fifteen years in Saginaw.<sup>44</sup> The area of Ontario around Goderich was becoming deforested as well. This anticipated loss of cheap and accessible fuel was a serious cause for concern within the industry. To be sure, experiments with other types of fuel were being done – in Goderich, some people were using coal and oil, while in Saginaw, some were using the sun – but the standard techniques of the industry were rapidly becoming unsustainable. This was beginning to cause a great deal of strain on smaller companies.

The birth of this industry within the Great Lakes region also coincided with capitalism coming into its own. The corporations that had founded the brine wells of Michigan and Ontario were mostly very small. They generally followed the pattern that four or five men would get together, borrow some money, hire someone who knew how to bore the well, and begin processing

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<sup>41</sup> *Facts Relating to the Manufacture of Salt*, 1.

<sup>42</sup> Wallace, *Memories of Goderich*, 58.

<sup>43</sup> *Ibid.*, 50 and 58.

<sup>44</sup> *Ibid.*, 3.

salt. Within Huron County, Ontario, there were dozens of these kind of operations in the 1870s. Most failed within five years and were either abandoned or bought out by more dominant producers. This kind of corporatization and conglomeration was happening throughout the economy of the late 19<sup>th</sup> century in North America. Although there is far more salt than there was gold or even copper, mining for salt followed a boom-and-bust cycle very similar to that of the more traditional mined metals. In addition, the dependent nature of the salt industry saw it being outmatched for capital and investment by newer industries. Unlike the automotive industry, salt never came into its own. Its dependence on lumber put it on unstable footing. International competition nearly caused its downfall. An indication of the view of private industry can be seen in the 1914 Michigan Geological Survey report, which referred to two periods of development in the state's salt industry. It stated, "The first, that of governmental development, was very largely one of failure; the second, or period of private initiative, has been marked by success almost from the beginning."<sup>45</sup>

### The Politics of the International Salt Trade

The Goderich salt industry sold mainly to Toronto and to Chicago. Goderich had had the good fortune to have a railroad connection built right around the same time as the initial discovery of the salt beds, which made transportation easy. It also had the enormous benefit of having the only well-configured shipping harbor on the Canadian side of Lake Huron.<sup>46</sup> This meant that it was easy to send ships full of salt throughout the Great Lakes system. From eastern Lake Huron, Goderich salt makers could quickly and economically send salt around the Straits of Mackinac, while they had

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<sup>45</sup> Cook, *The Brine and Salt Deposits of Michigan*, 23.

<sup>46</sup> Margaret S. Beecroft, *Windings: A History of the Lower Maitland River* (Maitland Valley Conservation Authority, 1984), 5.

to pay relatively high fees to the railroad companies to send salt overland to Toronto. As the meatpacking industry in Chicago grew, Goderich supplied a large proportion of its needed salt.

This, however, was problematic for the American salt manufacturers. The Canadian industry was growing just as rapidly as the Michigan one. Its purity rivaled the best salt in the world. Goderich had comparable access to transportation over the lakes as Saginaw and much better access than Onondaga, from which salt either had to be carried over land (again paying railroad fees) or shipped across lakes and rivers to Chicago. Incidentally, this is the reason why Onondaga's main market was on the eastern seaboard.

In addition, the lesson of the South in the Civil War had scared the Northerners. With their dependence on international trade for food supplies, the South had found itself in dire straits when their access to this trade was cut off. The Northerners had witnessed the problems in food preservation and lack of nutrition that the South had experienced during the blockade. Since this was in part due to the South's lack of local salt production and reliance on imports, it demonstrated to Northern industry leaders that a sustainable domestic salt industry was needed.

In fact, the move by American salt producers at this time can be seen as analogous to the 20<sup>th</sup>-century "oil independence" movement. There was still a great deal of fear of foreign invasion present in the United States. Numerous border skirmishes took place between the United States and Canada throughout the 19<sup>th</sup> century. Many Americans still expected another war with Britain at some point and saw Canada as the main threat, as it had been in the 1812 war. Salt industry leaders promoting a protective tariff in 1871 wrote that

...should a war with England occur at this time when we are still importing about two-fifths of our whole supply, the immediate effect would be to send the price of salt up to a figure which in the course of a year or two would impose a tax upon the American people far beyond what can be pretended to have been the cost of protection to the salt manufacturer...<sup>47</sup>

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<sup>47</sup> *Facts Relating to the Manufacture of Salt*, 8.

