A History of Grist Milling in Delta

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Illustrations that occur throughout this work are by Stephanie Bennell, with the exception of the mill cut-away illustration and the millstone cut-away diagrams, which were illustrated by Dan Moran.

Contents

Introduction

This is the story of one building, in a small town in Eastern Ontario, that for the first one hundred and fifty years of its existence, was central in many ways to the life of the community and its surroundings. Like many mills in Upper Canada, the mill in Delta was more than just a grist mill. It housed a distillery, a carding mill, a mill for cutting marble, and a sawmill. The mill also served as a feed store and an electrical supply outlet, while the adjacent structure once served as a stable. The room above the stable served as the town hall, courthouse, and school room.

Although the stone mill in Delta is the oldest, it was not the only grist mill that operated in Bastard Township. Timothy Smith's grist mill and distillery in Harlem (started 1813), and Ebenezer Knapp's grist mill in Plum Hollow (started 1819) were also amongst the earliest. The Delta mill was the largest and the longest operating mill in Bastard Township. There are three reasons why this mill survived for so long. The first was its long history as a functioning mill. Second was that this formidable structure was constructed of stone. Third was the foresight of Hastings Steele who donated the mill to four individuals, who later formed The Delta Mill Society. The restoration efforts of the society resulted in the mill being designated as an historic site of national significance.

Reconstructing the mills history proved to be a challenging endeavor due to the limited amount of documentation available. Compounding the matter even further was the large amount of contradictory evidence, both in the written and oral record. A great deal of care and circumspection was utilized when sifting through, and evaluating the evidence in order to arrive at what I believe to be a complete and accurate picture. Still, certain aspects of the mill's history remain unanswered. For example, when was Upper Beverly Lake flooded to its present level, and when were the roller mills installed in the mill? It is hoped that these and other questions will be answered at some time in the future.

This book is divided into four parts. The first will address the history of wheat and settlement in Upper Canada. It will then address the history of the mill from Abel Stevens' exploration of the mill site in Bastard Township, through to the final days of its operation under the ownership of Hastings Steele.

The second part will discuss the early days of hydro production in the Delta area and the mills involvement in its production.

The mill in Delta housed a distillery during the first half of the 18th century. This facet of milling has been neglected in almost all of the existing literature on grist mills. Therefore, a discussion of distillation in Upper Canada is included in the third part.

Part four will examine the equipment used in the automatic custom, and merchant mill. Most, if not all of the equipment used for the production of flour during the 18th and 19th centuries is unfamiliar to most of us. This section will familiarize the reader with their operation and explain the process of flour production in the 19th century.

One

Wheat

Wheat was first cultivated in the Fertile Crescent of South East Asia 10,000 years ago, and since that time it has played a very important role in the diet, economy, and development of civilization. The nutritional value of wheat and flour to humans was quickly recognized by the earliest farmers, and it soon became an essential component in the diet of many societies around the world. It was the domestication of wheat and other grains that helped to facilitate animal husbandry a short time later, which enabled humans to evolve from a hunter-gatherer lifestyle to a more sedentary, agricultural-based society. This was an important, fundamental change in human social evolution.

This method of food production laid the foundation that has allowed many societies around the world to evolve into the complex, densely populated industrial societies they have become. The development and evolution of grain grinding techniques proved to be an important factor in this transition.

The catalyst behind the evolution of grain grinding techniques was the development of agriculture. This facilitated the progression of grinding devices such as the mortar and pestle, the saddle stone and hand quern, and then the millstone and the accompanying technologies used in the automatic

mill conceived by Oliver Evans.[1] *The technologies and concepts invented by Oliver Evans, in turn, were instrumental in the industrial revolution and the social and economic structure it created.*

...

Following the American War of Independence, large numbers of Loyalists seeking life under British rule made their way to Upper Canada. The British Government, in recognition of their loyalty to the Crown, and in compensation for lands lost, awarded the Loyalists grants of land in Upper and Lower Canada. By 1784 an estimated 10,000 Loyalists had settled in Upper Canada, or what we now refer to as Southern Ontario. Each settler would have to petition the Executive Council through the Land Board in the District where they wished to settle. Their petitions, upon being presented to the Land Board, were either approved, or not, depending upon the merits of the individual petitioner. The principal merits were "the loyalty, character, and pretensions of each petitioner," with the usual allotment amounting to about 200 acres. Larger grants were awarded to those who had served in the British Army. The size of the grant increased proportionally with rank.[2]

Life was harsh. The 200 acres awarded to a settler would have been a vast expanse of what we now refer to as old growth forest, or in the case of the most unfortunate, Precambrian shield, pock

marked with beaver ponds, swamps, and precious little soil. During the first year a shelter had to be erected and enough land cleared to begin planting. The lands settled were densely populated with virgin forest consisting of oak, hemlock, tamarack and white pine. Many of the trees were immense, often 4 to 8 feet in diameter. Hence, their immediate removal was not an option for most settlers. The solution to the problem was that the settler cut down the smaller trees, and girdled the larger ones, leaving them standing but dead, which allowed light to penetrate to the crops on the ground.[3] These trees were removed at a later time. The first crops of wheat, potatoes, hay etc. were planted in between the stumps, which remained for many years before they had become rotten enough to remove.

The services of a grist mill were not always available to the early settler. Instead, they would have had to resort to more primitive means to clean and grind their grain. Hiel Sliter, whose family settled near Lyndhurst in 1801 recalled:

"Sometimes they selected a large stump, burned a hole in its top, bent down a sapling to serve for a spring pole to which they attached a wooden pestle. With this they could soon pound out considerable meal."[4]

More fortunate settlers would have possessed a hand or rotary quern. Grain was ground by rotating, by hand, an upper stone on top of a

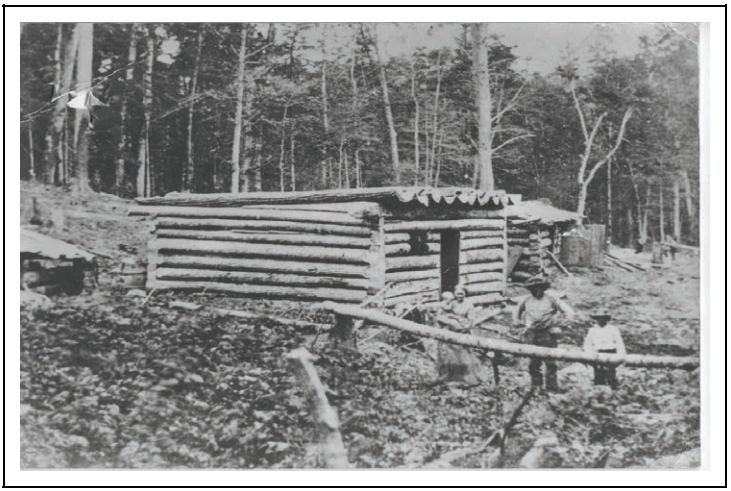
stationary stone. The grain was fed through a hole (the Eye) in the stone as it was rotated. Grinding wheat with a quern was a very laborious process, often taking up to eight hours to grind a bushel.[5] As "Grist and flour mills were considered to be a basic requirement for existence where flour for daily bread was made,"[6] one can see how important the construction of a mill would have been to these early settlers. The importance of a mill was not lost upon the government of the time. The construction of four mills (known as King's Mills) along the Lake Ontario watershed had been contracted by the Crown as an enticement to lure settlers to Upper Canada.

Clearly, the amount of labour saved by having access to a mill was a welcomed factor when grain was ground for family use. However, settlers were not content to simply provide sustenance for their families, but wanted to build communities, and a society with familiar social and economic values. More importantly they wanted to develop a standard of life similar to or better than what most left behind. This necessitated an outlet to sell the surplus portion of their crop. In Upper Canada the grist mill was the outlet that provided this service.

The mill site attracted a host of other services that were essential to early settlers. Blacksmith shops, inns, taverns, breweries and distilleries, general stores, cooperage and sawmills were a few of the businesses which were located near a mill site.

In comparison to the grist mill, the sawmill was of equal importance to the settler. The sawmill provided a source of lumber for homes, barns, and other needs. In areas not previously settled, sawmills were usually constructed first, as homes were required and fields needed to be cleared before crops could be planted. Many early settlers lived in modest log homes. Ferris Bolton, son of an early settler of Bastard Township, recalled his fathers first home:

"His first abode was...12 feet square. It was built of logs and roofed with hollow basswood, first layer with the hollow side up and the top layer reversed, covering the joints and making a waterproof roof. The sides and roof joints were filled with moss.... They lived two years in this 12 by 12 shanty, when



1800's shanty

they built a fairly large log house with an upstairs and shingled roof. ...”[7]

Although this account was from 1844, it was the typical first home of many settlers, especially those who arrived before the erection of a sawmill.

•

Prior to 1791 there were fewer than a dozen mills in Upper Canada. Over the next one hundred years this figure increased to 319 in 1832, 424 in 1938, 692 in 1851, 951 in 1871, and 1034 in 1891. Clearly, wheat was an exceptionally important crop in Upper Canada. Production and the number of mills kept pace with population growth. In the decade between 1842 and 1851 wheat production tripled, increasing from 3,221,989 bushels to 12,682,550.[8]

To this day, wheat is a significant element in the diet of modern society. However, soil depletion, the shift of most Canadian wheat production to the western provinces, and urban industrialization, caused the local mill to lose its position as the rural social and economic centre. In a few instances, local mills have survived as private residences, restaurants, derelict buildings or mere foundations. Some have survived as museums providing a glimpse of early life in Upper Canada.

Abel Stevens · William Stevens
Nicholas Mattice

The history of the mill and the town of Delta begins in 1793 with one Abel Stevens (1755 – 1826), the first and founding settler of Bastard Township. He emigrated to Upper Canada from Pittsford, Vermont early in 1793 and explored the area around Plum Hollow Creek in June of the same year. After locating what he deemed to be a favorable mill site, he petitioned for a grant. The Land Board received his first petition for lands in the future site of Delta[9] on December 17th, 1793, in which he stated that he wished *"to erect a Dwelling House and Sawmill and make considerable improvements there next season"*.[10] Abel Stevens then went back to Vermont and returned to Upper Canada in February of 1794. He brought with him five other families, who settled upon the lands that he had explored the previous year.[11] During the next two years there followed a flurry of petitions to the Land Board of the Eastern District from Abel Stevens and those families whom he had encouraged to settle with him.[12]

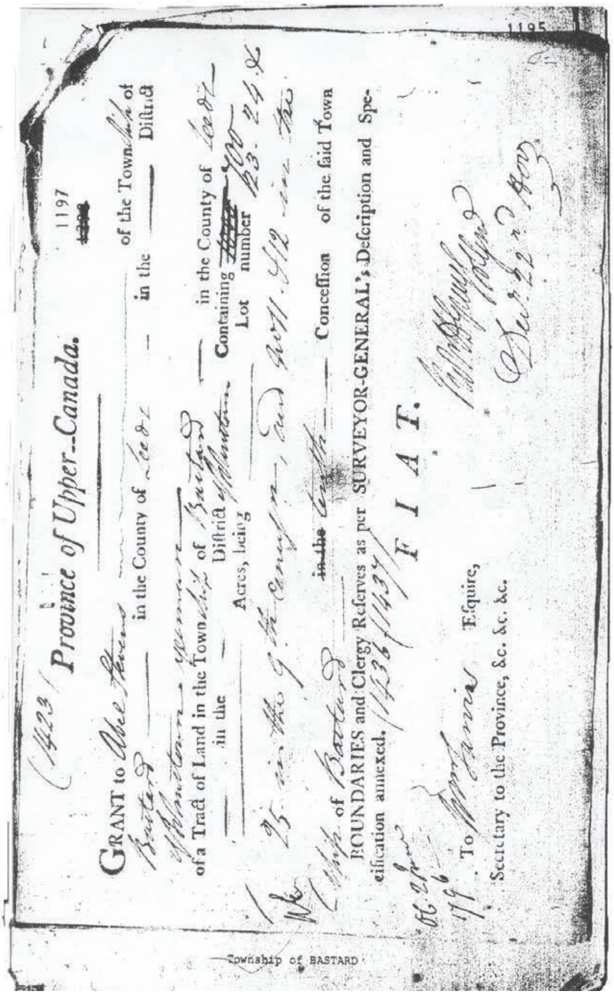
Finally, on June 2, 1796, Stevens was granted an additional 1,000 acres in Bastard Township. Lots 23, 24, and 25 in the 9th concession, and lots 11 and 12 in the 10th concession.[13] The first three lots comprised much of what is presently the town of Delta. The mill was, and is located on lot 23. His petition of 2nd June, 1796 read:

"Abel Stevens: Has been at a considerable expense, not less than $1000, in bringing settlers, and removing his family into the Province; has received 200 acres only. Prays for an additional grant of 1000 acres including the rapid between two small lakes on the southwest quarter of Bastard. Ordered that the same be granted."[14]

The petition stated that Stevens had received "200 acres only." The Ontario Archives Land Record Index, noted that a previous grant to Abel Stevens, his wife, and four of his children, was issued on June 22, 1793 in the Township of Bastard.[15] The survey map drawn by William Fortune in 1794, also noted that Abel Stevens was ensconced on lot 10 in the 10th concession.[16] It appears that before he explored Bastard, Stevens had already been granted land in the township before his "additional grant of 1000 acres"[17] (the mill site) was approved in June of 1796. His petition for the mill site, dated November 4, 1794, also stated that he was settled in the township:

"Abel Stevens: Petitioner has settled on lands on the Gannonaque River, County of Leeds, and has made considerable progress in cultivating the same. Prays for a grant of the rapids between the second and third lakes.....on said river to erect mills upon to accommodate the new settlement,..."[18]

It was not unusual for a settler to be granted land site unseen. Indeed, in 1793 Stevens had been granted land in the Township of Scarborough


(1423) 1197

Province of Upper-Canada.

GRANT to Abel Stevens of the Township of Bastard in the County of Leeds in the District of Johnstown of a Tract of Land in the Township of Bastard in the County of Leeds in the District of Johnstown Containing 700 Acres, being Lot number 23. 24 & 25 in the 9th Concession, and N 1/2 in the 10th Concession of the said Township of Bastard

BOUNDARIES and Clergy Reserves as per SURVEYOR-GENERAL's Description and Specification annexed. 1436/1437

F I A T.

To Wm Jarvis Esquire,
Secretary to the Province, &c. &c. &c.

Township of BASTARD

Fiat for mill site. A. O.

before setting foot upon it. (He explored this land and found it unsuitable.)[19] The grants were awarded before a survey of the Bastard Township had been undertaken, which was unusual. As Colonial policy strictly forbade settlement before completion of a survey, Abel Stevens and company were, in effect, squatting.

