

# A Study in Slate:

Welsh Immigration: Its Effects on the Slate Valley  
(1840-1870), The Slate Industry from 1901-1930,  
and Environmental Impacts of Slate Quarries.



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In Partial Fulfillment of a BS – Environmental Studies

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## **Abstract**

The Slate Valley of Vermont and New York is an area that covers approximately 300 square miles and is home to about 10 towns. Slate from this area is highly valued for its many different colors. Many Welsh people immigrated to Vermont in the 1850's from quarrying villages in North Wales. They changed the face of quarrying in the Slate Valley because of mining techniques and tools brought with them from Wales. They also changed the towns due to social and economic impact. This study focused on the correlation between the increase in Welsh immigration between 1840 and 1870, the increase in the slate business over the same time span, the slate industry from 1901 to 1930, and the environmental impact that quarries have on the surrounding landscape. The research has been historical, from libraries (University of Vermont, Green Mountain College), the Slate Valley Museum, and from the State of Vermont Census and business materials from the Building and General Services Department in Montpelier Vermont.

Keywords: Slate, Quarrying, Welsh, Vermont, Poultney, Castleton, Slate Valley, History, Immigration, Technology, Geology.

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## **Introduction**

My thesis is focused on the environmental history of the Slate Valley of southern Vermont and eastern New York State. There are many different aspects of the area that I have researched including immigration, geology, geography, and environmental aspects. One of the main areas that I researched is the geology and geography of the Slate Valley. This is important in order to understand where the work starts and what it is all about. Slate is a unique material in that it is found in only a few places in such extent as it is in Vermont. The slate of New York and Vermont is also unique due to its many different colors – greens, grays, blacks, and reds dominate in the Slate Valley quarries. Red slate is difficult to find and tends to be found only in the Granville, New York area. The small area of the Slate Valley shows that the towns were very closely linked to each other, not only due to quarrying but also because of immigration.

Due to a vast amount of immigration into the area in the 1850's and 1860's, I discussed the impact that these immigrants had on the area, and more importantly, the Welsh immigrants. The Welsh are unique because many came from an area in North Wales where slate quarrying was a staple of their economy. Because they came from an area with an established quarrying background, they gave an extraordinary amount to the development of the Slate Valley's slate quarries, and also to the small towns where they came to. The Welsh also changed the look and feel of many towns where they worked. The Welsh also provided a vast amount of information to the slate quarrying methods of the Vermont slate quarries. Their tools and methods were different to the birthing quarries in the area and proved to be superior. Some of the tools and methods that were

used when the Welsh began to use them in the area are still being used at some quarries to this day.

The uses of slate are another important part that I discuss. Since slate is such a versatile material, it has been, and is still being used for many different applications. It has been used in more practical ways in the past, such as blackboards, tabletops, mantelpieces for fireplaces, roofs, and many other residential uses. There are also many different industrial uses such as electrical slate. The uses of slate have changed slightly over the years. Today, slate is being used for aesthetically pleasing purposes such as crushing slate to use on driveways, for slate floors, and still being used in slate roofs. Although the uses of slate have changed over time, the bottom line is that it is still being used in many different products for many different purposes, and proves to still be strong in more ways than one.

In addition to historical research such as stated previously, I looked into different effects of slate quarrying on the region. These are environmental impacts of the surrounding area of the quarries. I have found and taken many photographs that will help prove the part of the huge environmental impact that the quarries have on the area. The landscapes of Poultney and Castleton have changed drastically due to the quarrying practices. There are great environmental impacts due to slate quarrying, and I investigated these impacts.

Another effect that I researched is the impact of immigration on the slate quarries of the area. Since the slate quarries in the Slate Valley were just starting at the time of a vast amount of immigration, determining the impact that immigration had on the employment of quarries should be obvious. Immigration is directly correlated to the

increase in the slate quarrying business. I researched both immigration and business records in order to try to find a correlation between the increase in Welsh immigration and the boom of the slate industry.

The majority of my thesis focused on the impact that the Welsh had on the area of the Slate Valley. Since they came from a different country they brought many traditions and cultural differences to the towns in Vermont and New York. They also changed the quarrying practices due to their knowledge and expertise in the field. I showed that they played a very important role in determining the look and feel of the towns today.

Although the impact cannot be felt as much today because many of the Welsh have either left or assumed different names and lost their family history, the bottom line is that they played an important role in the expansion and survival of the small towns in the Slate Valley, both by working in the business of the area and settling in the towns and increasing the populations in general. I am sure that many people would like to find out about the impact that the Welsh had on the area.

One of the main towns that I looked at is the small town of Poultney, Vermont. This small town is a farming village on the New York border, but quarries dot the area surrounding the village. In researching sources for information, the Green Mountain College located in Poultney is a plethora of information about slate quarrying, Welsh immigrants, and Welsh activities in the past. They currently have a study program – the Welsh Heritage Program that allows students to learn about Wales and the Welsh impact of the area. They also have a special event in the fall showing the Welsh heritage in the area.

The Slate Valley Museum in Granville, New York is another location where a vast amount of information is available. This small museum has many exhibits highlighting the past and present practice of slate quarrying in the Slate Valley. They are currently working on opening an exhibit telling about the geology and geography of the Slate Valley. They also have many special events throughout the year that focus on slate quarrying and the importance that it has throughout the entire area.