The isolationist strain in American thinking also feared entanglements within the seemingly endless European wars and dependence on any one foreign country for such an essential resource. In the same document, these promoters said, “[Salt] is not a mere preservative of food nor a condiment of food only; but an element of life”<sup>48</sup> (that is, due to its necessity in the human body), and thus it was vital for a sustainable domestic industry to be developed. These industry leaders in Saginaw and Onondaga promoted a tariff explicitly against the Canadian salt being produced at Goderich.<sup>49</sup>

To be fair, Canadians also feared American invasion. The Fenians, a group of Irish immigrants to the United States, conceived of a plan in 1864 and 1865 to invade Canada from Buffalo, New York, and hold it “with the purpose of intimidating Britain into surrendering Ireland.” Due to the ongoing American Civil War, this incident was barely noticed in the United States, but it caused alarm in Ontario. Militiamen were dispatched from Huron County to guard the border.<sup>50</sup> This was only one of a number of attempts, both unapproved and tacitly sanctioned, to take over parts of Canada in the 19<sup>th</sup> century.

## The Tariffs

The trade competition between the American and Canadian manufacturers was stiff. The tariffs on salt rose from 1.5 cents per barrel in 1860 to 16 cents per barrel in 1865. This was the tariff that the industry leaders lobbied to keep in 1871. The following year, 1872, has been identified as the peak of salt production in Goderich, although a number of the companies that operated in this period were not opened until after that point.<sup>51</sup> In the 1880s, American salt was subsidized such that

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<sup>48</sup> Ibid., 7.

<sup>49</sup> Ibid., 4.

<sup>50</sup> Wallace, *Memories of Goderich*, 51.

<sup>51</sup> Ibid., 74.

it was able to be sold to Canadian consumers “for significant losses, at prices that were often lower than what Canadian producers could manufacture a barrel for.”<sup>52</sup>

This series of tariffs came at the worst time for Canadian salt manufacturers. As previously discussed, the lumber industry was already dying out at this time. Goderich was particularly hard hit by this. As it was the largest and most built-up town in the area, it became increasingly expensive to bring wood to the brine processing plants. The smaller nearby towns of Clinton and Seaforth were able to out-compete Goderich by fuel prices alone.<sup>53</sup> Besides this, North America experienced a general economic downturn in this era, the so-called Panic of 1873. These changes nearly destroyed Goderich’s salt industry. In 1874, Hawley’s Well, one of the many small brining companies, produced 18,000 barrels of salt. By 1886, its production had fallen to 8,000 barrels and it was finally closed in 1892.<sup>54</sup> This was the pattern of most of Goderich’s wells.

The salt works did not go quietly into the night. In 1885, all the Canadian salt works banded together to form the Lakeshore Salt Association, including six facilities in Goderich. It was able to set price controls on shipment over the lakes, which provided equal advantage to all the Canadian producers and kept the business alive for a few more years.<sup>55</sup> The association was not able to sustain the industry long-term, however. By the end of the 1890s, only two salt producers in Goderich survived.<sup>56</sup> There were, however, other salt wells that held on slightly further afield. These tried to organize several other trade associations in a similar manner to the Lakeshore Salt Association, but all had become defunct well before 1930.<sup>57</sup>

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<sup>52</sup> Schnurr, *A History of Salt Wells in Huron County*, 16.

<sup>53</sup> L. Heber Cole, *The Salt Industry of Canada* (Ottawa: F.A. Ackland, 1930), 33.

<sup>54</sup> Schnurr, *A History of Salt Wells in Huron County*, 12-13.

<sup>55</sup> *Ibid.*, 16.

<sup>56</sup> Wallace, *Memories of Goderich*, 74.

<sup>57</sup> Cole, *The Salt Industry of Canada*, 34.