After he returned to Upper Canada in February of 1794, he made improvements on the lot granted to him the previous year, and also squatted on the lands at the mill site in order to stake his claim. It is not known what the manner of his occupation on the mill site was. Had he started to clear the site for his future mill? Had he started to build a dam? What is known is that his activities on Lot 23 were substantial enough to attract the attention of Justus and Thomas Sherwood, both United Empire Loyalists, and persons from prominent families. Title to Bastard Township had been granted to the Sherwoods as part of a British policy to give an individual the responsibility for developing a township. This said individual would receive large land grants, and in return he had to "recruit" fifty or more families to settle in the township.[20] After they discovered that Stevens had squatted on a site that they wished to develop, the Sherwoods contested his occupation to the Executive Council. In the end, Abel Stevens prevailed, even though he had settled only 24 families. The Sherwoods had settled none.[21]

There is no documentation that indicates the exact date the original mill was constructed. Its existence was first noted in 1797 by Lewis Grant in his survey of Bastard Township. What was very surprising was that his field survey notes described the mill as "Wm. Stevens mill." Although Abel did own the lot, it was his cousin William who had leased and operated the mill at that time.[22] It is a mystery as to which of the two built this mill.

The map of Bastard Township, drafted by Lewis Grant, noted the mills location and the layout of the mill ponds. The lots, concessions, and the names of the settlers on each lot are also noted. This map confirmed previous speculation that there were indeed two mill ponds and two dams. Although it does not show the exact location of the two dams, their locations are clearly described in the field survey notes. However, the location of the second dam appears to be an error, as the location on which he noted this dam to be situated upon, (lot 20, con. 10) was entirely under water, according to his map. His survey noted that the second *"Stevens dam" was* on lot 17, concession 10.[23] This was the dam that formed the second mill pond above Lake Abel. The size of the two mill ponds was substantially larger than previously thought to be. In fact, the first pond on this map was large enough to be titled *"Lake Abel"*, most certainly because Abel Stevens was the founder of Stevenstown. It was about half the size of the present Upper Beverley Lake. Lake

Abel, at the time, covered much of lots 18 to 20 in the 10th concession and about half of lots 19 to 22 in the 9th concession. These two mill ponds were separate bodies of water until sometime after 1816 when further alterations to the stream resulted in extensive flooding, and formed Upper Beverley Lake. It is not known exactly when these alterations were made. The two mill ponds appeared on a map drafted by an unknown surveyor in 1816, and provide the last known date for their existence as separate bodies of water.[24]

The original location of the mill was also noted on the survey map, and there are lines and notations that suggest measurements of its location were taken by Lewis Grant in order to determine its position in relation to the 10th line (Fortunes Line) and other lots. (See map) The field survey also noted the mill, and described its location in chains and links, relative to adjacent lot lines. In 1797 the mill was on the east side of the mill creek, as it is today.

The location of the original stream channel is a mystery. It has been suggested that the present stream channel was man made, having been altered by William Jones when construction of the stone mill was undertaken. A mill of stone construction required very sound footing. Given that the bedrock at the present mill site was quite close to the surface, the present site was chosen. The relocation of the mill may have necessitated altering the course of the stream in order to

provide adequate power. The former channel is assumed to have been oriented along the lowest run of land from Upper Beverley Lake, west along Recreation Street and into the present mill stream, just south of the mill. If the above assumptions are correct, the original mill that William Stevens operated in 1797 would have been located at what is presently the bottom of Matthew Street. This was on the east side of the original channel, as was noted on Grant's map. An examination of the field notes by a surveyor might prove fruitful in confirming this.

The type of mill originally constructed would undoubtedly have been a sawmill. A sawmill was usually constructed first, until agricultural production warranted the construction of a grist mill. In his reminiscences, Hiel Sliter stated that the mill had burned down twice before a stone mill was erected Therefore, it would be logical to conclude that it was of wood construction, and as noted in the Delta Mill conservation report, it was probably of timber frame construction.[25] [26]

After the Lewis Grant survey of 1797 there is little documentary evidence that relates directly to the mill until 1803, when the assessment rolls begin. The only surviving document available between these dates is a deed of sale dated 17th May, 1799, for the sale by Abel Sr., to his son Abel Jr., of a portion of lots 22 & 23. The deed used the mill as a reference to establish the location of another lot. It stated: *"the north Corner of the Bridge, near Abel*

Stevens & Nicholas Mattice mills in Bastard,"[27] which indicates that William Stevens no longer operated the mill at that time. Abel Stevens had formed a partnership with Nicholas Mattice. It is not known how long this partnership lasted, or whether their mill was a grist or a saw mill, only that by 1803 they were no longer listed as partners in the assessment rolls. (Nicholas Mattice, like Abel Stevens, emigrated from the United States and was granted 400 acres of land in Bastard Township in 1798.[28])

The sequence of ownership between the years 1803 and 1811 is rather confusing. (See Table 1 for a chronology of mill owners or operators). The assessment records and a few deeds of sale are the only sources of information that exist to interpret the sequence of events.[29] The assessment records in particular have proven to be valuable, and consistent. Only a few years are absent from the record. From these sources we are able to conclude that Abel Stevens had leased his mill to Nicholas Mattice from 1803 to 1808, and that it was both a sawmill and a grist mill with two run of stones.[30] (A run of stones is a set of two millstones for grinding flour.)

In 1808 there were two mills operating in Stevenstown. The March 21st,1808 assessment roll noted that both Nicholas Mattice and Abel Stevens Jr. operated separate grist mills.[31] Three months later, in June of 1808, Abel Sr. sold the mill property that he had leased to Nicholas

Mattice, to William Jones.[32] Ira Schofield was assessed for this grist mill in 1809. It is not known if Jones leased the mill to Ira Schofield or if he was a partner in the business.

It is interesting to note that Abel Stevens was also recorded as a grist mill and distillery owner in 1809 to 1810. This was the first time since 1799 that he was actively involved in milling. It appears that he had taken over the mill his son operated the year before. The location of this mill was not noted in the assessment rolls. It is likely that it was located on the property that he sold to his son in 1799, which bordered along Foundry Creek, north of the mill property that he sold to William Jones in 1808. The Hicock pond was the only suitable location for a mill on this property. Abel Stevens Sr., and, or Abel Jr. were also assessed for a grist mill at this location in 1818, 1819, and 1822.[33]

In 1810, only Abel Stevens was noted as having a grist mill in Stevenstown, while Jones & Schofield were recorded as partners in a merchant shop and a storehouse.[34] It is likely that after William Jones purchased the mill in 1808, it burned down, as Hiel Sliter's reminiscences stated, and that Jones & Schofield were in the process of redirecting the stream and constructing the stone mill on its present location.

William Jones & Ira Schofield

A new era of grist milling in Bastard Township began when William Jones erected the stone mill between March of 1810 and March of 1812. William Jones and Ira Schofield both came from socially well established and financially prominent United Empire Loyalist families. William came from the more prominent family of Ephraim Jones, who immigrated to Augusta Township from Massachusetts in 1790. By the time of his death in 1812, Ephram Jones had accumulated 11,260 acres, and was involved in various businesses throughout Leeds & Grenville. The stone construction and the type of mill they chose to build was undoubtably influenced by this family wealth and social position. A large amount of capital would have been required to build a mill of this size and type of construction, capital that both the Jones and Schofield families possessed. This enabled them to construct a large merchant mill with the cutting edge technology of the automatic mill designed by Oliver Evans. (Merchant milling and Evans automatic system will be discussed in part two). The suggestion that the mill was constructed as an automatic merchant mill is strongly supported by its size, and the fact that it is more than two storeys with a cross sectional profile exactly resembling the designs in Evans' guide.

Construction of the stone mill began in 1810 and was completed by March of 1812, with only Ira

Schofield assessed as its miller. William Jones was absent that particular year, likely due to the fact that he was busy with the war effort. William Jones served with the First Regiment of Leeds Militia during the War of 1812, and was later promoted to Lieutenant-Colonel of the Second Regiment in 1822.[35]

William Jones first appeared as miller in the spring of 1813 when the mill operated under the partnership of Jones & Schofield. A sawmill and a merchant shop were additional business interests that the partnership had in town.[36] William Jones retained ownership of the mill for the next 20 years, although he was not always directly active in milling. During this period, the mill operated under the Jones & Schofield partnership for only five years. For the remainder of his ownership, the mill was run by Jones himself or leased to another party such as James Schofield Jr. or Hartwell & Schofield. Jones' success as a miller is unknown. If we are to use the only fact available as an indicator, he was not doing well. In 1819 he mortgaged the mill for the sum of £ 1,358 to his brothers, Charles and Jonas Jones[37], and he spent the next six years directly active in the business before he leased the mill to Hartwell & Schofield for two years. The mill was idle for the last year of Jones' ownership, possibly due to illness, as he died the following year in 1831.

The first written reference to the *"stone mill"*, occurred in 1812 when a deed of sale used the

mill as a point of reference for the boundary of another property being sold.[38] A few years later the mill was mentioned in the letters of two individuals that traveled through Stone Mills. A Colonel Cockburn in 1816, described the village *"which consists of about twenty houses. There is an inn a saw and a grist mill / both excellent & a distillery."*[39] In 1817 William Smart, (in Robert Gourlay's Statistical Account of Upper Canada), remarked that it was *"unquestionably the best building of the kind in Upper Canada,"* and, that there were three stores and a blacksmith shop in town.[40]

Henry Jones

William Jones died intestate and without issue in 1831, therefore his property automatically passed to his brother Charles Jones. Charles Jones was also a miller and owner of the highly successful mill at Yonge Mills, located between Gananoque and Brockville. Charles sold the mill to Amelia Jones, Williams widow, for the nominal sum of four shillings.[41] Amelia then sold the mill to Henry Jones. For some unknown reason the property was not actually deeded to Henry Jones until January of 1836, for £500.[42]

Rather than operate the mill himself, Henry Jones chose to lease the mill to an Edward Matson who was the miller until 1834.[43] The mill under Edward Matson's management probably did not fare too well financially, despite the fact that both

wheat production and flour prices increased during the first two years of his lease. The massive fall of the market in 1834 and 35 must have been a fatal blow for Matson. Wheat prices dropped from over a dollar a bushel to 35 cents, and resulted in the total collapse of the export market.[44] Without enough capital to get by during the lean years, a merchant mill would not be very successful. Moreover, competition from two other sources would have been an added hindrance to his operation. The local grist mill was not the only outlet where the farmer could market his grain. Farmers also had the option to sell their grain to a grain agent, or the local store owner. There was also the option to transport their grain by sleigh, in the winter, to one of the large merchant mills along Lake Ontario. In Bastard Township, Augustus Schofield, owner of the Beverly store, purchased wheat from local farmers, and then sold the grain to Yonge's Mills.[45] Matson was also faced with ardent competition from Benjamin Tett of Newboro, who in addition to being a local merchant and a miller, was also a grain agent. Many of the inhabitants of Bastard and the surrounding area sold their wheat to Tett, who was paying top price.[46] Most of the grain purchased by Tett was shipped via steam boat along the Rideau Canal and sold to Thomas McKay, owner of the merchant mill at New Edinburgh, near Ottawa.[47]

Matson severed his lease in the fall of 1834, and Henry Jones placed an advertisement in the

Brockville Recorder on October 21, 1834 that read*: "Grist mill in Beverley for rent."*[48] The mill remained dormant as there was no favorable response to his advertisement. Another lengthy advertisement was placed one year later by Jones in the Brockville recorder on October 24, 1835, and offered his holdings for sale by an auction to be held November 17th in Brockville.

"The mills consist of a Stone Grist Mill, 60 by 40 feet, three stories high, with one run of Stones in operation, and sufficient room to place one or two run more;- a large wooded building in which there is a Saw Mill, a Mill for cutting, and polishing marble, and a Carding Machine;..."[49]

The advertisement also listed a farm with stone house, and four other lots outside the village. It remarked that the grist mill was still vacant in 1835.

James & Amelia Macdonell

The mill was purchased by James and Amelia Macdonell[50] in July of 1836. Both were Loyalists of Scottish descent from socially prominent families. Amelia was the widow of the former mill owner William Jones. James and Amelia immediately mortgaged the property for the full purchase price of £500, plus interest, to his brother-in-law Alexander Grant.[51] Operation of the mill resumed the following spring with two additional run of stones.

Crop failures in Upper and Lower Canada in the late 1830's resulted in a depressed state of affairs for farmers and millers. However, the demand for wheat and other agricultural products increased dramatically during the early 1840's, until 1846 when the Corn Laws were repealed. Wheat production and exports almost doubled as a result of the potato famine in Ireland.[52]

These factors would have provided a profitable environment for their mill. However, the Macdonell's do not appear to have been successful, and there are two very significant factors that could have affected their ability to turn a profit. The first was the large debt incurred by the Macdonell's at the time of their purchase. The costs associated with maintaining this debt, especially during the first year when the mill was idle, would have been a substantial burden. However, the Macdonell's did not make payments on either the principle or interest on this debt during the entire time they owned their mill. Subsequent mortgages they took out in 1841 and 1850, were also left in arrears, which suggests that theirs was not a very successfully run business. Increased local competition combined with the disadvantage of the mills location was an additional handicap to their business.[53] The mill was not located on a navigable waterway. This forced farmers and millers, who endeavored to sell their grain for export, to travel overland to Brockville to market their product. Overland transportation was more costly than water and

was, for years, an issue of concern among many of the inhabitants of Bastard Township who recognized the disadvantage of their location. The lack of water access to the Rideau Canal was a consequence of the Whitefish Rapids at the town of Morton. Access to the Gananoque River was prevented by the falls at Furnace Falls (Lyndhurst). There was a general lack of development for this entire waterway. This situation had been an issue of concern previous to the ownership of Macdonell. The construction of canal locks at Morton and the Gananoque River was proposed in 1826 by J. K. Hartwell and former mill owner William Jones, with the support of other local businessmen and farmers. A circular by J. K. Hartwell in the Kingston Chronicle read:

"The numerous and great disadvantages under which the inhabitants in the rear of this district have laboured since the earliest period of its settlement, occasioned by the bad state of its canals and an almost total want of them..." "...the utility of having a water communication, by which the produce of the back country may be conveyed to market...."[54]

Petitioning continued into the mid 1830's, and in 1835 a large petition signed by many of the prominent businessmen and local citizens was sent to the Lieutenant Governor.[55] In 1836 an engineering report was commissioned to study the practicability of the Gananoque route, which concluded that it was a viable proposition.[56]

Despite the petition, and the favourable engineering report, their efforts were not successful. The continued lack of access to the main transportation arteries resulted in a strong and permanent competitive disadvantage for poorly situated mills and other businesses. Mills located near the St. Lawrence River and Rideau Canal benefitted from the improvements made along this transportation network.