Personally, researching the Slate Valley is and has been a great opportunity to investigate the history of my home area. I was born and raised in a small town called Fort Ann, New York, which is located about 10 miles west of the outer fringes of the 'Slate Valley.' I have grown up my entire life hearing about the slate quarries and wondering how they work and what they mean to the area. I would have never dreamt that they meant so much to the economy of the area and have such a diverse history that would be able to be presented in a paper such as this. Because of my interest and research of my hometown and the surrounding area, I have learned so much about why landforms are where they are, such as the Champlain Canal, which connects the Hudson River to Lake Champlain and allows shipping vessels to go from the St. Lawrence River to New York City. The roads that seem modern around the area can be traced back many years to before they were such busy thoroughfares and were used by horses and buggies to transport goods to the canals and railroads.

The research that I have done proved to be enlightening in many different ways. Between learning about the impact that the Welsh immigrants had on the area, learning the importance of the slate quarries on the development of the towns of the Slate Valley,

and also learning how the slate quarrying had an impact not only on the towns in the valley but also on towns surrounding it (such as my hometown), I have a newfound respect for the quarries and what they really mean to the area. I hope that someone else may find them as interesting as I have.

## **Literature Review**

### **Geology**

#### **Formation of slate**

The Slate Valley of Vermont and New York is unique in the world because of its formational history. Metamorphism of shale into slate and the different cooling temperatures acted to make many different colors of slate in this very small area. It is world renowned for this fact.

The slate in this region formed between 450 and 650 million years ago during the Cambrian and Ordovician Periods of the Paleozoic Era (Chernicoff & Whitney, 2002). Dating techniques such as measuring the decay rate of radioactive elements that are inside the rock help to determine the age of a rock. Another way to determine the age of a rock is to locate fossils in the stone, such as trilobites and fish that lived in a certain time period (Slate Valley Museum, 2002, Ratte, 1989).

Slate is defined as “A fine-grained, foliated metamorphic rock that develops from shale and tends to break into thin, flat sheets”(Chernicoff & Whitney, 2002). Shale is “a sedimentary rock composed of detrital sediment particles less than 0.004 millimeter in diameter. Shales tend to be red, brown, black, or gray, and usually originate in relatively still waters.” Because of the way that clay settles in its formation into shale, it determines the cleavage points in the metamorphic rock, slate.

Slate forms when shale, which is below ground, becomes compressed and heated to great temperatures and pressures that change the rock from weakly bonded shale to a very strong slate. Slate tends to break along flat planes, called the rock cleavage. This tendency makes it a great material to use as blackboards, roofing, pool table tops, and floor tiles (Dale, 1906).

Slate comes in many different colors. The most common is gray or black, but there are some greens, blues, yellows, browns, purples, and reds. The colors of slate depend on the types of elements and chemicals that are present during formation. For example, if iron were present during formation the slate would be red (due to oxidation of the iron). Many slates exhibit mottled or mixed colors. The color of some slates fades over time due to exposure to the elements. Some slates, called unfading, do not fade over time, making it a good roofing material (Slate Valley Museum, 2002).

### **Plate Tectonics**

The reason why slate is so widely dispersed throughout the world is due to plate tectonics. At one time, every continent on the earth was combined into one major landmass, Gondwanaland. Because the continents were all joined together, there were shared areas of similar rock formation. For example, the slate in Vermont and New York has similar formation times and characteristics to the slate from Wales, indicating that both formed in the same areas.

Vermont and Western New York were located on an ocean coast until about 320 million years ago. Wales and Newfoundland were also located on the same coast and underwent the same transformation that present day Vermont underwent. When Pangaea, another 'supercontinent,' formed about 225 million years ago, Vermont and the eastern seaboard of the present United States were merged with the rest of present day North America. When Pangaea separated about 200 million years ago, the two areas whose rocks had formed so similarly were separated. Figure 1 is a figurative evolution of the Earth due to plate tectonics (the areas circled in red highlight the Vermont and Wales areas.)