On the other hand, the tariff was extremely beneficial to Michigan's salt industry. In some ways, it was almost too helpful – from 1887 to 1891, the increased competition within the state's industry itself caused the price of salt to fall so far that many companies suspended operations due to the inability to make a profit. Like Ontario's industry, Michigan's salt capacity was diminished as the lumber industry died out and took the associated salt blocks, especially in the Saginaw Valley, with it. The industry adapted to the new conditions, however. By 1905, Michigan produced more salt than any other state, over 10 million barrels per year, and by 1908, its salt was considered the most valuable for its quality.<sup>58</sup>

### Changing Applications of Salt

At this point, the uses of salt began to expand from their traditional realm of food preparation. Now that a steady supply of salt for preservation and consumption was attained, the chemical industry began to become the largest buyers of brine. The chemical properties of salt and its applications had been known for many years and were arguably critical in the development of modern chemistry, but they had primarily been a European development.<sup>59</sup> In the 1890s, however, a number of chemical industries were founded in Michigan and rapidly became a significant part of its economy. Several companies were founded in or around Detroit, including the Solvay Process Company and the Wyandotte Chemicals Corporation. The Michigan Geological and Biological Survey's 1914 book *The Brine and Salt Deposits of Michigan* describes the salt production in Detroit in this manner: "The salt deposits of the Salina formation in Wayne county [sic] are probably of more importance [than the new rock salt mine] however, as a source of part of the raw materials for

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<sup>58</sup> Cook, *The Brine and Salt Deposits of Michigan*, 26-27.

<sup>59</sup> Robert Froman, *The Science of Salt* (New York: David McKay Co., 1967), 38-44.

the manufacture of soda ash, leach, caustic, etc., than as a source of salt itself.”<sup>60</sup> This newly recognized application had significant implications. The Wyandotte Chemicals Corporation was acquired by the German chemical corporation BASF in 1969, which still has a location in Wyandotte.<sup>61</sup>

The most important and lasting development of the chemical industry, however, was in Midland. The salt in that region contains a great deal of bromine, which today is used in flame retardants and pharmaceuticals and which has traditionally been used to make photographic film, pesticides, and sedatives, among other uses. By 1914, the Dow Chemical Company, which was founded to take advantage of this local resource, had thirteen wells and was the largest producer of bromine and its derivatives in the United States.<sup>62</sup>

As was noted already in 1914, “[t]he manufacture of salt in the Saginaw valley has been and still is essentially a by-product industry.”<sup>63</sup> These chemical companies – not just in the Saginaw Valley, but in Detroit as well – became the industry that produced salt as a byproduct when the lumber was gone. They were critical to the automotive industry, producing various materials used in car manufacturing. As the chemical companies wanted inexpensive brine for their processes, they drilled their own wells within the city, which was the point at which Detroit became a true salt producer to compete with Saginaw and Goderich.

Goderich also saw the foundation of salt-based manufacturing concerns at this time, which caused a revival of the salt industry. In 1895, the North American Chemical Company bought Ransford Salt Works, a small local manufacturer, to produce table salt.<sup>64</sup> This company, which

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<sup>60</sup> Cook, *The Brine and Salt Deposits of Michigan*, 162.

<sup>61</sup> “Fact Sheet: Wyandotte, Michigan,” BASF Corporation, 2015.

<sup>62</sup> Cook, *The Brine and Salt Deposits of Michigan*, 144.

<sup>63</sup> *Ibid.*, 129.

<sup>64</sup> Wallace, *Memories of Goderich*, 96.

became Rice's Salt Company, a well-known Canadian brand, was able to reactivate old wells in 1914 and install a "vacuum process," a much more efficient way of evaporating salt from brine.<sup>65</sup> This helped Canada produce food for Britain and its allies after the outbreak of World War I.<sup>66</sup> A salt-based chemical industry is considered to have started in 1911 when the Canadian Salt Company built a plant at Sandwich, Ontario, to procure brine for manufacturing caustic soda and bleaching powder.<sup>67</sup>

### The Salt Mines

Detroit was a relative latecomer to the salt manufacturing industry. It seems likely that this was because it had a number of established industries already and so was not as reliant on resource extraction as other parts of the state. The first salt was produced by the well at the Detroit Salt Company in Oakwood in 1895, followed by companies in Ecorse, River Rouge, and Wyandotte. The production here grew rapidly – from the initial 13,000 barrels in 1895 to over 1,000,000 by 1914.<sup>68</sup> The salt wells, however, are not what the Detroit salt industry is best known for.