The mill continued to operate under Macdonell until his death at the age of 53 in 1847, after which his widow continued operation until it was sold to Walter H. Denaut.[57]

Walter H. Denaut

Walter H. Denaut first moved from his hometown of Prescott to Stone Mills in 1825, where he was employed for a short time as a clerk by general store owner, J. K. Hartwell. Denaut then moved to Brockville where he was active in a number of different vocations before he entered into business with James Crawford. They formed the partnership, Crawford & Denaut, and acquired contracts to construct locks along the Beauhornois Canal at Cornwall, Farren Point, Morrisburg, and Galoup Rapids.[58] Government contracts for lock building were quite profitable, and upon his return to Beverly in 1839 he purchased the general store and a farm.[59]

In February of 1850 Walter Denaut acquired the mill from the heirs of James Macdonell after he discharged the three outstanding mortgages that the Macdonell's had left in arrears.[60] Denaut promptly commenced extensive renovation of the mill, which was noted in the 1851 census. It stated that the mill had one run of stones with two employees and that it was under repair at a cost of £2,600. His renovations were relatively

Caroline & Walter H. Denaut

extensive and proved to be important to his success as a miller. This was largely due to the installation of two 48" Swain turbines.[61] [62] The turbines were housed in the stone addition that he added to the back of the mill. He housed his saw mill in the timber frame structure that he

erected behind the turbine shed.[63] The installation of the two turbines was a significant advancement in terms of energy efficiency and production potential. Turbines had the added advantage of durability and greater power output. The wooden water wheel did not possess these qualities, and required constant and costly maintenance. They also required heated housing around them in the winter to prevent freezing.

Denaut was also responsible for building the stable that was used by his customers. The hall above the stable was used as a concert hall, town hall, and courthouse. Originally the second floor was of brick construction with stone quoins and stepped gable parapets.

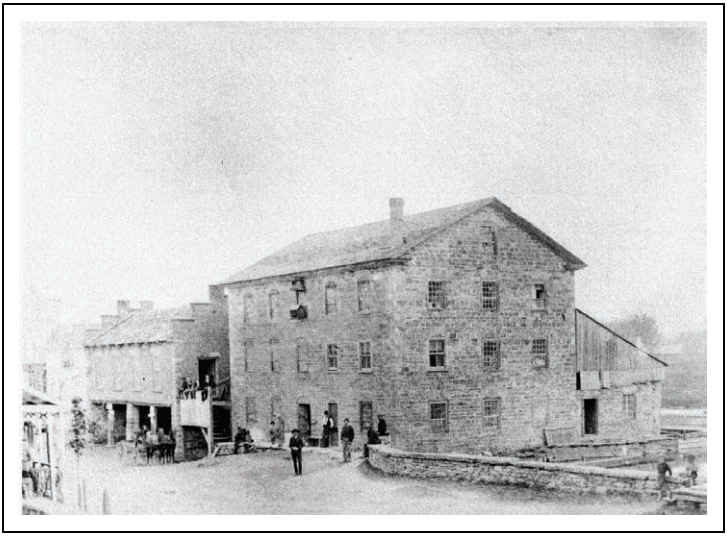
An examination of the census records reveals other reasons why Denaut was such a successful miller. Almost immediately after his purchase the demand for Upper Canadian wheat increased dramatically. By 1856 exports had more than doubled, and remained high until the mid 1860's.[64] In Bastard Township, wheat production rose from 34,269 bushels in 1851, to a peak of 57,787 in 1861.[65] (See table three.) The 1861 census stated that Denaut's mill produced 6,000 bushels of flour in 1860.[66]

His mill was successful enough to have two employees as mill-wrights, Chester and Solomon Haskin, at $45.00 per month, and a miller with one assistant.[67] (The signature of Denaut's miller,

William Bush, can still be seen on the mill stone crane, dated December 26, 1863.) It is surprising that Denaut's mill was still profitable after 1871. By 1871 soil depletion had reduced wheat yields to between 7 – 10 bushels per acre in Bastard and the surrounding townships. Sixteen bushels per acre had been the norm for most of the province.[68] Total wheat production for the township had fallen to a quarter of the 1861 levels and never recovered.[69] (See table 3.) This situation was exacerbated by the introduction of higher quality western wheat to the European market, which reduced Upper Canadian production to less than one quarter of its previous level. Wheat was no longer a viable crop for many farmers and millers. Those mills in the more remote locations would have been hit hard if they had relied on wheat alone.

Despite the decline in the wheat economy, the number of mills in the province continued to rise, from 951 in 1871 to 1034 in 1891. The reason for their continued success may be that "Their persistence reflected their integration with other aspects of the rural economy."[70] This persistence coincided with a shift in farming practices. A general shift to mixed farming, increased dairy farming, and livestock rearing had become the trend throughout the province.[71] The economic activities of many grist mills, including the Delta mill, were no longer exclusively confined to flour production, but also included sawmills, feed mills, and a place where grains other than wheat were

ground. Calf meal, cracked corn, and chicken feed etc. would be required to fill the new agricultural needs of the province.



Mill c.a. 1880.

Another possible explanation for Denaut's continued success may be that he took advantage of the increasing demand for lumber, both locally and for export. The attached saw mill would have been a lucrative addition to his grist milling operation. The opening of the hinterland by the railway, and the construction of colonization roads such as the Opeongo, Peterson, and Hastings road, resulted in a logging boom, and released vast quantities of lumber destined for

export and domestic use.[72] The population of Upper Canada and Bastard Township rapidly expanded during the latter half of the nineteenth century, and with it grew the demand for finished lumber and other products. This demand continued to increase with the growing population of the country. It is important to point out that the census of 1871 notes a sawmill was not in operation during that particular year, thus the assumption that Denaut operated his sawmill during the following years is speculative.

Many millers were also involved with other activities in the local economy. Walter Denaut, for example, was the owner of the general store, and served as postmaster and court clerk. Each position would have provided adequate remuneration. Alternate sources of income allowed millers to operate during times when their mills were not profitable.

Walter Henderson Denaut died on March 16, 1889 at the age of 81. His obituary in The Record News, Smiths Falls read:

"Mr. Walter H. Denaut died at his home in Delta, on Saturday, and was buried on Monday. Mr. or Squire Denaut as he was called, was well known throughout all this section, and death has taken one who has been closely identified with the progress of the country."[73]

After his death the mill was run by his son, James Lancaster Schofield Denaut, until it was sold in 1893.

George Haskin

The mill was purchased from Walter Denaut's widow Caroline on October 5, 1893, by George Haskin[74] for the sum of $6,000.[75] There was a surprising dearth of information on the mill during Haskin's ownership. He appeared in two sources only; the 1901 census, and the municipal assessment rolls. He is listed in the 1901 census as miller, age 45. Like several other mill owners, he was a descendant of United Empire Loyalists who came from Vermont in 1784.

George Haskin is reputed to have installed roller mills. Although there is no documentation to support this, it would seem logical that he did, as most mills, in order to remain competitive, had installed this modern technology that produced a higher quality flour. However, in neighboring Lyndhurst, car loads of wheat from Manitoba arrived via the Brockville & Westport Railway in the 1890's. The Grain was ground in Henry Green's roller mills at the rate of two carloads per week. The flour was distributed to nearby villages.[76] It is a matter of debate whether a competing operation of this size negated the benefit of the roller mills in the Delta mill.

Mill 1900 showing stack for steam engine.

Steam engines increased in popularity throughout Bastard Township during the last two decades of the 19th century. They were used for a variety of purposes such as, cheese factories, cooperage, foundries, sawmills, and by farmers for threshing grain. George Haskin was rather late when he installed this technology. According to the Township Assessment Rolls, a steam engine was not installed until 1899.[77] It was installed in the north part of the stone addition (turbine shed) that Walter Denaut built when he renovated the mill in the 1860's. The chimney for this boiler can be seen in several pictures of the mill taken between 1899 and 1904. This boiler was used in the mill until 1903, and the reason for its removal

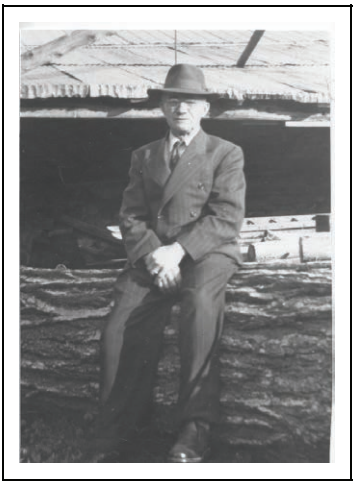
is unknown. Given that steam engines were expensive pieces of equipment, it is even more puzzling as to why its use was terminated. The capital lost in its disposal or resale must have been outweighed by some improvement or development that benefitted the operation of the mill in some way.

In 1899 George Haskin also established a brickyard on the mill reserve, and in 1900 he leased this operation to William Chase. This brickyard was located west of the mill and operated for a number of years.[78].

Hastings Steele

Hastings Steele, in partnership with his brother-in-law James Huffman, purchased the mill from George Haskin in 14 March, 1913 for the sum of $8,000.[79] The partnership between these two men did not last long, and for unknown reasons it was dissolved on March the 2nd of the following year.[80] (Local legend has maintained that neither men wished to part with the property. An auctioneer was hired and the property was bid for in the privacy of the mill office. The auction was attended by only Steele and Huffman. Hastings Steele won the bid.) Another partnership was formed with Omer P. Arnold and lasted until 1921.[81] Again, the reason for its dissolution is unknown. During the 1920's and 1930's, Hastings Steele was assisted in the operation of the mill by his son W. R. Steele.

The business endeavors of Hastings Steel & Son were not confined to the grinding of grains, but also included a sawmill and an electrical supply outlet, and the service of electrical contracting. Hastings Steele, who was also an electrical contractor, wired many of the rural homes in the area between 1938 and 1952.[82] According to Stewart Wright, who worked with Hastings Steele at this time, this service was provided to homes in the more remote outlying rural areas that had not received electricity during the late.1920's.



Hastings Steele

The mill's grinding operations consisted of custom grinding for local farmers, at the rate of ten to thirteen cents per one hundred pounds, and the sale of other products ground at the mill.[83] Products produced at the mill were varied, and reflected the shift to mixed farming practices that took place the previous century. These products included such items as bran 2 cents/lb, cracked corn 2.5 cents/lb, rolled oats 5.5 cents/lb, and flour at 5 cents/lb.[84] (Prices are for 1930.) The production of animal feed was also a significant activity in the mill. A grain chopper was

The Mill 1957

purchased in the 1920's to grind hen, chick, horse feed, and calf meal for local farmers. This Champion Grinder is presently on display on the first floor of the mill. Much of the grain used for animal feed was shipped in via the Brockville & Westport Railway.[85]

The mill's cash and order books record the production of flour until at least 1939. There are no records after this date to tell us whether flour was produced or not, until 1944 when it is clear that the mill's sole grinding function was that of a feed mill. It continued to operate as a saw and feed mill until 1949, when the grinding and saw

operations were shut down. The mill then functioned as a feed store until failing health forced Hastings Steele to close its doors in 1960. It remained dormant until 1963 when Hastings Steele graciously deeded the property to The Delta Mill Society, a not-for-profit organization whose aims were, and are, to preserve the historical integrity of Canada's oldest stone mill.

The Delta Mill Society

The last but ongoing chapter in the story of the Delta Mill began in 1963 when Hastings Steele sold the mill property to the newly formed Delta Mill Society for one dollar. It was Mr. Steele's hope that the mill would be preserved and become a museum of milling technology. The original founders of the society were Albert Frye, Elizabeth Robinson, Mildred Sweet and Robert Tuck.

The mill was in a state of disrepair. With the help of federal, provincial, and private grants, extensive repairs were undertaken over the next forty years. In addition, a great deal of effort was made by volunteers to raise funds for the restoration. They also donated much of their personal time in assisting with the actual renovation. Stabilization of the entire first floor and roof began in 1972. Repointing to some of the stonework was also completed.

The mill was an excellent example of Georgian architecture, and represented one of the earliest

examples of industrial architecture in Upper Canada. For this reason, the mill was granted National Historic status in 1973.

In 1985 the mill was opened to the public during the summer months, and remained open until 1999. The next four years were very busy. In the late summer of 1999, an extensive one million dollar restoration project began. A coffer dam was constructed to re-route the mill stream so that the lower parts of the stonework could be repointed and stabilized. A large portion of the south west wall and turbine shed was dismantled and reconstructed so that the stones followed their original lines. Interior work involved the installation of a fire alarm and exit system, the restoration of windows, floor, and roof support structures.

The mill reopened its doors to the public in May of 2004. Each summer, The Delta Mill Society hires students to provide guided tours of the mill and the Museum of Industrial Technology.

Conclusion

The construction and operation a large merchant mill in a remote location, far from the main transportation arteries, was a somewhat ambitious, grandiose venture, especially when the small size of the local economy is taken into account. Considering the builder was from a prominent family that was firmly ensconced in the elite social, and business life of Upper Canada, this is not surprising. The type of mill constructed and operated was one that reflected his perceived station in life.

The location of the mill was its main disadvantage. The grain trade in Eastern Ontario generally favored the more geographically privileged merchant mills along the St. Lawrence and Rideau waterways. Efforts on the part of its earliest owners to establish locks at Whitefish Falls, in order to link the mill with the Rideau Canal, were unsuccessful in remedying this situation.

Not until the mill was run by Walter H. Denaut do we begin to see a measure of success in its operation. There appear to be several reasons for this. First and foremost was the level of business acumen that Denaut possessed. Second, and perhaps more importantly, was that for the first twenty years after his purchase he operated during the peak years of the Upper Canadian wheat economy. Even after this peak, overall

provincial population growth and the expansion of mixed farming practices allowed some mills to align themselves with other sectors of the local economy. The mill in Delta continued to function in this environment throughout the remainder of its history under the ownership of George Haskin, then Hastings Steele.

Two

Hydro

A number of documents, that reposed in private hands for many years, came to light in 2005 through the generosity of their owners, who donated these documents to the Leeds & Thousand Islands Archives at Lyndhurst. The donated materials were in the form of hydro bills, electrical equipment orders, customer lists in ledgers, and inspection fees. The documents, spanning the years 1911 to 1930, outlined the arrival of electrical service to Delta,[86] and provided more details regarding electrical service and the first customers in Lyndhurst.

In 1910 George E. Roddick, the mill owner in Lyndhurst, petitioned the town council for permission to extend electricity through the village of Lyndhurst, and that he also be exempt from taxes for the first ten years. He was granted permission in 1911,[87] and by January of 1912 he had signed up forty customers.[88] Power was provided by a 30 KW, three phase, 2200 volt generator that he purchased from the Canadian Westinghouse Company in November of 1911.[89] This generator, and the marble switchboard accompanying it, was purchased for the sum of $657 dollars and was installed in his mill.

By December of 1917 (quite possibly earlier) his electrical infrastructure had been extended to

Delta, where a substation had been installed,[90] that provided its residents with electricity that cost each customer $1.25 to $4.00 per month. This service was billed to Delta resident, James Huffman, who in return, collected payment from each customer, and received twenty five percent of all monies collected.[91] By 1926 there were almost fifty homes and businesses in the town of Delta that received electricity from the Lyndhurst power plant.[92] (See Table 4) This arrangement with James Huffman continued until 1926 when available documentation ceased.