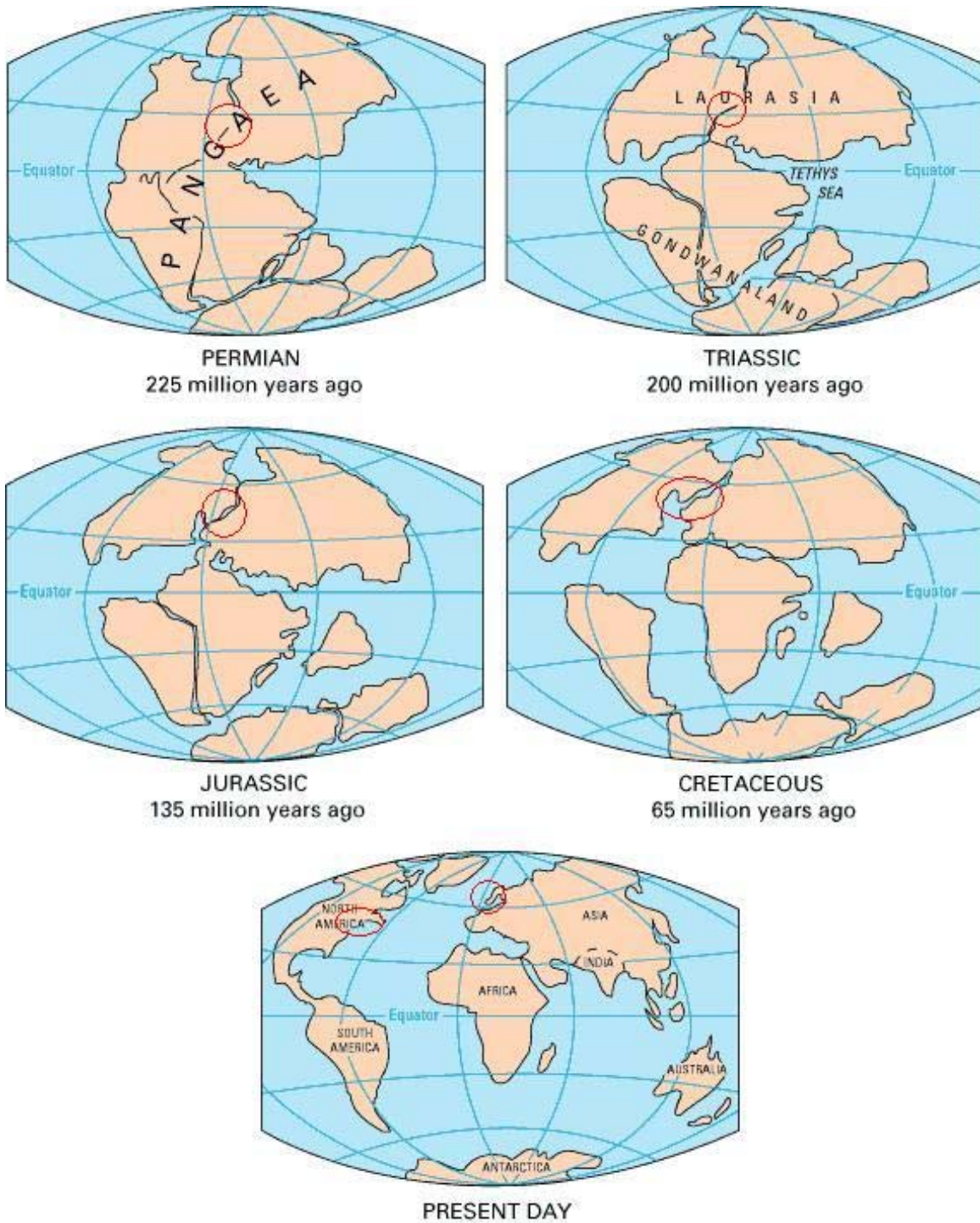


Figure 1. Evolution of the Earth due to Plate Tectonics. (Watson, 1999)

### Locations of Slate Deposits

There are slate deposits all over the world. Some of the more important areas of mining are in Wales; Newfoundland, Canada; Pennsylvania; and the Slate Valley of Vermont and New York. What makes slate from the New York/Vermont area important is its durability as compared to other slate from around the globe. Many barn roofs around the Slate Valley are over one hundred years old and still very solid.

Slate is quarried in other locations in the United States also. There are deposits in Maine, the Lehigh valley of Pennsylvania, Maryland, and Virginia. Some other states where slate is located but not quarried are New Jersey, Georgia, Utah, Tennessee, Arkansas, North Carolina, and California (Slate Valley Museum, 2002).

In Vermont, there are three main slate belts. They are located in the eastern Connecticut River valley, the central part of Vermont, and on the Western border with New York State, all of which run north to south. The eastern belt stretched from Guilford to Victory. The slate that was very tough and was pretty much equal in strength to that from Wales. The central slate belt stretched from Memphremagog Lake southward to Barnard. The slate here was almost completely black. The western belt is also known as the “Slate Valley” and was by far the most productive region of slate quarrying in Vermont. The slate here is most like that of Wales because of its color and quality (Hitchcock, 1861).

### **Geologic Features**

There are many different geologic features that determine the quality and ease of mining slate. An ideal slate quarry has little glacial material, river deposits, or disintegrated slate. A supply of water is also a must in order for the quarry to run smoothly, as it prevents the slate from becoming brittle. The layers of slate should be

basically uniform in composition of materials, and vertical, with no folds or bends in the layers. There should be little faulting, false cleavage, and curved cleavage (Behre, 1933).