Despite the reputation of salt mining being an intensive but relatively simple labor, it was actually a late development in the Great Lakes regional salt industry. Several early attempts at a proper underground mine had been undertaken in the 1870s in Goderich, but had been abandoned due to the high water table flooding the shaft, which was located on the bluffs of Lake Huron's shoreline.<sup>69</sup> Something similar happened when a mine was attempted in Detroit in the 1906. At around 420 feet, the miners hit an underground river that poured millions of gallons of water into the

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<sup>65</sup> Ibid., 165.

<sup>66</sup> Ibid., 139.

<sup>67</sup> Cole, *The Salt Industry of Canada*, 34.

<sup>68</sup> Cook, *The Brine and Salt Deposits of Michigan*, 162.

<sup>69</sup> Muir, *Salt*, 10.

shaft. Shortly after, several miners were suffocated when a pocket of hydrogen sulfide gas was released. The companies attempting to drill the mine were beset with numerous financial difficulties. Although a functional mine was dug in 1910, it changed hands four times before it was finally acquired by the International Salt Company in 1913, which owned it until the 1980s. In 1914, the mine produced 12,000 tons of salt per month.<sup>70</sup>

The Detroit mine, which to this day is the only underground mine of any kind in the Lower Peninsula, produced salt for multiple purposes, including tanning leather and preserving food.<sup>71</sup> Detroit was an early adopter of road salt to deal with ice on winter roads, using it already in 1940. Shortly thereafter, road salt became standard across the wintery regions of North America.<sup>72</sup>

A mine was not successfully dug in Goderich until the 1950s. The Domtar Chemical Company surveyed a number of locations in Michigan and Ontario, drilling to 1900 feet, and discovered the vast extent of the salt deposits in the region. In July 1956, it announced the development of a \$6 million rock salt mine along the lakeshore in Goderich. The first shipment of salt from the mine took place in 1959. A second shaft was dug in 1967 to improve ventilation. At that time, the mine had 245 employees.<sup>73</sup>

While salt mining grew in the area, brine wells hung on. Domtar also built a brine evaporation plant in Goderich. It functioned similarly to the 19<sup>th</sup> century wells, but at a considerably larger scale. It had two wells placed five hundred feet from each other, and went deeper than the old wells had. Pressurized water was forced into the salt beds through one well, causing hydrofracturing and dissolution of the salt, which was then pumped up to the surface as brine. Finished in 1964, it originally used wood to boil off the water, just as the old wells had, but quickly transitioned to using

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<sup>70</sup> Cook, *The Brine and Salt Deposits of Michigan*, 162.

<sup>71</sup> "History of the Detroit Salt Mine," Detroit Salt Co., accessed April 19, 2018. <http://detroitssalt.com/history/>.

<sup>72</sup> "Our Story," *siftocanada.com*.

<sup>73</sup> Wallace, *Memories of Goderich*, 165.

coal and then natural gas as fuel.<sup>74</sup> It is much easier to produce table salt from brine than from rock salt, because when the water in brine evaporates, it leaves behind small grains of salt, while rock salt is generally mined as relatively large pieces of rock that must be crushed to a very small size to make them suitable for consumption. Brine is also far more useful for the chemical industry than rock salt, as it is pre-dissolved in high concentration.

### Mining, Detroit vs. Goderich

Although the geological factors and techniques of the rock salt mines in both cities are very similar, their significance to their respective cities is radically different. The mine in Detroit is virtually unknown. In fact, there seems to be something of a tradition of local newspapers writing exposés about the mine to remind the residents that it exists. Just last year MLive wrote an article titled “Detroit’s salt mines are Michigan’s biggest buried secret.”<sup>75</sup> The Goderich mine, on the other hand, dominates the shoreline and is the town’s largest single employer.<sup>76</sup> These differing levels of awareness are probably due to the cities’ different demographics. Detroit, which of course is best known for the automotive industry, has always had many times Goderich’s population and has wide variety of industries. Goderich, a small lakeside town, depends on the salt mine, tourism, and agriculture for much of its citizens’ employment.

The decline of the salt industry in Detroit was caused by increased domestic and international competition.<sup>77</sup> The salt in the western United States is in many locations far more accessible than it is in Michigan, where it necessitates tunneling over a thousand feet below the ground to reach. In

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<sup>74</sup> Ibid., 165.

<sup>75</sup> Serba, “Detroit’s Salt Mines Are Michigan’s Biggest Buried Secret.”