In the late 1920's the Ontario Hydro Electric Commission expanded their infrastructure in eastern Ontario. This process was completed in two phases. The first phase provided service to certain rural towns and villages. The second phase was the expansion of service to residents in outlying rural areas, and to the remaining towns that did not receive service during the first phase. This expansion of service took place after WWII, and continued into the 1950's.

In 1929 Ontario Hydro is said to have purchased the generator at Lyndhurst and shut it down, leaving both Delta and Lyndhurst without power.[93] At that time, Hastings Steele installed a small dynamo in the mill,[94] and was able to produce a few kilowatts, which was sufficient enough to provide power to only a few houses in Delta and Lyndhurst. This situation did not last very long, and in September of 1929, Hastings Steele began

to sell a large amount of electrical supplies to area residents who were having their homes wired and inspected.[95] This wiring was done in anticipation of the service that Ontario Hydro began to provide to Lyndhurst, Delta, and other towns at this time. The Delta customers who had received electrical service from the Roddick plant were billed only for a change of service.[96]

Three

Distilleries & Intemperance

Abel Stevens, Nicholas Mattice, and William Jones were also involved with other business activities in Stevenstown. The assessment rolls noted that a still was used at their mills, or was run as a venture independent of any milling activity. The distillation of "spirituous liquors" was an activity often associated with a grist mill. Many mills in Upper Canada at one time or another housed a still, and it was a profitable activity for the miller to set aside a portion of his 1/12th allotment of grain to ferment, then distill it for those whose proclivities leaned towards intemperance. In fact, most of the small distilleries produced, on an annual basis, more alcohol than their initial capital cost.[97] Many millers added a distillery, or abandoned their grist milling activities and pursued this profitable trade, and as a result a large number of small distilleries were scattered throughout the province.[98] The practice was an especially attractive one during times when wheat prices were low. Lord Selkirk remarked in his diary:

"The low price of grain induces many farmers to distill wheat as the readiest market. Farmers are very anxious to get cash payments, and make a great allowance in prices for it,"[99]

The Colonial government also recognized (as did many governments before them) the large amount of revenue that could be gained from a tax upon stills. The first legislation in Upper Canada was enacted in 1794, and it imposed a yearly tax, *"not exceeding one shilling and three pence, lawful money of this Province, for every gallon which the body of such Still or Stills shall or may be capable of containing,"*.[100] This legislation, which applied only to the distillation of spirits for sale, also stipulated that a licence was required to work a still, and that the applicant file a written request for a licence that stated the capacity of his still or stills. The Inspector General confiscated the stills of those who reported false information when they applied for a licence. The legislation also stated that no still shall have a capacity of less than ten gallons.

As the industry grew, so too did the governments zeal to generate revenue and by 1820, the tax per gallon of still capacity had doubled to 2 shillings and 6 pence.[101] The annual revenue collected was considerable. Seventeen hundred pounds was collected in 1820. As a result, enforcement of the regulations was strictly applied by Colonial authorities. Many distillers attempted to avoid payment of the applicable duties on their stills by removing them from the premises during collection time. In 1804 the Inspector for the Midland district remarked:

"there are a good many stills taken off the furnaces throughout the district in order to prolong the payments of duty until the fall. I shall set off in a few days to visit some of the Distillers, and no doubt not but some of them will pay dearly for their maneuvers."[102]

The practice of distilling expanded rapidly during the first twenty years of the 19th century. Most of this growth occurred during the 4 year period between 1798 and 1802. In 1798, 26 still licences were issued, with a total capacity of 2,500 gallons. By 1802 this number had jumped to 73 with a total capacity of 6,498 gallons.[103] (Capacity refers to the volume of liquid that a still could hold, not its production capacity.) To put these numbers into perspective, the total annual output of these stills amounted to about six gallons of spirits for each male adult.[104] Moreover, in 1803, 16% of Upper Canadian wheat production was distilled.[105] These distilleries were scattered throughout all districts of the province, with 44 persons licenced to work them.

The years between 1804 and 1821 witnessed continued growth in the industry. By 1820 there were 104 persons licenced to operate stills in Upper Canada, with a total capacity of 11,733 gallons.[106]

There were at least one or more stills that operated in Stevenstown during the early years. Stills first appeared on the record in 1804 when

Jehiel Mitchell operated a 37 gallon still.[107] Between 1807 and 1808, future miller William Jones ran a 168 gallon still, which he appears to have sold to Ira Schofield in 1809. The other grist mill run by Abel Stevens in 1809, also contained a 76 gallon still, while another 120 gallon still was operated by Samuel Parsons at another location in the township.[108] On any given day these three stills, with a total capacity of 364 gallons, could produce about 50 gallons of 60% alcohol. After 1809, distilling, in either Stone Mills or Bastard Township, is not mentioned in the official record until 1820, when grist miller Timothy Smith of Harlem is listed as an operator of a 66 gallon still.[109] Timothy Smith was the last known licenced distiller in Bastard Township.

As previously mentioned, most of the distilleries were small and widely distributed throughout Upper Canada during the first fifty years of the century. Indeed, this was the pattern for most manufacturers in Upper Canada at the time. The nature of the distilling industry changed drastically after 1850, as the industrial revolution modified the size and distribution of production centres throughout North America and Europe. The factory manufacturing process, fuelled by population growth and the expansion of foreign markets, resulted in the concentration of many industries (distilleries included) in the larger, geographically privileged urban centres. The small rural distilleries were unable to compete with their larger urban counterparts who produced immense

quantities of spirits, purchased grain in bulk, and produced a higher quality, more consistent product. The introduction of railroads, and the general improvement of transportation infrastructures, enabled these larger industries to distribute their cheaper, mass-produced products throughout the province to previously untapped rural markets. Improved transportation also increased the mobility of rural inhabitants, who were no longer inclined to buy some products locally when cheaper products could be purchased elsewhere. For small rural producers, competition from outside markets had not been an issue before this, as most products were produced and consumed locally.[110]

By 1871, distilleries in Ontario numbered only nineteen, compared to the 153 three that existed in 1850.[111] By the turn of the century the industry was dominated by five large corporate distilleries.

Temperance

Drinking, within a wide range of social circumstances, was prevalent and socially acceptable in pre-industrial European and North American society. Alcohol was considered to be a stimulant, and was consumed throughout the day, on breaks in the workplace and on the farm. Liquor was a daily part of life in many homes and was regarded by many to be a necessity, a staple considered essential for good health.[112] As a preventative measure against illness, whiskey,

beer, or hard cider was often served to all members of the family each morning. Moreover, its use was central in almost all social occasions. For some individuals, this pattern of daily alcohol use (introduced early in life), no doubt manifested into abuse later on. Additionally, some sank into intemperate behaviour as a result of the hardships of pioneer life ."[113] Garland and Talman in their article *Pioneer Drinking Habits* describe the environment that helped to contribute to excessive alcohol use:

"The task of clearing his land, erecting buildings and providing the necessities of life was a hard and monotonous one. The pioneer was surrounded by many dangers. Disease swept off those whom he respected. The new settlement presented a drab appearance. All the trees were cut down as a matter of safety. Charred stumps stood on every side and a flower garden was so rare that it was quickly noted by the traveler. The poor means of communication, lack of books, libraries, music and other restraining influences were in part responsible for the harshness which grew up."[114]

There is no comprehensive, hard evidence from this period to inform us what the actual drinking habits of individuals were, either in Bastard Township or for the rest of Upper Canada. The surviving records that do exist are fragmentary. There are two sources of information for the Delta area. One from Philipsville, and the other from Chaffey's Locks. An examination of the day books

of James Philips, of Philipsville, and the receipts from the store at Chaffey's Locks reveal that all purchasers of whiskey, wine, and beer were men, who generally purchased their spirits by the quart, and occasionally by the gallon. However, these records reveal little about the drinking habits of individuals. The receipts are to few in number and cannot be assembled to reflect an individuals purchasing habits over a broad time line. Moreover, most individuals would have patronized more than one establishment and purchased his drink from different merchants and taverns. No documentation from most establishments has survived. Even if the receipts were complete, they would not necessarily be representative of other areas in the province.

The daily use of alcohol in most homes was moderate and for the most part it was consumed in small quantities with meals.[115] Drunkenness to the point of familial, social, and personal neglect, while fuelling the fiery rhetoric of temperance advocates, may not have been as prevalent as the temperate wanted others to believe. The high rate of alcohol consumption during the first half of the 19th century likely reflected its frequent intake throughout the day in small quantities, both at home and in the workplace.

Nonetheless, the formation of temperance societies throughout North America grew from the perception that alcohol consumption was disrupting both social and family life. This is one

school of thought. More recent interpreters have suggested that it was an attempt by the middle class to "*create a climate more favourable to production*" in the workplace,[116] and befitting of contemporary Christian values.

Conclusion

Was drinking a widespread problem, disrupting the social and familial fabric of Upper Canadian society? There is no hard evidence to show that it was. The documents and the historical records of the temperance movement suggested that it was a problem. However, the biased nature and blatant hyperbole in their perspective raises questions regarding the veracity of their claim. Hence, their claims and all other surviving accounts are anecdotal.

In the absence of anything conclusive, two questions remain unanswered. Did the level of drunkenness actually increase, and result in the formation of the temperance movement? Or, did the level of disapprobation towards drinking by certain segments of society, and the dissemination of their views, result in the perception by others that drinking was a widespread problem?

Whatever the reasons were, the growth of the temperance movement was rapid and widespread. By 1832 there were one hundred temperance societies throughout Upper Canada.[117] The first temperance society in Canada was formed in

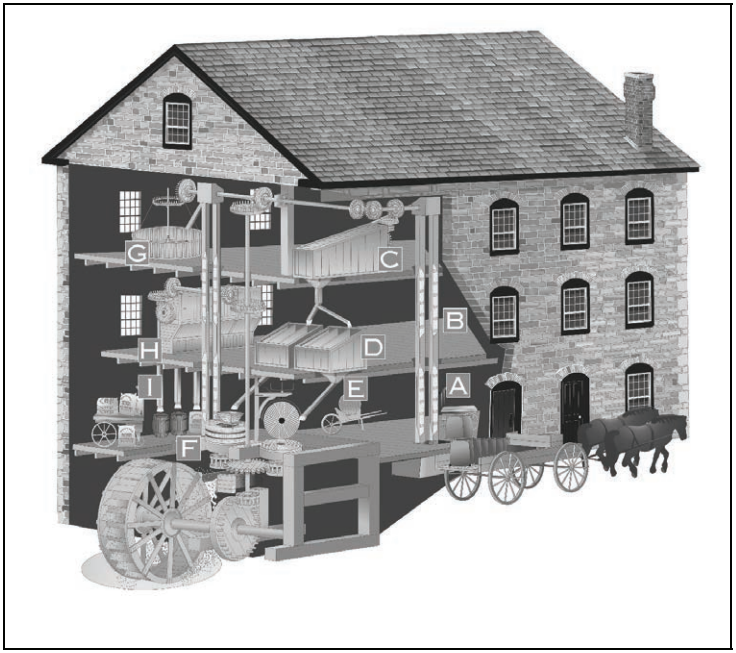
Montreal, Lower Canada, on June 9, 1828. The following day, on June 10, the first temperance society in Upper Canada was formed in Bastard Township with Beverley resident, Dr. Peter Schofield, giving a lengthy address on the *"alarming use of ardent spirits"* and the dangers awaiting those who *"stumbled down the precipice of dissipation into the valley of wretchedness, degradation and ruin."*.[118]

Four

The Automatic Mill

Oliver Evans, an American inventor from Delaware, was the first to conceive and build a high-pressured steam powered land vehicle that eventually evolved into the modern automobile. This was only one of his many ingenious concepts. In May of 1787 he presented a petition to the Pennsylvania State legislature asking for a patent on his automatic flour milling technique.[119] This new milling process allowed for the grinding, cooling, and bolting of flour without the necessity of manual labour at each stage of the process. Eight years later, Evans published his book *The Young Mill-Wright and Miller's Guide*. This highly detailed treatise went through fifteen editions and set the standard in flour milling technique until the second half of the 19th century.[120] Evans' automatic mill was the forerunner of the modern factory manufacturing process. His process involved the use of five separate inventions that moved the grain and flour from one machine to the next, from the time it was dropped off at the mill to the time the flour was ready to be packed in barrels. Two men, instead of the five under the old system, could run a mill with Evans' inventions installed. The five pieces of equipment were; the Elevator, the Conveyor, the Hopper-boy, the Drill, and the Descender. The functions of these inventions were as follows.

1. The elevator was an endless leather belt with small tin buckets attached. The belt was attached to two pulleys at the top and bottom and was used to lift grain and flour in the buckets attached to the belt. The elevator moved the grain or flour from one floor to the next. 2. The conveyor was designed to move grain or flour horizontally from one place to the next. It was essentially a large wooden screw (auger) set in a trough. As it turned, the grain or flour was moved along the trough to the desired location. 3. The hopper-boy was used to stir the flour to prevent it from sticking as it cooled. Previously, this was done manually with a rake. The hopper-boy was a shallow round container, within which a rake was attached at the bottom of a vertical shaft with arms that extended outwards from the centre. The arms swept the flour to the centre as it cooled. It then fell down through a chute to the bolter. 4. The drill was quite similar to the elevator. Instead of buckets attached to the belt, it had small rakes, which swept the flour along horizontally. 5. The descender was a wide belt that moved the flour in a downward direction. The belt rotated by the weight of the flour, and moved the flour along with it. In Upper Canada, most mills did not make use of the drill or the descender as the conveyor would have been deemed sufficient to perform their functions.



Mill Cross-section

After the grain was brought to the mill, it was weighed and the millers $1/12^{th}$ toll was taken as payment. It was then deposited into a hopper (A). The elevator (B) then carried the grain to the third floor where it was deposited into the grain cleaner to remove the chaff and dust etc.. After cleaning, the grain dropped via chutes, to the grain garner bins on the second floor (D) before it descended through chutes (E) to the first floor where the stones were located (F). The grain entered the

stones at the centre, via the hopper, and after it was ground, the grist fell below the bedstone where it was picked up by the elevator and raised to the third floor. The grist was deposited into the hopper-boy (G), where it was stirred by a rake as it cooled before it dropped into the bolter (H). The bolter separated the flour from the bran and middlings. After leaving the bolter, the flour, bran, and middlings were packed into bags or barrels (I). Middlings are the coarse starchy particles of wheat and the fine bran. They were originally used for animal feed.