Folds are where beds of deposited rock bend into different formations, usually into channel-like formations. A fold is “a bend that develops in an initially horizontal layer or rock...” (Chernicoff and Whitney, 2002) Folds are important in quarrying because in some slate deposits, the quarry can mine the entire thickness of rock. It is important to figure out how the slate is folded, so that the most feasible method of mining can be chosen. The way that the fold intersects the land surface can tell how easily accessible the slate will be (Behre, 1933). (See Figure 2)

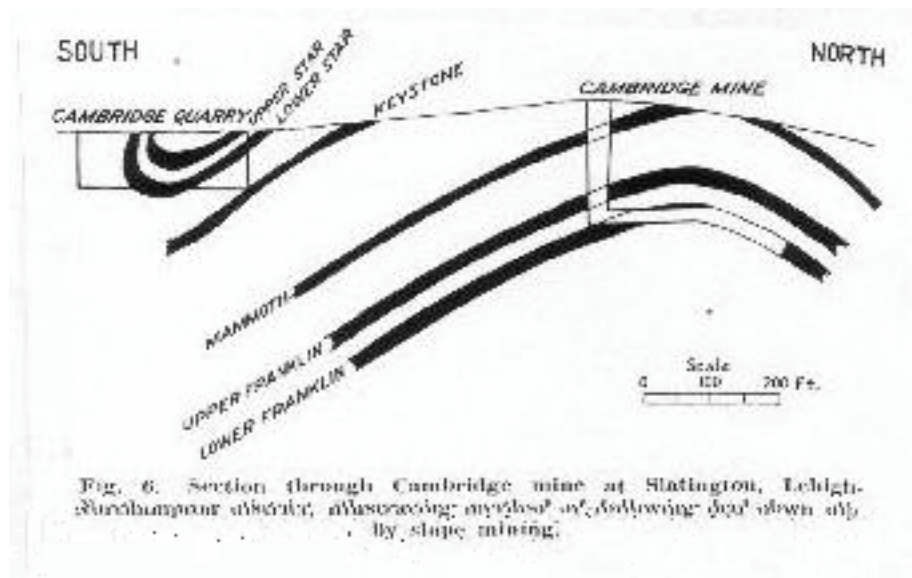


Figure 2. Folding of Slate Beds. (Behre, 1933)

Faults are defined as “A fracture dividing a rock into two sections that have visibly moved relative to each other” (Chernicoff and Whitney, 2002). Faults can be difficult for quarrying operations because of the way that rocks can be displaced over each other. (See Figure 3) Some faults push older rock over the top of younger rock. That can be disastrous for mining, because if slate is located in the younger layer, then

some will be lost to deeper sections in the rock layer. Some types of faults include thrust faults, which displace rock over a large horizontal displacement and small angle; and normal and reverse faults, which displace rock over a small horizontal displacement and a higher angle. (Behre, 1933)

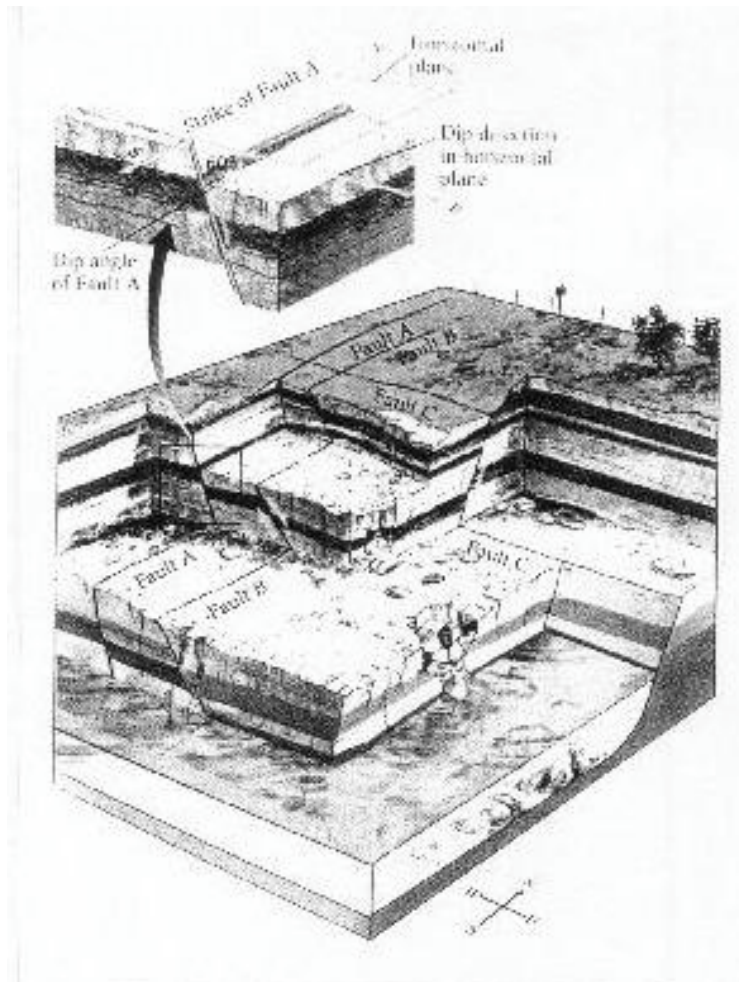


Figure 3. Faulting of Rocks. (Chernicoff & Whitney, 2002)

Cleavage is a term that describes a distinct feature in slate, the tendency for the material to break along flat planes, or cleavage planes. This is an important feature to slate because it determines the quality of slate. Slate that does not break along its true cleavage plane is said to have a 'false cleavage,' which can be disastrous to find in a

quarry since slate with this cleavage is basically useless (Behre, 1933). Many times, cleavage is difficult to see until the slate is broken. This is referred to the 'grain' of the slate, much like the grain of a wooden board. Cleavage is shown by figure 4, showing the cleavage plane and grain of a piece of slate.