<sup>76</sup> Heather Boa, “Goderich’s Salt Mine Positioned for the Future,” *Bullet News* online, October 23, 2012, <https://archive.is/20130115090702/http://huron.bulletnewscanada.ca/2012/10/23/feature-goderichs-salt-mine-positioned-for-the-future/>.

<sup>77</sup> Willis F. Dunbar and George S. May, *Michigan: A History of the Wolverine State* (Grand Rapids, MI: William B. Eerdmans Publishing Company, 1995), 355.

addition, the enormously increased access to salt in modern times has caused salt to be far less expensive and much harder for a company to make a profit from.

Goderich's industry benefitted by having less competition. Its market is largely domestic and it supplies a significant proportion of road salt throughout eastern Canada. The Goderich salt mine regularly claims to be the largest salt mine in the world.<sup>78</sup> In the early 2000s, it was producing 5.5 million tons of salt per year – over half of Canada's salt – by using a method of drilling twelve feet into the rock face in the mine on the top and on the bottom of a "room" within the salt, inserting and detonating blasting caps to dislodge it, and scooping out the broken pieces, which were further crushed and taken to the surface. It employed seventy workers per shift. At that point the mine, which is located entirely under Lake Huron, was advancing at a rate of five miles per year and producing salt for water softening, road deicing, and chemical and industrial manufacturing. The mine covered an area larger than the city of Goderich's footprint.<sup>79</sup>

The Detroit mine closed in the 1983 due to changing economic conditions and increased competition. Sadly, that same year saw the death of a worker through falling down a shaft.<sup>80</sup> It changed hands twice before reopening in 1998 as the Detroit Salt Company, LLC, and now produces rock salt solely for deicing. (This company was sold to the Kissner Group in 2010, which owns other salt mining and deicing operations in the United States.)<sup>81</sup> A significant amount of Detroit salt is used by the city itself – for the 2016-2017 winter, the city purchased 9,000 tons of salt to clear the roads, with the expectation to use 16,000 tons for the 2017-2018 winter. Wayne County bought 44,000 tons of salt from the Detroit mine as well as 20,000 tons from Compass Minerals (the

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<sup>78</sup> "Our Story," *siftocanada.com*.

<sup>79</sup> *The Goderich Salt Story*, Sifto Canada, Inc., film.

<sup>80</sup> C Pat Batcheller, "CuriosID: Are There Salt Mines under Detroit?" *WDET* online, May 15, 2017. <https://wdet.org/posts/2017/05/15/85173-curiosid-are-there-salt-mines-under-detroit/>.

<sup>81</sup> "History of the Detroit Salt Mine," Detroit Salt Co.

company that owns the Goderich mine) and Morton Salt. Oakland and Macomb counties buy primarily from Compass Minerals.<sup>82</sup>

### The Current Situation

According to the U.S. Mine Health and Safety Administration, there have been three reported injuries at the Detroit mine since 2006, but no fatalities since it reopened in 1998. The Detroit Salt Company recently asked the Michigan Department of Environmental Quality (DEQ) to approve plans to increase its production limit from 1.7 million tons of rock salt per year to 2 million tons. As of May 2017, the DEQ's Air Quality Division had submitted a report detailing that the mine was following proper safety procedures with regards to particulate matter, but that they were holding a public comment period before making a final decision.<sup>83</sup>

The Goderich rock salt mine went through a challenging period in the early 2010s. In 2009, a worker was killed and the Sifto Canada Corporation was obliged to pay a \$140,000 fine for violating Canada's Occupational Health and Safety Act.<sup>84</sup> In August 2011, Goderich experienced an F3 tornado that "cut a 20-km swath" through the town<sup>85</sup> and killed another mine worker, as well as injuring 37 citizens.<sup>86</sup> The 2011-2012 winter was abnormally warm, causing a six percent decline in salt sales, followed by union strikes in 2012. The mine experienced tens of millions of dollars in losses. The owners took the opportunity to modernize the mine after the tornado by switching from blasting caps to two remote-controlled continuous miners. These machines cut into the side of the

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<sup>82</sup> Batcheller, Pat, "CuriosiD: Are There Salt Mines under Detroit?"

<sup>83</sup> Ibid.