Custom & Merchant Milling

There were two types of milling operations in the 19th and early 20th century, merchant and custom. The custom mill was usually a smaller operation that ground grain for the personal use of the local farmer. The miller retained as payment, 1/12th of the grain. Many mills, especially those in more remote locations were custom mills. When agricultural production expanded to the point where farmers produced more grain than required for local use, merchant milling became a significant factor in the local economy. A merchant miller purchased grain from the farmer and then exported the flour or grain to the United States or Great Britain.

The stone mill in Delta, starting with William Jones & Ira Schofield, operated with varying degrees of success, as both a merchant and

custom mill using automatic technology. Many mills in Upper Canada, especially those in the more remote locations, were a combination of both a merchant and custom mill.

There is evidence in the present structure, of the automatic process associated with merchant milling. On the first floor, there is a portion of the elevator which extends up to the third floor in two places. It is attached to belt driven pulleys. On one of the elevators on the first floor, there is a stenciled logo for 196 superfine fall wheat, with the number 196 referring to the weight of the flour per barrel. One hundred and ninety six-pound barrels of flour were associated with merchant milling for shipping purposes and were not used in the custom process.

Grain Varities

There were two types of grain cultivated in Upper Canada during the 18th and 19th century - summer and winter wheat - each with its advantages and disadvantages in terms of quality, climatic parameters, and ease of milling. The characteristics of the flour produced from each grain also affected the type of baking that it would be used for.

Summer wheat, also known as spring wheat, was a hard and dry wheat with a brittle husk that rendered the wheat hard to mill. The miller had to use greater pressure and millstone speed to

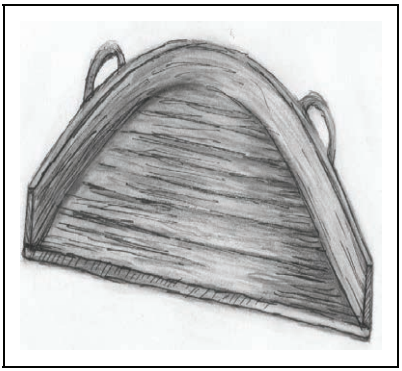
effectively grind this variety. This had an unfortunate drawback in that the added pressure caused increased friction that created excess heat, and resulted in discoloration of the flour. Summer wheat did possess the advantage of the ability to grow in colder climates and was also planted earlier than its counterpart. This wheat was planted as soon as the frost left the ground. The high percentage of *gluten* in summer wheat made this flour ideal for making bread or other products where greater leavening was a desired characteristic. Gluten is the complex protein created when water is added to flour.

Winter, or fall wheat, was a softer wheat with a lower quantity of gluten and a higher starch content. Winter wheat was planted in the fall and was harvested early the following summer. The softer quality resulted in a wheat that was easier to mill into flour, although it was not as desirable for baking except for products where leavening was not an issue, ie. flat breads, and crackers etc. The high starch content also made this grain desirable for the distillation of alcohol.

Grain Cleaning

Due to the presence of impurities after it was harvested, the grain was cleaned before it was ground. Foreign matter such as weeds, sand, dust, insects, chaff, etc. were separated from the wheat. There were three steps in the cleaning process that were performed by the farmer.

The first step was to thresh the grain to detach the chaff from the wheat and the wheat from the straw. This was accomplished by using a flail on a barn floor. A flail was made of two wooden sticks attached together with a leather thong or rope. One stick was held in both hands and the farmer then swung it, which brought the attached second stick down, and dislodged the wheat and chaff. The straw was then removed with forks, leaving the wheat and chaff behind.

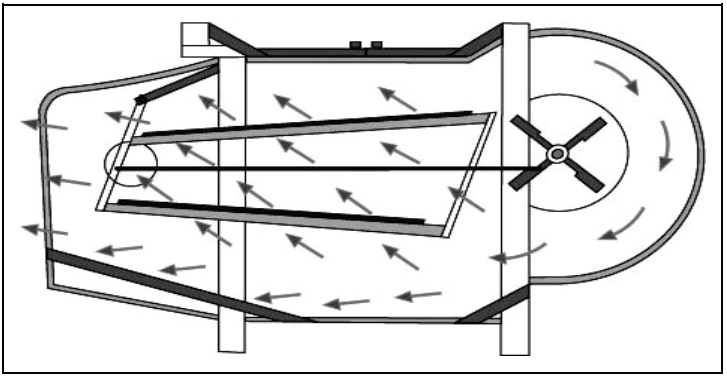


Winnowing Fan

The second step was a process known as winnowing. Winnowing is a very ancient process of cleaning grain, with some of the earliest written references to be found in the Bible (Matthew 3:12, Jeremiah 15:7 and Isaiah 30:24). The winnowing process was also referenced in Homer's, *The Odyssey*, book one. There were two types of winnowing devices, the fan and the shovel. The shovel resembled the typical garden shovel except that it had a deeper trough. The fan was a large semicircular tray constructed of wood or wicker, with a handle on each side. To effectively use these tools the farmer had to choose a relatively windy day. The fan or the

shovel was loaded with grain. The grain was tossed into the air and the chaff and other light impurities (dross) were carried off by the wind. This rudimentary process rarely succeeded in thoroughly cleaning the grain, so a third cleaning was usually required.[121]

The third step involved the use of a hand screen that contained two sizes of wire mesh. The upper coarse mesh allowed the grain to fall through while trapping the coarser dross. The lower, finer screen prevented the grain from falling through, but allowed the smaller dross to fall through.

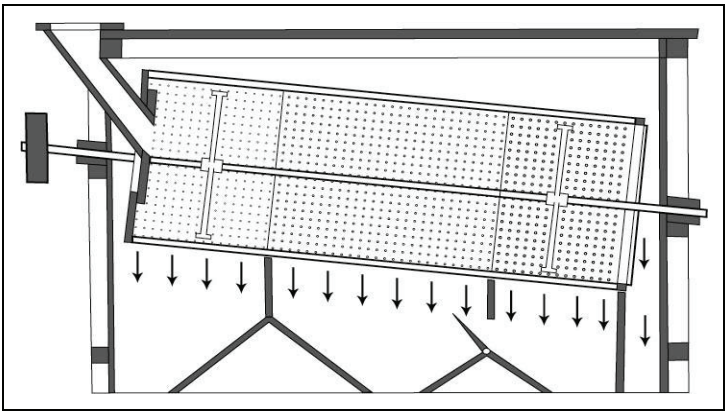


Fanning Mill

The invention of the fanning mill, in the 19th century, greatly improved the level of cleanliness. The fanning mill (also known as a winnowing machine) was originally a hand-cranked invention. Grain was fed into the top of the mill and fell through a coarse screen that filtered out

the larger impurities such as stones, dirt and dust. The grain then fell onto a finer screen which allowed the smaller matter to pass through while it retained the grain. The fan blew out the impurities, while the clean grain remained on top of this screen for collection.

At the Mill



Rolling Screen Cleaner

The previous processes were usually performed by the farmer before bringing his grain to the mill. When the farmer brought his grain to the mill, the miller weighed it and extracted his 1/12th toll. He then ran the grain through a rolling screen cleaner. The cleaner contained a cylindrical screen, which was set on an angle, so that, as it turned, the grain rolled down the length of the cylinder. At the point where the grain entered, the holes in the screen were small, and the finer

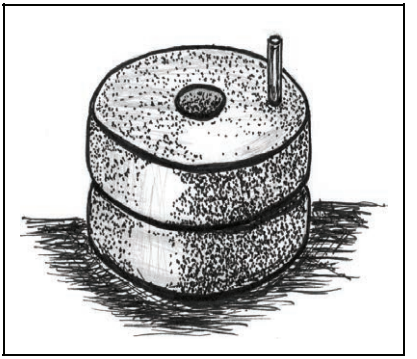
impurities dropped from the cylinder as it rotated. The holes became larger the further one moved along the length of the cylinder. As the grain rolled down the length of the cleaner it fell through the larger holes to the garner bins below, leaving the larger impurities behind which fell out of the end of the cleaner. Some rolling screen cleaners were designed with two screens, one inside the other. The inner screen was of coarser mesh with an outer screen of fine mesh.

An improved method of cleaning and removing dirt and smut, a pathogenic plant fungus, from the grain was invented around the middle of the 19th century. This device was called the smutter. The smutter was a machine with a drum at the top that contained wheels with small rods attached to them. When the wheel spun, the rods knocked the grain about, dislodging the dirt and smut. The grain then fell down a spout, and as it fell through the spout, a fan blew a current of air across the falling grain, separating chaff, dust and dirt while allowing the clean grain to fall below into a hopper. The grain was then ready for the miller to grind.

Early Grinding

Undoubtably, the first tools used to grind grain involved the use of a hand-held rock to grind the grain in a depression on an exposed rock surface. The earliest known device was found in a cave in France and dates to about 25,000 B. P.[122] Since it

predated plant domestication, it was used for grinding wild grains. From this evolved the mortar and pestle. The earliest known example of the mortar and pestle dates to 6,000 B. P.[123] The mortar is a piece of wood or stone hollowed out to form a bowl. The grain was placed in the mortar and was ground by pounding it with the pestle (a blunt piece of wood or stone). Although the mortar and pestle was later replaced by the hand quern and millstone, it continued to be used in various places around the world, and as discussed in the introduction, it was used by some of the earliest residents of Upper Canada.



Hand Quern

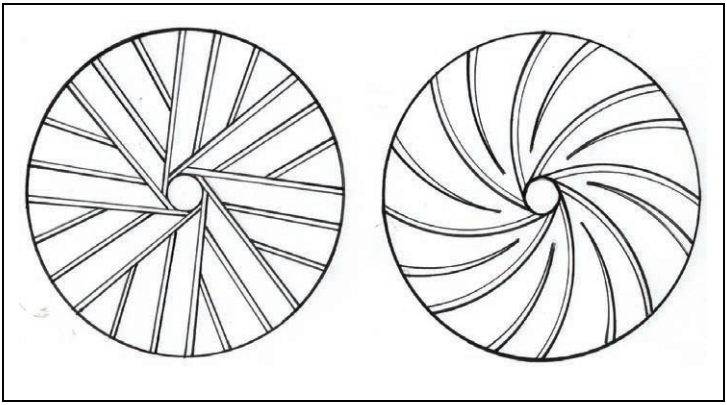
The hand quern was the next major technological innovation in the milling process. The earliest written account of a hand quern appeared in the writings of Cato (232 - 247 BC.).[124] Examples of third Century B. C. Celtic querns have been found in Britain.[125] A quern was a set of two circular stones, one atop the other, with the top stone kept in place by a peg through a hole in the centre. The two stones were not in contact with one another but were kept slightly apart by the centre peg. The top stone was turned by a handle

that had been set into it near the outer edge. The grain was fed through the hole (eye) at the centre of the top stone and as the stone was turned, the grain was ground and the flour fell out of the outer edge between the two stones. The process of grinding was often performed by two persons. One fed the grain into the quern, and the other turned the stone. Like the mortar and pestle, the quern remained in use well into the 19th century in North America, and is still used in certain areas around the world.

Millstones

The first evidence of what we now recognize as a millstone dates to 85 BC. in the writings of the Greek writer Antipater.[126] This millstone was attached atop a vertical shaft, and a horizontal water wheel was attached to the bottom of the shaft. This was known as a Norse, or Greek mill, and quickly spread throughout Europe and the Mediterranean. It evolved through the centuries to take the form of the grist mill that existed in North America during the 18th and 19th century.

In order to produce flour of the highest possible quality, the millstone had to possess four specific qualities. (1) The stone had to be structurally uniform to allow for even wear. (2) The stone had to be of sufficient hardness to prevent it from wearing out too quickly. (3) The stone had to be porous enough to provide sharp edges for efficient grinding. (4) The stone had to possess qualities



Quarter Sickle

that prevented it from crumbling under pressure.[127]

Although stone such as granite, sandstone and volcanic rock were used, the best millstones were from a freshwater quartz at Ferté-sous-Jouarre near Paris, France. They were known as buhr stones and were of such high quality that they were imported by mills all over the world, including the mill in Delta. The life expectancy of a French buhr stone was about 100 years, while that of granite was sixty.[128] The French buhr stone did not come in one piece, but came in sections 12 to 20 inches long, 8 to 10 inches wide and 6 to 9 inches thick, which had to be cut and fitted together. They were backed with plaster of Paris to hold them in place. A metal hoop was then forged and the hot metal placed around the outer edge of stones. As it cooled, it shrunk, it

bound the stones tightly together. In Upper Canada the French buhr stones were imported in their entirety, or were purchased from a local manufacturer who imported the stones and assembled them locally.[129]

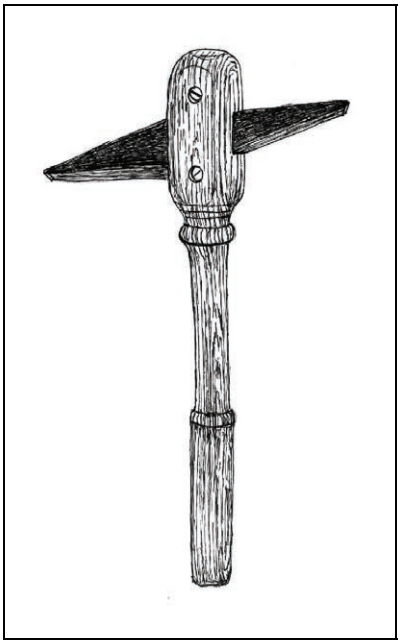
Because the millstones were extremely heavy it was necessary to include added structural support in the mill. This structure was called the husk and was installed below the floor upon which the millstones were located. The husk was constructed using large timber beams that, in addition to supporting the weight of the stones, also transferred the vibration created by the millstones to the ground below in order to minimize structural deterioration of the mill. The upper husk in the Delta mill was constructed to support three run of stones,[130] and was installed between 1836 and 1837 when James Macdonell renovated the mill to accommodate three run of stones.

There were two millstones in one run of stones; the bed stone and the runner stone. The bed stone remained stationary during the grinding process, while the runner stone turned, and ground the flour against the bedstone. Typically, mills ran stones which ranged in size from 5 to 7 feet in diameter; however, after the 1830"s, stones 4 ½ feet in diameter or smaller became the norm.[131] Smaller stones required less water power to drive them and could be run faster, producing two to five times the quantity of flour per hour.

To maximize the use of their smaller surface area, it was necessary to increase the number of furrows and lands in the smaller stones.[132] Furrows were the grooves cut into the millstone, and the lands were the high spots in between the furrows.

Maximum grinding efficiency could not be achieved unless the stones were dressed. An undressed stone would not grind at its full potential, and resulted in grist that was too warm. Dressing was the carving of a series of grooves (furrows) which radiated outwards from the centre of the stone. The edges of these grooves formed a cutting edge that improved their efficiency in cutting grain. They also assisted in carrying the grist out toward the skirt. The furrows of each millstone were cut so that as the runner stone turned, the furrows crossed in a shearing action.

The process of dressing a stone was a highly skilled trade in itself, and many years of experience were required in order to master the technique. In most mills, the miller dressed the stones himself, while in areas where there was a higher concentration of mills, this process was performed by a skilled individual who traveled with his tools from mill to mill.