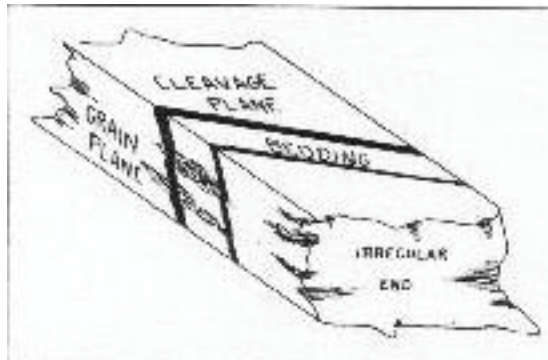


Figure 4. Cleavage of a Piece of Slate. (Behre, 1933).

## **Welsh and Quarrying**

### **Similarities and differences between Vermont and Wales**

There were some similarities between Wales and Vermont, such as the many small slate villages that dotted the landscape. However, there were many differences that were unnerving for the Welsh immigrants. One of the largest differences was that the climate in Vermont was much different than in their native Wales. Due to the warm Atlantic Ocean current of the Gulf Stream, Wales hardly ever saw temperatures that dropped below freezing during the entire winter. The summers were also mild and rarely reached temperatures of more than seventy degrees. In a great contrast, Vermont has winters that are bitterly cold and summers that can be very hot, which left the immigrants uncomfortable in a strange land. In slate mining traditions, the Welsh never had to deal with frozen rocks in their old country. However, certain slates in the United States

cannot be split after they are frozen, such as those from Granville, and other slates must be worked in a frozen state if they have previously frozen and thawed, such as those in Poultney. Vermont was also different because of the vast expanses of wooded land as compared to Wales, where much of the land was bare due to farming fields (Parry, 1879, North, 1946).

Welsh immigrants were also disturbed with the absence of chapels that dominated their lives in the 'old country'. Churches played such an important part in the everyday lives of the Welsh, that without them they felt almost naked (Slate Valley Museum, 2002).

### **Welsh quarrying**

Slate quarrying in Wales started long before Europeans even knew about Vermont. Written references to quarrying in Wales date back to around 1399, done by early settlers to the region. (North, 1946). What the slate was used for is not discussed but for the most part, it was quarried by individuals who dug it out of the mountains and then shipped it to ports for shipment to other cities (Sallery, 2002, Richards, 1995).

Large-scale production of slate in Wales began around 1782 (about 100 years prior to the beginning of quarries in Vermont), when a man named Richard Pennant decided to operate a quarry (Pritchard, 1935). It was at this quarry where many Welsh first started working with slate and learning the trade that has stuck with them for centuries. Pennant, according to everyone involved with the Welsh slate industry, revolutionized the slate quarrying business. Pennant came up with an ingenious system to mining the slate out of hillsides. A series of "galleries" (steps) were cut into the hillside that made mining and disposal of wastes easier and more expeditious. Another invention that Pennant is

accredited with, is a method of raising slate from lower parts of the quarry to higher parts by filling and emptying a series of water tanks (Roberts, 1998).

By the year 1882, according to Welsh quarry statistics, there were some almost nine thousand men employed at the quarries throughout Wales. Sixty percent of Welsh quarrymen worked at two quarries in Wales, and it was from these quarries that most workers left to immigrate to America (Roberts, 1998, Ellis, 1931). Figure 5 shows slate quarrying villages located in Wales.

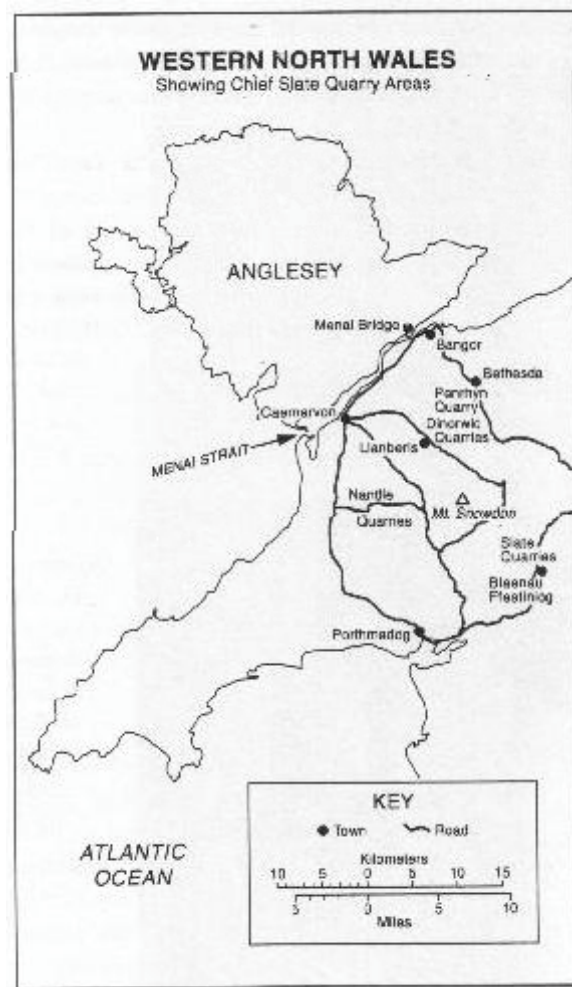


Figure 5. Slate Villages in North Wales. (Roberts, 1998)