<sup>84</sup> "Salt Mine Operator Sifto Canada Fined \$140K after Worker's Death," *Canadian Occupational Safety* online, July 18, 2011. <http://www.cos-mag.com/ohs-laws-regulations/30117-salt-mine-operator-sifto-canada-fined-140k-after-workers-death/>.

<sup>85</sup> Boa, "Goderich's Salt Mine Positioned for the Future."

<sup>86</sup> Amy Pataki, "Salt at the Source: A Day in a Lake Huron Mine," *thestar.com*, accessed April 19, 2018. [http://projects.thestar.com/projects/salt\\_mine\\_lake\\_huron.html](http://projects.thestar.com/projects/salt_mine_lake_huron.html).

rock face and produce a continuous stream of salt without using explosives, which is intended to improve worker safety.<sup>87</sup> At least one resident responded positively to this news, saying “I like the idea of no more blasting. As a child growing up in and around the Hwy 21 [sic] area of Goderich, blasting was always a topic of discussion and its effects on the surface. Cracks in houses [and] foundations attributed to blasting were always hot topics.”<sup>88</sup> On a more positive note, the salt extraction business in Canada celebrated its 150<sup>th</sup> anniversary in 2017, from the date the original salt company in Goderich began production in 1867, which was also the same year that the Canadian Confederation was organized.<sup>89</sup>

The largest salt producer in Michigan, Dow Chemical, merged with Delaware-based DuPont in 2017, briefly forming the largest chemical company in the world. *USA Today* reported that this merger made the combined company worth \$130 billion. Per the terms of the deal, the company, DowDuPont, is in the process of splitting into three smaller, more manageable companies, one each to focus on agriculture, material science, and specialty products. This is anticipated to streamline production for all parts of these companies, but there was concern about risk of plant closures and layoffs for some employees of both companies.<sup>90</sup>

Altogether, these developments seem to indicate a relatively positive outlook for salt production in the Great Lakes region. Although the industry has never been the most important to either Michigan or Ontario, it has always been a significant secondary employer. Nearly all of the articles about the salt manufacturing in the region speak about the vast extent of the salt deposits that

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<sup>87</sup> Boa, “Goderich’s Salt Mine Positioned for the Future.”

<sup>88</sup> Rhea Seeger, October 30, 2012 (10:20 a.m.), comment on Heather Boa, “Goderich’s Salt Mine Positioned for the Future,” *Bullet News* online, October 23, 2012, <https://archive.is/20130115090702/http://huron.bulletnewscanada.ca/2012/10/23/feature-goderichs-salt-mine-positioned-for-the-future/>.

<sup>89</sup> “Our Story,” *siftocanada.com*.

<sup>90</sup> Nathan Bomey, “Dow Chemical, DuPont Reach Deal on Merger,” *USA Today* online, December 11, 2015. <https://www.usatoday.com/story/money/business/2015/12/11/dupont-dow-chemical-merger/77137888/>.

lie deep under the Great Lakes and their potential to provide the entire supply for both countries if it were ever necessary. Of course, the early European settlers perceived the forests of the region to be a boundless resource as well, but even by the 1870s it was apparent that they were rapidly disappearing. This could be a warning that the salt industry that was initially bound up with the lumber industry can have problematic environmental consequences just as deforestation did, and that assuming that a resource will last indefinitely can be dangerous.

## Conclusion

The alternatively symbiotic and competitive relationship between the salt producers in Canada and the United States can tell us a great deal about industrialism, economic competition, and international relations. Due to the continually changing economic and geopolitical context of this industry, it is an interesting case study in resource development and usage since the mid-19<sup>th</sup> century until now. Capitalism is practiced differently today than it was in the 1870s and environmental concerns are a higher priority; however, the practices used then are not alien to us today. We are still familiar with debates around resource extraction, fair competition and labor practices, and ecological consequences of industry. In addition, industry – including Great Lakes salt mining – continues to be affected by international and domestic competition. This industry, however, has finally reached a point which it never has before: It is no longer a “parasite” of other industries, but has become a stand-alone industry. Despite the relatively low public awareness of salt production, it has certainly contributed to create the Michigan and Ontario we know today.

## Bibliography:

Adelberg, Justus. *Report Concerning the Manufacture of Salt at Works Proposed to Be Erected at Zilwaukee, by the Saginaw Solar Salt Co.* Self-Published, 1863.