Mill Pick

Before the stones were dressed, the mill would be shut down so that the runner stone could be lifted with the crane and laid horizontally, enabling the dresser to work on the exposed surface. The stone had to be tested to ascertain the location of the low and high spots. The miller rubbed a paint staff across the stones, and a red mark would be left where there were high spots (The paint staff was a straight piece of wood that had been applied with red ochre). Before the paint staff was used, it was tested to ensure that it was perfectly straight. This was done using a proof staff which was a cast iron bar lightly coated with oil to which the paint staff was touched. This revealed any warping that had to be corrected. Next began the very laborious task of dressing the stones with mill picks. This process was a lengthy one, and depending on the size of the stones, it would take from twelve to twenty hours to dress the two stones. The miller first dressed down the

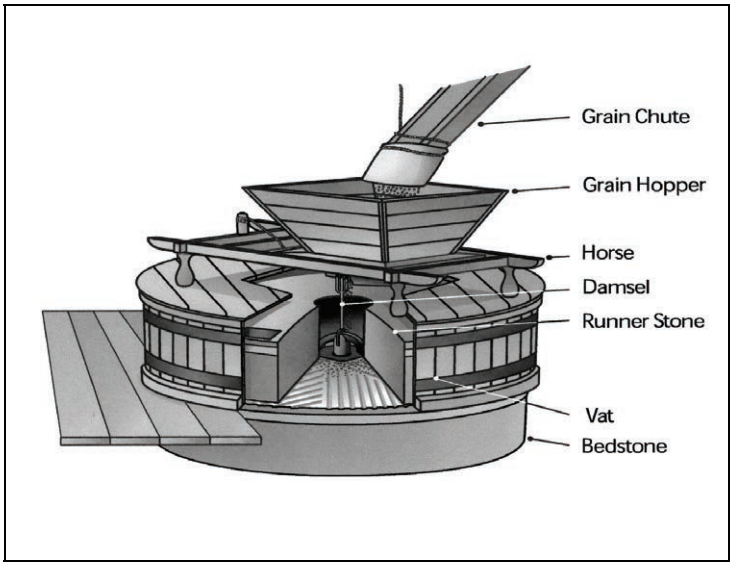
high areas, and then the furrows, deepening them and sharpening the edges. Dressing the stones had to be done every month or two, depending upon the hardness of the stone and the quantity of grain that had been ground. The style of dress was usually one of two types, quarter dress or the sickle, with much disagreement among millers as to the best of the two. An important consideration when stones were dressed, was what type of grinding the miller wished to perform. If he desired to split peas or crack corn, his stones were dressed with a small proportion of land (lands were the high portions on the face of the millstone in between the furrows) surface relative to that of the furrow. When grinding flour, he would need a greater proportion of grinding surface, and so, the surface area of land would have to be greater.[133]

Each pair of functioning millstones in a mill was taxed by the authorities at the rate of £150 on the first pair of stones, and an additional £50 for each pair thereafter. After 1850 this tax was levied by municipal authorities.[134] This was a substantial sum. In Bastard Township, during the 1830's and 40's, one hundred and thirty acres of land was valued at about one hundred pounds.

Grinding the Grain

The object of grinding wheat is to separate the flour from the bran and the middlings. The bran is the outer skin of the wheat kernel, while the

middlings are the coarser parts of the wheat and some of the fine bran.



Mill Stone Cut- away

The two stones did not actually touch when grain was ground, although they were very close. The gap between the two stones decreased as the grain moved from the eye of the stones to the outside (skirt). The millstones had to be perfectly balanced, with the proper distance maintained between them to produce a high quality flour. Maintaining this balance was a process known as tentering.

Typically, millstones turned at a rate of fifty to one hundred and fifty revolutions per minute. The

speed had to be carefully regulated, as too high a speed created too much friction, which caused the flour to scorch. The speed of the stones was determined by the stone size and quality of the grain. As the stones turned, the grain was fed through the centre of the runner stone and entered the furrows.

The furrows performed three functions in the grinding process. First, they distributed the grain by centrifugal force to the outer edge of the stone. Second, they acted as a cutting edge. Third, they provided ventilation that minimized overheating. As the grain moved along the furrows, it was cut by the shearing action of the back edge of furrows, and was ground between the lands. The grain was reduced more and more as it traveled to the outer edge of the stones. The flour was separated from the bran and middlings during this process. Typically, a yield of one barrel of superfine flour from five bushels of wheat could be expected.

Fast and Gradual Reduction

There were two types of flour milling in the 19th century. *Fast reduction*, also known as low grinding, was the process used prior to 1863. The stones were run as close together, and as fast as practically possible. The flour, bran and middlings were separated in one grinding. A lower quality and quantity of flour was produced by this method, and resulted in an inferior baked product

due to the large percentage of gluten that remained in the middlings. A flour with a low gluten content resulted in lower bonding and therefore the dough would not entrap gasses as it was baked. Quite simply, the bread did not rise. Re-grinding the middlings, and mixing the flour, with flour from the first run, was the initial solution to the problem. Unfortunately, this grinding usually resulted in damaged gluten, caused by the excessive friction of grinding. This resulted in a second rate flour.

On the 11th of March 1863, a patent was granted to John Brown for his new grinding process called *gradual reduction.*[135] John Brown was the miller for E. W. B. Snider of German Mills in St. Jacobs, Ontario. With this new process the stones were not run as close together, and were run at a slower speed. Unlike fast reduction, gradual reduction did not produce flour in just one run. Instead, the first run was intended to remove the bran from the wheat kernel and grind the kernel into a meal called grits. A large amount of grits and a small proportion of flour and middlings was produced in this process.[136] The grist was then bolted to separate the grits, middlings, and flour from one another. The flour was kept aside as third grade flour, and the grits and middlings were ground again, and produced first and second rate flour respectively. One barrel of flour from five bushels of wheat was the usual yield. This new process, with its additional steps, reduced the number of bushels of grain that were ground

in an hour. Production capabilities were reduced from 20 barrels of grain per hour, to 5-12 barrels per hour. However, the overall quality was superior, and the quantity of flour produced was about 16% higher.[137]

Roller Mills

In the 1870's, roller mills supplanted the millstone in North America as a more efficient means of grinding grain. They were a necessary piece of machinery for a merchant mill to remain competitive.[138] The roller mill was originally invented in Switzerland in the 1830's by Jacob Sulzberger, and was constructed of three pairs of corrugated rollers. These sets of rollers were placed one above the other, each set reduced the grain further. There were many variations of roller mills patented as new improvements were made with different numbers of rollers utilized in different configurations. Most mills had three or more roller mills running in series, with the grist transferred to the next machine after being ground by the previous one. Some of the larger mills contained as many as nine roller mills.

Roller mills were much more efficient than the millstone. They required 47% less power to run, and did 37% more work than millstones.[139] The quality of flour produced was also higher because the roller mill did less damage to the grist than the millstone. The roller mill produced much less friction and did not tend to overheat the flour.

Maintenance was not required as frequently with the roller mill, as the rollers did not have to be dressed nearly as often as a millstone did. By the turn of the century, roller mills had become the standard in the merchant mills of Ontario.

Cooling

Once ground, the grain exited the stones, via the meal spout, hot from the friction, and damp from the natural moisture it contained. Unless it was cooled properly, the flour clogged the bolter. Before the advent of the mechanical hopper-boy, flour was manually stirred around in a large bin, or sometimes it was spread out on the top floor of the mill to cool. The latter was particularly undesirable as vermin and insects could contaminate it. Flour was cooled in a much more efficient manner with the mechanical hopper-boy. The elevator carried the flour up to the top floor, and deposited it into the hopper-boy. It was a large circular shallow tub about ten to fifteen feet across, and about two and one half to three feet deep. As the shaft rotated, the rake stirred the flour which was, as it cooled, gradually swept toward the centre of the hopper by the rake. A hole at the centre of the hopper led to a chute that directed the flour to a bolter on the floor below.

Bolting

Bolting was the process that separated the flour into different grades. The flour did not emerge from the millstones uniform in texture after it was ground, but contained many degrees of fineness which had to be separated. The ability of the miller to separate flour into different grades was determined by the technology available at the time. Specifically, this was determined by the ability of manufacturers to design and produce bolting cloths of varying degrees of fineness.

A bolter resembled a rolling screen cleaner in its basic design. Cloths of varying degrees of fineness were stretched around a wooden cylindrical frame. At one end, where the flour entered the bolter, the bolting cloths were very fine, and decreased in fineness as the flour progressed toward the opposite end of the cylinder. Like the rolling screen cleaner, the cylinder in the bolter was turned by the power of the mill, and was set on an incline, which caused the flour to travel along the roller. Most bolters had a six inch drop over their length. As the flour travelled along the roller, the finest flour fell through the first cloth to a bin below, and the next finest through the next cloth, etc. The middlings and the bran, being too large, fell out of the end of the cylinder.

There were three grades of flour, specified in the flour inspection act, at the beginning of the 19th

century in Upper Canada. Superfine, fine, and middlings.[140]

Over the years as technology advanced, finer grades of bolting cloth were manufactured. By the 1860's upwards of five or more different grades of bolting cloth were available to the miller. These improvements in bolting cloths meant that the miller produced many grades of flour and tailored his production to the needs of the individual customer. By 1860 there were eight different grades of flour specified in the flour inspection legislation; superior extra, extra superfine, fancy superfine, superfine, superfine II, fine, fine middlings, and pollards.

Packaging

Depending upon the type of mill he operated, flour was packed by the miller in one of two ways. The merchant mill packed flour in barrels in order to facilitate ease in shipping. In Quebec, 1806 legislation permitted flour barrels of three different weights to be exported through Montreal; 98, 196 and 224 pounds.[141] Legislation demanded that barrels be properly marked with regard to weight, grades, name of mill, and size of barrel. The legislation even dictated the types of wood and method of barrel construction. Upper Canada had no legislation with regard to barrel size until 1820.[142] When it was implemented, packing requirements did not apply to custom milling.

Flour packaged for custom services was generally returned to the farmer in bags.

Power

Hydraulic power, provided by the numerous streams and rivers of the province, was used to drive most grist mills in Upper Canada until the mid 19th century. The primary factors that determined the suitability of a mill site was the seasonal consistency and volume of flow. Consistency of flow was the most troublesome of the two. Seasonal variations in flow reduced productive capabilities, or even prevented the mill from operating at all. The 1851 census noted that more than one of the mills in Bastard Township was unable to operate at all that year due to drought conditions [143] The creation of a mill pond helped to minimize the effects of seasonal variations. A mill pond reduced the down time that occurred during seasonal lows. Even with a mill pond, most mills were fortunate to operate eight months of the year.

Dams

Many of the early dams were little more than large amounts of brush that were covered with layers of increasingly finer stone.[144] Others were more complex dams of timber-crib construction. Log frames, or cribs, were built and then filled in with rock and earth. The dam was constructed like a

Mill 1860 - 80 showing mill as dam.

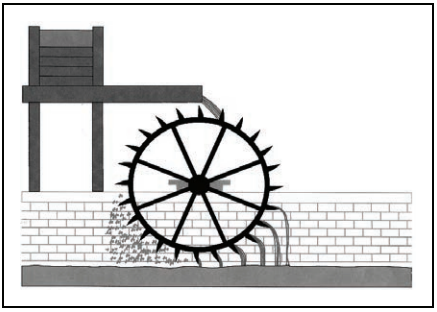
ramp with the slanted portion facing upstream. A timber crib dam was a relatively cheap form of construction that was erected from materials located in the immediate vicinity. Dams of stone, although stronger, were not as common due to the high cost of construction and level expertise and expense required to build them.

The first dams in Stevenstown were likely of timber-crib construction. Later, when the stone mill was erected by William Jones in 1810 to 12, it was constructed in such a way that the mill formed a portion of the dam. This dam remained until 1962, when the Ministry of Natural Resources constructed the present dam,

southeast of Main Street, and replaced the stone bridge with the present concrete structure.[145]

Water wheels

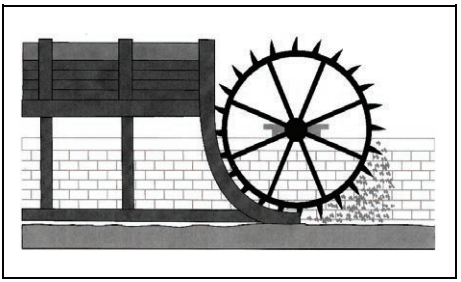
There were two main types of water wheels used in Upper Canadian grist mills. The Horizontal (tub wheel) and the vertical water wheel. The horizontal wheel was the ancestor of the turbine. Its construction was essentially the same as that of the Greek mill. This wheel was good for small falls and plenty of water, and generally did not require the construction of a dam.[146] Cogs or gears were not required by this wheel. These wheels were often carved from a single piece of wood cut from old growth forest in the Appalachian mountains of the U. S. .[147]



Overshot

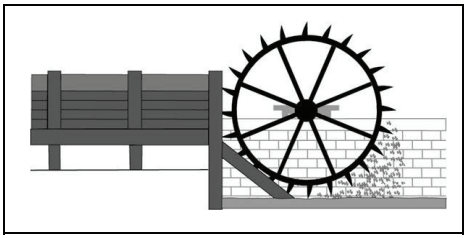
The vertical water wheel was the more common type used. Its first known use dates to the later half of the first century BC. The Roman engineer Marcus Vitruvius described in detail, the workings of the vertical water wheel in

his book *De Architectura.*[148] There were three ways to use this water wheel. The type used depended upon the parameters presented by the mill site, namely the fall of water.



Breastshot

Each type also utilized a different percentage of the available waterpower. These three types were: 1. The overshot, 2. the breastshot, and 3. the undershot. As can be seen from the diagram, each type of wheel received water at a different level on its vertical profile, which resulted in a different level of efficiency. The overshot wheel, which received water from the flume at the top, was the most efficient, due to the fact that up to one half of the buckets were full at the same time. The overshot generally required a fall of ten feet or more, and transmitted sixty percent of the available water power to the mill.[149] The breastshot, received the water half way up the wheel so that one quarter of the buckets were full at any given time.



Undershot

This wheel transmitted forty-five percent of available water power to the mill, and required half as much fall as the overshot wheel. As suggested by the archaeological report conducted by Bazely, the breastshot was the type of wheel likely used in the Delta mill, given the fall, and the former level of Lower Beverley Lake.[150] The undershot was the least efficient of the three (utilizing 30% of available water power) and was generally used where there was little or no fall. This wheel did not utilize the weight of water in the buckets, but used the flow of the stream against the paddles to turn the wheel.