**When and why did they immigrate to the United States?**

The Welsh immigration to the United States started around 1850, during a tough time for all the immigrants in Wales. It was in the latter part of the 1840's that the slate quarries in Vermont were starting to open and posed a great opportunity for the Welsh who had quarried slate from their home country for centuries previous. In 1845 the first immigrants were 62 quarrymen who came to work in the quarries in Maine. From then, there were many who came in 1847, and 300 people came to the U.S. in 1849 (Owen, 1952).

It was in July of 1846 that a speaker spoke to around 400 quarrymen and their families in the Bethesda, Wales area about the opportunities that awaited them in the United States. The following month, there was a report in a Welsh newspaper that many quarrymen had been influenced by this speaker and had already packed their bags and left for the new country. In the years following, many left their towns and came to the quarry villages and farms in Wisconsin, West Virginia, Vermont, Maine, and Pennsylvania. According to the 1851 British census, 500 people had left the Welsh town of Llanberis in the five years previous to the census (Owen, 1952).

The Welsh had left their home country for many reasons. According to a Welsh newspaper *Yr Amserau*, many of the reasons were due to the British government: "The standing army, with the resultant high taxes and tolls, the law of primogeniture which caused immense landholdings by the aristocracy, and the 'union between church and state so that we...have the huge wealth which is swallowed by the church'" (Roberts, 1998). The residents of Wales faced high taxes, little land to be purchased in many areas, high rent being charged by landlords, the church (which many Welsh had already withdrawn from) was still receiving money from the residents, and failing crops in the 1840's. In

addition, the slate industry in Wales was entering a recession during the same time period. “It is not surprising that many slate quarrymen of North Wales were ready to migrate”(Roberts, 1998).

Whilst many immigrants came to the United States and worked on farms, most wanted to find places where they could use their skills in working slate. Since the quarries in Maine were established prior to the arrival of the Welsh immigrants, this is where many of them began. Because of the lack of size and jobs of the Maine quarries, many of the Welsh left and came to the quarries in Vermont and New York. It was probably because the other quarries in Maine and Pennsylvania had already been established and had a work force of their own that many Welsh ended up coming to Vermont. The quarries here had just started to open and had many opportunities to expand and grow, and the influx of immigrant workers fit the bill (Parry, 1879).

## **The Slate Valley**

### **Geography**

The slate valley is a fairly large area that covers parts of two different states. It is located in of Rutland County, Vermont and Washington County, New York. Overall, it measures approximately thirty miles from north to south and about ten miles from east to west, a total area of about 300 square miles. The center of the Slate Valley is about 70 miles due north of Albany, New York, about 90 miles due south of Burlington, Vermont, and about 30 miles west of Rutland, Vermont. The southern extent of Lake Champlain is nearby. Other lakes located within the valley include Lake Saint Catherine in Poultney

and Wells and Lake Bomoseen in the town of Castleton (Roberts, 1998, Bertolas, 1982, Dale, 1899).

There are many small towns located within the Slate Valley, from Benson, Vermont in the north to Salem, New York in the south. Other towns in New York State include Granville, Salem, and Hampton. Vermont towns include Fair Haven, Castleton, Pawlet, Wells, and Poultney. (See figure 6) Poultney and Castleton are two towns that changed drastically with the advent of slate quarrying. The focus of the business within the towns changed, along with employment patterns and the ethnic make-up of the people in these two small villages (Roberts, 1998, Haynes, 1977, Latham, 1961).

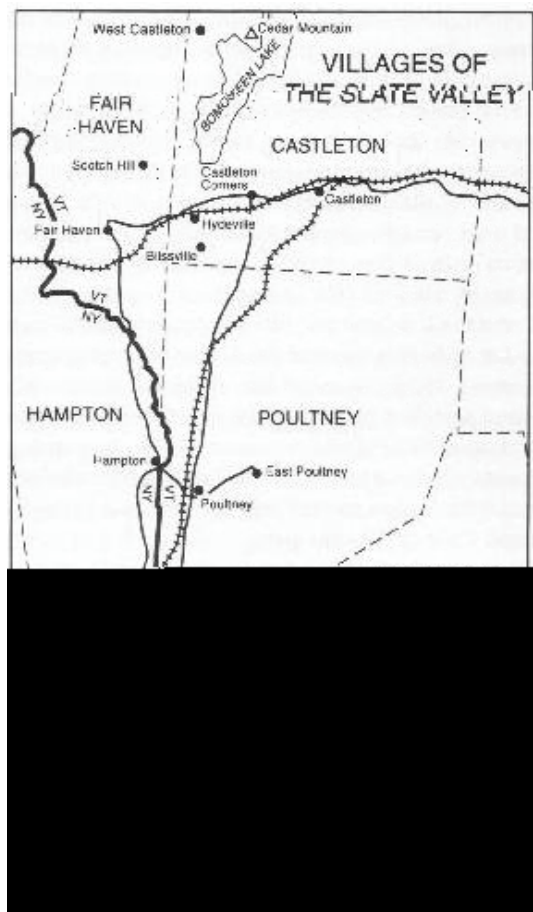


Figure 6. Villages of the Slate Valley. (Roberts, 1998).