Batcheller, Pete. "CuriosiD: Are There Salt Mines under Detroit?" *WDET* online. May 15, 2017.  
<https://wdet.org/posts/2017/05/15/85173-curiosid-are-there-salt-mines-under-detroit/>.

Beecroft, Margaret S. *Windings: A History of the Lower Maitland River.* Maitland Valley Conservation Authority, 1984.

Boa, Heather. "Goderich's Salt Mine Positioned for the Future," *Bullet News* online. October 23, 2012. <https://archive.is/20130115090702/http://huron.bulletnewscanada.ca/2012/10/23/feature-goderichs-salt-mine-positioned-for-the-future/>.

Bomey, Nathan. "Dow Chemical, DuPont Reach Deal on Merger." *USA Today* online. December 11, 2015. <https://www.usatoday.com/story/money/business/2015/12/11/dupont-dow-chemical-merger/77137888/>.

Brown, Ian W. *The Role of Salt in Eastern North American Prehistory.* Baton Rouge, LA: Department of Culture, Recreation and Tourism: Louisiana Archaeological Survey and Antiquities Commission, 1981.  
<https://www.crt.state.la.us/dataprojects/archaeology/virtualbooks/SALT/salt.htm>.

Cole, L. Heber. *The Salt Industry of Canada.* Ottawa: F.A. Ackland, 1930.

Cook, Charles W. *The Brine and Salt Deposits of Michigan: Their Origin, Distribution and Exploitation.* Lansing, MI: Wynkoop Hallenbeck Crawford Co., 1914.

Dunbar, Willis F. and George S. May. *Michigan: A History of the Wolverine State.* Grand Rapids, MI. William B. Eerdmans Publishing Company, 1995.

*The Goderich Salt Story.* Sifto Canada, Inc., Film.

“Fact Sheet: Wyandotte, Michigan.” BASF. 2015.

*Facts Relating to the Manufacture of Salt at Saginaw, Michigan, and Onondaga, New York.*

Syracuse, NY: Summers & Co., 1871.

Froman, Robert. *The Science of Salt*. New York: David McKay Company, 1967.

Garrigues, S.S. *Report on the Salt Manufacture of Michigan, Prepared to Accompany Volume III of the State Geological Survey*. New York: Julius Bien, 1876.

“History of the Detroit Salt Mine.” Detroit Salt Co. Accessed April 19, 2018.

<http://detroitssalt.com/history>.

Kurlansky, Mark. *Salt: A World History*. New York: Penguin Books, 2002.

Muir, Gordon. *Salt*. Self-Published, n.d. (From the Collection of the Huron County Museum & Historic Gaol.).

“Our Story.” *Siftocanada.com*. Accessed April 19, 2018. <https://www.siftocanada.com/our-story>.

Pataki, Amy. “Salt at the Source: A Day in a Lake Huron Mine.” *thestar.com*. Accessed April 19, 2018. [http://projects.thestar.com/projects/salt\\_mine\\_lake\\_huron.html](http://projects.thestar.com/projects/salt_mine_lake_huron.html).

“Salt Mine Operator Sifto Canada Fined \$140K after Worker’s Death.” *Canadian Occupational Safety* online. July 18, 2011. <http://www.cos-mag.com/ohs-laws-regulations/30117-salt-mine-operator-sifto-canada-fined-140k-after-workers-death/>.

Schaetzl, Randall. “The Michigan Basin.” *Geo.msu.edu*. Accessed April 14, 2018.

<http://geo.msu.edu/extra/geogmich/mibasin.html>.

Schnurr, G. *A History of Salt Wells in Huron County, 1865-1990*. Self-Published, 2016. (From the Collection of the Huron County Museum & Historic Gaol).

Serba, John. “Detroit’s Salt Mines Are Michigan’s Biggest Buried Secret.” *MLive*. July 28, 2017.

[http://www.mlive.com/entertainment/index.ssf/2017/07/detroit\\_salt\\_mines\\_inside\\_](http://www.mlive.com/entertainment/index.ssf/2017/07/detroit_salt_mines_inside_)

mich.html.

Wallace, Dorothy. *Memories of Goderich: The Romance of the Prettiest Town in Canada*. Self-Published, 1977. (From the Collection of the Huron County Museum & Historic Gaol).