The water wheel had two significant drawbacks. First, wheels that were mounted on the exterior of the mill were highly susceptible to the buildup of ice. This resulted in added stress due to the extra weight of the ice, which shortened the operating season of the mill. Wheels were enclosed in a wheel house, in order to lengthen the running time of the mill, or, as in the case of the Delta mill, the wheel was located within the main structure. A wheel located in the wheelhouse, or the mill, was heated by a stove to keep it ice free to some extent. The material of their construction was the second drawback. Their wood construction, and constant contact with water, resulted in a situation where a high level of maintenance was necessary to keep them sound. Even with constant maintenance, the life span of a wheel was rarely longer than ten years.

Steam Power

Steam-powered engines were an alternative form of power to the water wheel. They were first used in Upper Canada in 1823 at the Chipawa mill in the Niagara region.[151] Steam power had several advantages over water. Steam was a consistent source of power, unlike water which was subject to seasonal variations. Steam engines could also be placed at any location, so that a mill did not have to be located at a site with running water. Despite these advantages, the use of steam power was not utilized to any great degree in the early years. As the census of 1860-61 shows, less than fifteen percent of grist mills used steam power.[152] They were not used to any great degree until after the 1860's. In Bastard Township, the use of steam power did not become prevalent until the late 1880's.[153]

The cost to convert from water to steam power had to be weighed carefully by the miller, and this was a factor in their slow gain in popularity. The boiler and its requisite accessories were expensive. In addition, steam engines required a constant supply of wood for fuel. A miller located near a more lucrative market centre, such as Kingston or Ottawa, was more likely to justify the expense of upgrading to steam than his bucolic brethren. Indeed, steam technology was not used in the Delta mill until 1899, and then for some unknown reason its use was discontinued in 1903.

Turbines

During the period from the 1840's to 1860's, there was a general trend toward the use of iron water wheels or cast iron turbines. As mentioned in the historical section, Walter Denaut installed two Swain turbines in the Delta mill sometime in the 1860's. Like the water wheel, the turbine was limited by the vagaries of seasonal water flow. It did have the advantage of being much more durable than the wooden water wheel and, as it was submerged, it was not subjected to the problems of ice buildup. It also provided more power than the water wheel.

Conclusion

It is rather ironic that the inventions and concepts of Oliver Evans, that were first utilized for the production of flour in the small mills of Ontario, were also partly responsible for the decline of the local mill. His automated system was initially intended for use in flour mills. However, the technology was also embraced by most manufacturing sectors for the same reasons Evans invented it - his system increased production and lowered labour costs. His technology, and the invention of the steam engine, helped to make the industrial revolution possible.

During the industrial revolution, the flour milling industry became concentrated in the larger urban centres. These large commercial roller mills out

competed the small rural mills. The mill in Delta was one of the few in Leeds County that survived, because flour milling was no longer the sole source of income for its owners.

By the second world war, the Delta mill and many of the surviving rural grist mills in Ontario, operated as feed stores, or not at all. The grist mill no longer provided adequate income for their owners.

Appendix

Table 1

Chronology of Mill

The following is a chronological list of some of the information compiled from the Assessment Rolls for Bastard Township from 1802 - 1849. Years not listed are absent from the archival record. **Note:** *(All the data in the assessment records collected no later than March 31st of the year.)* No information for the years after 1850 has been included. Sources: Assessment Rolls for Bastard Township. Archives of Ontario, Reel MS 2547 – 2548.

1797 - 1810

1797	William Stevens	Stevens mill and two dams noted by Lewis Grant in his survey of Bastard Township and on map. (This information not from assessment records.)
1803	Nicholas Mattice	Grist mill, 1 additional run of stones Sawmill

1804	Nicholas Mattice	Grist mill, 1 additional run of stones Sawmill
1805	Nicholas Mattice Abel Stevens	Grist mill, 1 additional run of stones One 70 gallon still
1806	Nicholas Mattice	Grist mill, 1 additional run of stones
1807	Nicholas Mattice William Jones	Grist mill, 1 additional run of stones One 150 gallon still
1808	Nicholas Mattice Abel Stevens Jr.	Grist mill, 1 additional run of stones Grist mill

1808	Abel Stevens	One 70 gallon still Abel Stevens sells mill property to William Jones on June 10 for £375. Also sells property south of mill to Nicholas Mattice for £100.
	William Jones	One 168 gallon still
1809	Ira Schofield	Grist mill One 168 gallon still
	Abel Stevens	Grist mill. (Probably on his sons property at the Hicock pond.) One 76 gallon still
1810	Abel Stevens	Grist mill One 80 gallon still
	Jones & Schofield	Merchant shop & Storehouse

1812 - 1850

The Stone Mill

1812	Ira Schofield	Grist mill, 1 additional run of stones Sawmill Merchant shop
1813	Jones & Schofield	Grist mill, 1 additional run of stones Sawmill
1814	Jones & Schofield	Grist mill, 1 additional run of stones Sawmill Merchant shop
1815	Jones & Schofield	Grist mill, 1 additional run of stones Sawmill Merchant shop
1816	William Jones	Grist mill, 1 additional run of stones Merchant shop
1817	Jones & Schofield	Grist mill, 1 additional run of stones Sawmill Merchant shop

1818	James Schofield Jr. Abel Stevens & Abel Stevens Jr.	Grist mill, 1 additional run of stones Sawmill Merchant shop Grist mill
1819	James Schofield Jr. Abel Stevens & Abel Stevens Jr.	Grist mill, 1 additional run of stones Sawmill Grist mill
1820	William Jones	Grist mill, 1 additional run of stones Sawmill Merchant shop
1821	William Jones	Grist mill, 1 additional run of stones Sawmill

1822	William Jones Abel Stevens Jr.	Grist mill, 1 additional run of stones Sawmill Grist mill, on Con. 9 Lot 22, Hicock pond
1825	William Jones	Grist mill, 1 additional run of stones Sawmill
1826	William Jones	Not operating mill
1827	J. K. Hartwell & Schofield	Grist mill Sawmill Merchant shop
1828	J. K. Hartwell & Schofield	Grist mill, 1 additional run of stones Sawmill Merchant shop
1830	William Jones	Not operating mill
1832	Edward Matson (tenant)	Grist mill. Leased from Henry Jones.
1833	Edward Matson (tenant)	Grist mill. Leased from Henry Jones.

1834	Edward Matson (tenant)	Grist mill. Leased from Henry Jones.
1835	No miller	Dormant
1836	James Macdonell	Dormant
1837	James Macdonell	Grist mill, 1 additional run of stones
1838	James Macdonell	Grist mill, 2 additional run of stones
1839	James Macdonell	Grist mill, 2 additional run of stones
1840	James Macdonell	Grist mill, 1 additional run of stones
1841	James Macdonell	Grist mill, 1 additional run of stones
1842	James Macdonell	Grist mill, 1 additional run of stones
1843	James Macdonell	Grist mill, 1 additional run of stones

1844	James Macdonell	Grist mill, 1 additional run of stones Sawmill Merchant shop
1845	James Macdonell	Grist mill, 1 additional run of stones Sawmill
1846	James Macdonell	Grist mill, 1 additional pair of stones Sawmill
1847	James Macdonell	Grist mill 1 additional run of stones Sawmill
1848	Amelia Macdonell	Grist mill 1 additional run of stones Sawmill
1849	Amelia Macdonell	Grist mill 1 additional run of stones Sawmill
1850	Walter H. Denaut	Grist mill, 1 additional run of stones Saw mill Merchant shop

Table 2

Mill Production

Production at the Delta Mill from 1928 - 1939. All quantities are in bushels. The figures for custom grinding are not limited to flour. This is the only information that relates to actual grain grinding for the mill. Source: Hastings Steele ledgers. The Delta Mill Society Archives, Delta, Ontario.

Year	Custom Grinding	Oats	Corn
1928	16,797	1,761	2,690
1929	15,555	2,619	1,302
1930	15,683	1,716	521
1931	20,536	1,220	76
1932	12,683	820	
1933	9,354		
1934	11,263		
1935	21,449		
1936	18,260		
1937	11,741		
1938	9,912		
1939	12,864		

1940	18,731		
1941	12,789		

Table 3

Bastard Township Wheat Production

	1851	**1861**	**1871**	**1881**	**1891**
Bushels	32,269	57,787	27,945	15,962	15,408
Acres	2,642	4,232	2,761	2,227	1,687
Yeild/ac	12.97	13.65	10	7	9
% Wheat	26	25	14.5	6	7

% Wheat refers to the percentage of total crop production.
Yield/ac. in bushels.

Sources: Census of Canada. 1665 to 1871. Statistics of Canada. Volume VI. Ottawa: I. B. Taylor, 1876.

Table 4

Delta Hydro Customers in 1925
Service from George Roddick Mill, Lyndhurst.

Customer	$/Month	Customer	$/Month
J. Sexton	4	J. Russell	1.25
H. Steele	1.25	H. E. Johnson	1.5
M. Steele	1.25	M. Parsonage	1.25
Mrs. E. Gilbert	1.25	O. Brown	1.25
Clive	2.75	Hazelton	1.25
S. Whitemore	1.25	Howard	1.75
H. Lafliche	2	Mrs. A. Stevens	1.25
Ralph	1.25	S. Phelps	3
Dr. Kelly	3	Lawson	1.25
Delta Hotel	3	Bresse	1.25
Mrs. E. Barlow	1.5	S. Russell	1.25
Stafford	1.25	W. Russell	1.25
Hill	1.25	Arnold	1.25

Stone	1.25	Haskins	2.1
Baptist Ch.	1.25	Halladay	2.3
Rev. Davis	1.25	Russell Store	2.9
Coleman	1.25	Whitemore Store	3
Topp	1.25	Bell	1.25
Bell	1.25	C. Bogart	1.25
Preston	1.25	Dr. Sherwood	1.5
Pierce	1.25	A. Irwin	1.25
Whaley	1.25	E. J. Stuffel	1.5
S. Sweet	2.5	H. Sweet	2

Sources: Roddick, George. Electrical Ledgers, 1912 - 1926. Leeds and Thousand Islands Archives at Lyndhurst.

Glossary

BEDSTONE. The bottom stone of a pair of millstones. The bedstone remains stationary during the grinding process.

BOLTER. A machine which separated flour into different grades of fineness.

BRAN. The hard outer layer of grain.

BUHR STONE. A freshwater quartz quarried at Ferté-sous-Jouarre near Paris, France, and used to make millstones. The millstones constructed of this stone were of the highest quality.

CONVEYOR. The conveyor, was designed to move grain or flour horizontally from one place to the next. It was essentially a large wooden screw (auger) set in a trough. As it turned the grain or flour was moved along the trough to the desired location.

CUSTOM MILL. A mill that ground flour for use by the farmer. The miller retained 1/12th of the grain as payment for his services.

DESCENDER. The descender was a wide belt that moved the flour in a downward direction. The belt was caused to rotate under the weight of the flour, and carried the flour along with it.

DRILL. An endless belt with rakes attached. The rakes swept the flour or grain along in a horizontal trough.

ELEVATOR. The elevator is an endless leather belt with small tin buckets attached. The belt was attached to two pulleys at the top and bottom and was used to lift grain and flour in the buckets attached to the belt. The elevator moves the grain or flour from one floor to the next.

FURROWS. The large grooves that were cut into the millstone to cut the grain.

GRIST. A term applied to grain or unbolted ground wheat.

GRIST MILL. A grist mill ground wheat for local consumption. The miller would retain 1/12th of the graon as payment for his services A grist mill was also known as a custom mill.

HOPPER BOY. The hopper boy was a shallow round container within which, a rake was attached at the bottom of a vertical shaft with arms that extended outwards from the centre. The rake stirred the flour as it cooled to prevent it from clumping together.

KINGS MILL. A mill built by the Crown.

LANDS. The flat high area between the furrows. The lands ground the wheat after the furrows had cut the grain.

MERCHANT MILL. A merchant mill purchased, and ground flour for export.

MIDDLINGS. Middlings are the coarse starchy particles of wheat and the fine bran. They were originally used for animal feed.

SUMMER WHEAT. Summer wheat, also known as spring wheat, was a hard and dry wheat with a brittle husk that rendered the wheat hard to mill. This wheat was planted as soon as the frost left the ground.

WINTER WHEAT. Winter, or fall wheat, was a softer wheat with a lower quantity of gluten, and a higher starch content. Winter wheat would be planted in the fall and be harvested early the following summer. The softer quality resulted in a wheat that was easier to mill into flour

Endnotes

1. Oliver Evans was an American inventor who pioneered the automated manufacturing process. Although he invented this process for the grinding of grain to flour, it was adopted by many other manufacturing sectors.

2. Paterson, Gilbert C. Land Settlement in Upper Canada 1783 – 1840. 1921, p. 1. , 24, 26.

3. Ball, Norman Roger. The Technology of Settlement and Land clearing in Upper Canada Prior to 1840. 1979, p. 114. Girdling involved cutting the bark around the circumference of the tree, thereby cutting the flow of water and nutrients to the rest of the tree, killing it and preventing leaf growth.

4. Sliter, Hiel. Pioneer Privations. 1873, p.2.

5. Storck, John. Flour For Man's Bread. 1952, p. 77.

6. Leung, Felicity L. Grist and Flour Mills in Ontario: From Millstones to Rollers, 1780s-1880s. 1997, p. 72.

7. Township of Bastard and South Burgess. Do you mind the time when..., Ferris Bolton Writes. 1994, p. iv.

8. Census of Canada. 1665 to 1871. Statistics of Canada. Volume VI, 1876.

9. Delta is one of four names that the town has had. The previous names are, in chronological order; Stevenstown 1796 - 1810, Stone Mills 1811 - 1826, Beverley 1826 - 1856, and Delta 1857 - present. The two Beverley Lakes also had one or more name changes, with upper Beverley Lake, formerly known as Lake Abel, and Lower Beverley Lake, formerly known as Gannanoque then Hendersons Lake.

10. Stuart, Elizabeth Stevens. Our Stevens Story. (1978?), p. 14.

11. Cruikshank, E.A. The Activity Of Abel Stevens As A Pioneer in, Ontario Historical Society Vol. xxxi. 1936, p. 58.

12. For a more detailed account of his petitioning activities, interested readers may wish to consult; Fritz, Paul S. Land Surveyors, and Settlers: The Origins of Bastard and Burgess Townships, Leeds County, Ontario. 1994. and Cruikshank, E.A. The Activity of Abel Stevens as a Pioneer, in Ontario Historical Society Vol. xxxi. P. 58. 1936, and, Stuart, Elizabeth Stevens. Our Stevens Story. (1978?)

13. Bastard Township Papers. Archives of Ontario. MS 658 Reel 26 – 27.

14. Fraser, Alexander. Grants of Crown Lands in Upper Canada, 1792-1796, Land Book A. Eighteenth Report Of The Department of Public Records And Archives Of Ontario 1929. 1930, p. 168.

15. Upper Canada Land Records Index. National Archives Of Canada, p. 1570. and Register of Fiats and Warrants for Land Grants – old regulations, MS 658 Reel 20. Archives of Ontario.