### **Discovery of Slate and Quarrying in Vermont**

Slate quarrying started in Vermont around 1839 in Fair Haven by a Col. Alonson Allen. He spent years trying to develop interest in the product and in 1845 he started manufacturing school slates for teaching purposes. He did this for a few years and then in 1847 started manufacturing roofing slate. Roofing slate is a more profitable product, so Col. Allen stopped making school slates and focused solely on roofing slate. He was rightfully called the “pioneer in slate quarrying and manufacture” (Joslin, 1875, Hitchcock, 1861, Hathaway, 1947).

The second person to start quarrying was a man by the name of F.W. Whitlock, who was originally from Castleton but then moved to Poultney. His quarry was in Castleton and he opened it in 1848 (Joslin, 1875).

Daniel and S.E. Hooker established the first quarry in Poultney in 1851. These two men started their quarry on their family farm that was located about three miles north of the village of Poultney, Vermont. They started off small, manufacturing very little in their opening year of 1851, but steadily increased production throughout the next three or four years until 1854 when the quarries were worked steadily and consistently. They have been mined ever since. In 1875, Hugh Hughes came into possession and the quarry employed about sixty men and mainly manufactured roofing slate (Joslin, 1875, Earney, 1963).

### **The Welsh Come to the Slate Valley**

The beginning of the Welsh impact in the slate valley began around 1850 when many people were immigrating from Wales and other European countries. As early as the mid 1840s, immigrants were coming from Wales and settling in Wisconsin with their fellow countrymen to work on farms (Roberts, 1998, Edwards, 2000). However, many

preferred to find someplace where they could use their skills that they learned in Wales and use them for a job here in America. Quarries in Maine were the first to see immigrants, but because of their limited size and production, many quarrymen opted to move away and find other areas. This is how many quarrymen ended up in the Slate Valley in Vermont and New York. Since the quarries in Vermont were just starting to become a large production business and were looking for skilled laborers, it seemed like a perfect match (Roberts, 1998, Conway, 1961, Jones, 1982).

### **Welsh Quarrying in Vermont**

The first written history of a Welsh owned quarry was in 1852 when John Humphrey and some other Welsh immigrants found a deposit and established what is now called the Eagle Quarry. This mine was established in 1853 and they started manufacturing roofing slates. This quarry started out as a very small mine until around 1869, when they made a mill for sawing and planning which was located on the quarry grounds. After a couple years, the mine also built a mantle and marbleizing shop on their grounds where they could make special colors and “marbleize” slate (which is making it look like marble). They also built a cutting shop on the property that cut special patterns in the slate slabs. By 1871, the quarry was manufacturing many different products including fireplace mantles, billiard beds, tabletops, hearths, school blackboards, tile, flagging, doorsteps, and some other miscellaneous articles (Joslin, 1875).

The mines of Eagle Quarry, at the height of production, were at a depth of one hundred fifty feet from the surface and there were six tunnels into the hill, each going down more than six hundred feet. Each of these six shafts had a rail system to transport the quarried slate to the surface.

For undisclosed reasons, this quarry stopped production in 1874. At the height of production the quarry employed one hundred to one hundred fifty men and had a ‘superior quality’ of slate. According to the author, “It is inexhaustible, and we may reasonably expect that this valuable property will not long remain idle”(Joslin, 1875).

### **Uses of slate**

There have been many different uses of slate throughout time. With the finding of slate in the slate valley, slate was beginning to be used in such things as foundations and roofing material at private residences. When slate quarrying became a staple business in the economy of the Slate Valley, the diversity of uses for slate broadened dramatically. By 1855, the West Castleton Slate Company had many different uses for their quarried slate which are as follows: Blackboards, Headstones, Tiles, Slate for architectural purposes, Roofing Slate, Vases, Fence posts, Washbowls, Fireplaces, Mantelpieces, Bathing Tubs and Butter Vats (Collins, 1999, Stearns, 2001).

The West Castleton Company also developed the process of ‘marbleizing’ slate, which makes quarried and polished slate look like marble. This process is done by placing the slate in a vat of water and submerging it. They would then put various colors of paint in the water. Since paint floats on water, by draining the water out, the paint would adhere to the slate. By then baking and polishing the slate, the marbleizing was complete. Through this process, slate companies could produce a material like marble but for a lesser cost (Roberts, 1998).

### **Summary**

The geology and geography of the Slate Valley are important in recognizing the importance of the slate quarrying industry that has been birthed from it. Beginning in the mid to late 1800's, slate quarrying began to become a very important staple to not only the economy but also to the lifestyles of the residents of the Slate Valley. The Welsh have much more experience in quarrying slate because they have done so, in Wales, for many centuries previous to the discovery of slate in Vermont. It is due to this fact that their tools and traditions evolved over time and therefore helped to revolutionize the slate quarrying industry of Vermont. The Welsh immigration not only helped to grow the slate industry but also changed the demographics of the towns in which they settled. Their impacts on the slate industry, lifestyles, and settlements during the 1850's and 1860's can still be felt in some Slate Valley towns today. From the beginning of slate quarrying in the area, there have been many different uses of slate. The business flourished due to the inventive nature of the quarry owners to find different uses for the material. The slate industry is still alive and well today with slate still being used as a roofing material.