16. William Fortune. Plan of Settlement at Stevenstown 1795. From Fritz, Paul. Land, Surveyors, and Settlers: The Origins of Bastard and South Burgess Townships, Leeds County Ontario. 1994, p. (ii).

17. Contrary to popular belief Abel Stevens did not receive a grant of 1,800 acres (200 for himself and 200 for each of his eight children) in Bastard Township. He did receive a grant of this size in Scarborough Township but did not accept it.

18. Fraser, Alexander. Grants Of Crown Lands In Upper Canada 1792-1796. Land Book A. Eighteenth Report Of The Department Of Public Records And Archives Of Ontario 1929. 1930, p. 94.

19. Cruikshank, E.A. The Activity Of Abel Stevens As A Pioneer, in Ontario Historical Society Vol. xxxi, p. 58. 1936.

20. Lockwood, Glenn. The Rear of Leeds & Lansdowne. 1996, p. 33.

The practice of awarding township grants was becoming a matter of concern among colonial authorities, and as Robert Prescott, in a dispatch to the Lieutenant Governor of Upper Canada noted; "I am entirely of your opinion, that the practice of setting apart Townships, or other large tracts of land, for certain persons and their associates, is a most pernicious one, and liable to infinite deception & imposition - My proposal, that the applicants should be at liberty to petition either singly or in associated companies,..." Although this dispatch was communicated two years after the grant was awarded to Abel Stevens, it quite likely reflects the opinions that Authorities may have previously developed, and may have been another factor that weighed against the Sherwoods. [Prescott, Robert. Dispatch to the Lieutenant Governor of Upper Canada. April 21, 1798. Upper Canada Sundries, Reel 4502. p. 217 - 223. National Archives of Canada.]

21. Fritz, Paul S. Land Surveyors, and Settlers: The Origins of Bastard and Burgess Townships, Leeds County, Ontario. 1994, p. 16.

22. Grant, Lewis. No. 4 Bastard, Johnstown, 19th Oct., 1797. reel M308, p. 546. Call number M/430/Bastard/1797. National Archives of Canada. and Survey of Bastard, 1797. Land

Surveyor's Record, Field Notebook 233, reel 10. Queen's University, Documents collection.

23. Ibid. p. 7.

24. B. 13. Bastard, 1816. Call No. M/430/Bastard/1816. Reel M-308 Pg. 545. National Archives of Canada.

25. Sliter, Hiel. Pioneer Privations. 1873, p. 3.

26. Mill Society conservation report. 1996, p. 14.

27. Brockville Land Registry Office. Reel 932. Memorial E-286.

28. Stuart, Elizabeth Stevens. Nicholas Mattice U.E, of Bastard. from Ontario Genological Society News & Views, March 1987, p. 33.

29. It is important to mentioning here that the assessment records do not differentiate between the tenant and the owner of a particular lot, but only note the name of an individual who occupied the lot in an active capacity. The land records must also be consulted in order to determine whom the lessee and lessor were.

30. Assessment Rolls for Bastard Township, Archives of Ontario, Reel MS 2547 – 2548. (The Assessment rolls contain information collected by the Town Clerk and an appointed Assessor who were responsible to the District Treasurer. They

collected information such as householder, location, cultivated & uncultivated acreage, building and construction values, livestock, manufactures etc.. This assessment of real and personal property was undertaken in order to levy tax for local improvements and district expenses. Most of the Johnstown documents remained privately in the hands of two local historians until they were donated to the Archives of Ontario between 1920 - 1947.) [page 1 - 2 Assessment rolls].

31. Assessment Rolls for Bastard Township, Archives of Ontario, Reel MS 2547 – 2548.

32. Brockville Land Registry Office. Reel 932, Memorial D-65.

33. Assessment Rolls for Bastard Township, Archives of Ontario, Reel MS 2547 – 2548.

34. Ibid. MS 2547-2548.

35. William Jones fonds. National Archives of Canada. MG55/24-NO.71.

36. Assessment Rolls for Bastard Township, Archives of Ontario, Reel MS 2547 – 2548.

37. Copy of Abstract Index for Block D, Delta, in Delta Mill Archives, Delta, ON.

38. Leeds land Copy Books, Queen's Archives memorial 287, March 18, 1812. Abel Stevens Jr. to Smith Curtis.

39. Colonel Francis Cockburn, March 12, 1816. Upper Canada Sundries. National Archives. Reel C-4548. p. 14161.

40. Gourlay, Robert. A Statistical Account of Upper Canada, Compiled with a View to a Grand System of Emigration. 1822, Vol. 1. p. 518.

41. Memorial No. 485. Charles Jones to Amelia Jones, October 29, 1832. Copy in Delta Mill Archives, Delta ON.

42. Deed of sale for mill January 1836. Copy in Delta Mill Archives, Delta, Ontario.

43. Assessment for Bastard Township. Archives of Ontario. Reel MS 2547 – 2548.

44. McCallum, John. Unequal Beginings Agriculture and Economic Development in Quebec and Ontario until 1870. Toronto: University of Toronto Press, 1980, p. 15.

45. Yonge Mills Records, Archives of Ontario. Cited from Phillips, Robert C., A Geographical examination of merchant milling and the export of wheat from Upper Canada in the 1830's. Bachelors thesis, Wilfrid Laurier University, 1985, Appendix 3. p. 4.

46. Phillips, The Flour Milling Industry and Economic Development in Leeds County: 1820 - 1850, 1991, p. 42.

47. Benjamin Tett. Wheat Account, 1833 - 1840. Benjamin Tett Fonds, Queen's Univetsity Archives, at Kingston.

48. Brockville Recorder and Times. Oct. 21, 1834. Brockville Public Library. Reel #2.

49. Ibid. Oct. 24, 1835.

50. Other writers have spelled his surname *MacDonnell*. In the deeds of sale for the mill, it is signed *Macdonell* .

51. Abstract Index for Bastard Township. Brockville Land Records Office. p. 93.

52. McCallum, John. Unequal Beginings Agriculture and Economic Development in Quebec and Ontario until 1870. Toronto: University of Toronto Press, 1980, p. 16.

53. Fritz, Paul. A History of the Old Stone Mill Delta, Ontario. Delta: The Delta Mill Society, 2000, p. 20.

54. Kingston Chronicle. August 18, 1826, p. 2, col. 4 -5.

55. Kingston Chronicle and Gazette. January 3, 1835, p. 3. Col. 4.

56. Baird, N. H. Report to the Projections of the proposed Improvements in the Navigation of the Gananoque....to render the same a viable for navigation. August 21, 1837.

57. Brockville Land Registry Office. Township of Bastard Abstract Index, p. 93.

58. Marsh, Mr. & Mrs. Delbert. Correspondence dated Jan. 9, 1970. Grandson of Walter H. Denaut.The Delta Mill Society Archives, Delta, ON.

59. Fritz, Paul. A History of the Old Stone Mill Delta, Ontario. Delta: The Delta Mill Society, 2000, p. 21.

60. Memorial of a Deed, Memorial of Assignment of Release, June 22, 1850. Copies in The Delta Mill Society Archives, Delta, ON.

61. United States. U.S. Supreme Court. Swain Turbine & Manufacturing Co. V. Ladd, 102. U.S. 408 (1880). Patent reissued Nov. 19, 1872 Patent No. 5154.

62. Fritz, Paul. A History of the Old Stone Mill Delta, Ontario. Delta: The Delta Mill Society, 2000, p. 24.

63. Ibid. p. 22-24.

64. McCalla, Douglas. Planting the Province: The Economic History of Upper Canada 1784 - 1870, 1993, p. 322.

65. Canada. Census of Canada. 1851-52, 1860-61, 1870-71, 1880-81, 1890-91.

66. Canada. Census Returns 1860-61. Township of Bastard in the County of Leeds. Micro film, Upper Canada Village Archives.

67. Fritz, Paul. A History of the Old Stone Mill Delta, Ontario. Delta: The Delta Mill Society, 2000, p. 22.

68. Phillips, Robert C. The Flour milling industry and economic development in :Leeds County 1820 - 1850, p. 126.

69. Canada. Bureau of Statistics? Census of Canada. 1851-52, 1860-61, 1870-71, 1880-81, 1890-91.

70. McCalla, Douglas. Planting the Province. The Economic History of Upper Canada 1784 - 1870, p. 104.

71. Jones, Robert Leslie. History of Agriculture in Ontario 1613 - 1880. 1947, p. 264.

72. The construction of these roads, and the Public Lands and Colonization Act of 1853, and the Homestead Act of 1868, were intended to

induce the settlement of land in the more remote, unsettled regions of the province.

73. The Recorder News, Smiths Falls. Feburary 14, 1889.

74. In the deeds of sale for the mill, George Haskin signs his name with no “s” at the end.

75. Copy of Deed of Land. Statute. Caroline A. Denaut to George Haskin. October 5, 1893. Delta Mill Archives, Delta ON.

76. Lockwood, Glen. p.312.

77. Bastard Township. Assessment Roll for the Municipality of Bastard, Ward 3. 1894-1914.

78. Ibid. 1894-1914.

79. Copy of Abstract Index for Block D, Delta, in Delta Mill Archives, Delta, ON.

80. Warren, Howard. Correspondence with The Delta Mill Society, dated June 4, 1992.

81. Fritz, Paul. A History of the Old Stone Mill Delta, Ontario. Delta: The Delta Mill Society, 2000, p. 28.

82. Scheinman, Andre. Delta Mill Conservation Report. McNeely Engineering Consultants, for The Delta Mill Society, 1996. p. 51.

83. Steele, Hastings. Hastings Steel & Son. Order book 985.32.4. The Delta Mill Society Archives, Delta, ON.

84. Ibid. Cash book 985.32.2.

85. Interview with Gordon Gray, Delta, ON March 1979. by Paul Fritz and Bud Gordon.

86. Oral tradition has maintained that a dynamo was installed in the mill in 1911 by George Haskin, and that this dynamo was used to provide electricity to the town of Delta. To date, the only available piece of documentation stated that it was not installed until 1929, and it was of such low capacity, (only a few kilowatts) that it could only provide power to a few houses in Delta and Lyndhurst. The available water power provided by the mill creek is marginal at the best of times, and there was very little surplus energy to run a dynamo of sufficient capacity to provide electricity for all but a few homes.

87. Lockwood, Glenn. The Rear of Leeds & Lansdowne. 1996, p. 475.

88. Roddick, George. Electrical Ledgers, 1912 - 1926. Leeds and Thousand Islands Archives at Lyndhurst. folio,

89. Receipt contained in, dated Nov. 25, 1911.

90. Ibid. folio, 200.

91. Ibid. folio 200-203.

92. Ibid. bill contained in, dated June 1st 1926.

93. Ibid. p. 476.

94. Warren, Howard. Correspondence with The Delta Mill Society, dated June 4, 1992. The Delta Mill Society Archives, Delta, ON.

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96. Ibid. folio 75 - 93.

97. MacKinnon, Tanya. The Historical Geography of the Distilling Industry in Ontario: 1850 - 1900, 2000. p. 28.

98. Ibid. p. 2.

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100. Upper Canada. An Act to Lay and collect a duty upon stills. 1794, p. 1.

101. Fraser, Alexander, ed. Accounts of the Receiver General for the Province of Ontario in, Tenth Report of the Bureau of Archives for the

Province of Ontario 1913. 1914, p. 298.

102. Upper Canada West: Civil Secretary's & Provincial Secretary, Records to issuance of licences. National Archives. RG5 - B0 vol. 53. File # 1.

103. Fraser, Alexander, ed. Accounts of the Receiver General for the Province of Ontario in, Eleventh Report of the Bureau of Archives for the Province of Ontario 1914. 1915, p. 733, 751.

104. McCalla, Douglas. Planting the Province: The Economic History of Upper Canada. 1993, p. 98.

105. Ibid. p. 252.

106. Fraser, Alexander, ed. Accounts of the Receiver General for the Province of Ontario in, Tenth Report of the Bureau of Archives for the Province of Ontario 1913. 1914, p. 298 - 299.

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110. Spelt, Jacob. Urban Development in South-Central Ontario. 1983, p. 100.

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112. Heron, Craig. Booze: A Distilled History. 2003, p. 30-31.

113. Garland, M. A. and Talman, M. A. Pioneer Drinking Habits and The rise Of The Temperance Agitation In Upper Canada Prior To 1840. Ontario Historical Society, Vol .27. Toronto, 1931, p. 343.

114. Ibid. p. 344.

115. Heron, Craig. Booze: A Distilled History. 2003, p. 30.

116. Noel, Jan. Canada Dry: Temperance Crusades before Confederation, 1995, p. 5.

117. Ibid. p. 104.

118. Brockville Recorder and Times. June 12, 1928.

119. Automobile Quarterly. The American Car Since 1775, 1971, p. 14.

120. Leung, Felicity L. Grist and Flour Mills in Ontario: From Millstones to Rollers, 1780s – 1880s, 1981, p. 57.

121. Ibid. p. 37.

122. Howell, Charles and Keller, Allan. The Mill At Philipsburg Manor Upper Mills and A Brief History of Milling, 1977, p. 16.

123. Sas, Jon A. The Versatile Millstone: Workhorse of many industries, 1990, p. 1.

124. Syson, Leslie. The Watermills of Britain, 1980, p. 14.

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126. Reynolds, John. Windmills & Watermills, 1970, p. 11.

127. Leung, Felicity L. Grist and Flour Mills in Ontario: From Millstones to Rollers, 1780s – 1880s, 1981. p. 38.

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129. Ibid. 122.

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131. Leung, Felicity L. Grist and Flour Mills in Ontario: From Millstones to Rollers, 1780s – 1880s, 1981, p. 123.

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133. Dedrick, B. W. Practical Milling, 1924, 1989, p. 266.

134. Leung, Felicity L. Grist and Flour Mills in Ontario: From Millstones to Rollers, 1780s – 1880s, 1981, p. 137.

135. Ibid. p. 151.

136. Ibid. p. 154.

137. Ibid. p. 148.

138. Ibid. p. 186.

139. Ibid. p. 190.

140. Ibid. p. 44.

141. Ibid. p. 133.

142. Ibid. p. 24.

143. Census Return 1851-2 . Upper Canada Village, p. 78, 85.

144. Leung, Felicity L. Grist and Flour Mills in Ontario: From Millstones to Rollers, 1780s – 1880s, 1981, p. 51.

145. Scheinman, Andre. Delta Mill Conservation Report. 1996, p. 51.

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147. Wiggington, Eliot. Foxfire 2. 1973, p. 142.

148. Syson, Leslie. The Watermills of Britain, 1980, p. 18.

149. Leung, Felicity L. Grist and Flour Mills in Ontario: From Millstones to Rollers, 1780s – 1880s, 1981, p. 47.

150. Bazely, Susan, M. The Delta Mill Wheelpit Excavation BdGa-34, 1993, p. 42.

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