In looking at these statements, it is evident that the Welsh had a profound impact on the Slate Valley. One main aspect of their impact is that pertaining to the slate industry. Due to the number of immigrants skilled in working with slate coming to the area, there is a definite correlation between the increase in the number of immigrants and the increase in the number of slate quarries that were established during the first few years they began coming to the area. Directly linked to this statement is one that can look at the tools and traditions that these immigrants brought with them to the United States that helped to revolutionize and expedite the slate quarrying process. It can also be shown that the culture and economy changed due to the Welsh immigrants. Because of

the Welsh immigrants helping to establish the slate industry as a staple of the economy of the Slate Valley, it can be projected that more and more slate businesses opened in the decades following 1870. In looking at a thirty year time span between 1901 and 1930, it can be shown that, due to the establishment of the slate quarries by the Welsh during the mid 1800's, the slate industry continued to grow even after the Welsh impact had started to fade. Lastly, it can also be shown that due to the vast amounts of quarrying that takes place throughout the Slate Valley, there is a large environmental impact. This impact can be seen to begin with the advent of the first slate quarry and can be seen to continue to this day.

## **Methods**

My research was conducted in many different areas. In order to find a correlation between the business and immigration of the Slate Valley, I researched many census materials. The State of Vermont Department of Buildings and General Services in Montpelier was a vast source of United States Census materials, including immigration and settlement records for the years between 1840 and 1870. The Bailey Howe Library at the University of Vermont was a source for Industrial Census materials during that same time period. Many historical books from the University of Vermont and Green Mountain College helped to find facts to the Welsh and environmental impact on the Slate Valley. Vermont State Geologist Reports between 1901 and 1930 came from the personal collection of one of my advisors, Barry Doolan. These books, written by George Perkins, show aspects of slate quarrying such as annual state-wide income and established quarries. The environmental impacts were researched through many books and by taking photographs of many quarries throughout the Slate Valley.

## **The Study Area:**

The Slate Valley is a very specific region in southwestern Vermont and east central New York. It covers about 30 miles north to south and 10 miles east to west. I will focus my attention on two towns in the Slate Valley: Castleton and Poultney, Vermont. Some other towns are Wells, Vermont and Granville, Hampton, and Salem, New York.

The Slate Valley gets its name from the geologic formation of slate located within it. This slate among the best in the world because of its strength and many different colors. Quarrying in this area started in the mid 1800's and has continued until this day. Around 1850, immigrants from Wales started to come to the area. Welsh immigrants were particularly interested in the Slate Valley because they emigrated from an area in Wales that was also a large quarrying district. Many of their tools and quarrying methods came with them, particularly the Maine slate belt, the Slate Valley of Vermont and New York, and Pennsylvania.

**Four main study areas:**

1. I discussed the Welsh impact on the Slate Valley due to immigration and the increase in the slate quarrying business between 1840 and 1870.
2. I showed that the Welsh had a vast impact on towns in the Slate Valley because of their tools, traditions, and other cultural and economic impacts.
3. I looked at slate quarrying between 1901 and 1930, the number of quarries that were established and in business during that time, and economic impact of the quarries on the towns of the Slate Valley in order to show the projection of the growth of the slate industry over time.
4. I established that the slate quarries have a large environmental impact on the surrounding towns, from the beginning of quarrying until present day.

These four study areas are important in order to understand the birth and growth of the slate industry from its inception in the 1850's. The first two topics discuss the impacts that the Welsh immigrants had on the area, between the impacts on the slate quarrying industry and the cultural impacts on the surrounding areas. This is important to know because they were the first group of immigrants with the vast knowledge of slate quarrying and helped to revolutionize the slate industry. The third topic is important to look at because it shows the projection of the continual growth of the slate industry over a 90-year time span. This helps to establish that the impacts that the Welsh had on the slate industry during the time period between 1840 and 1870 were critical to the growth of the industry for years afterwards. The fourth main topic area is important due to the overall assessment of the environmental impacts on the surrounding landscape and communities due to the slate quarries. All four topics together help to show the vast importance and impact that the slate quarries had and continue to have on the Slate Valley.

### **Methods:**

1. In order to demonstrate an understanding of this topic, I have reviewed literature and business documents from 1840 to the 1870. It is during this time span that the Welsh started coming to the area and have had the greatest effect on the mining industry. The main types of materials that I have used are census materials that were used in order to find the numbers of Welsh immigrants coming to the area. The census materials that were gathered came from the State of Vermont's Buildings and General Services department in Montpelier. The increase in business in the slate quarries was

found using industrial census materials that were located at the University of Vermont library. Other literature came from area libraries and other academic collections so that I could gain a sense of the increase in employment and business dealings in the slate businesses over this time span. Numerical data was be collected and plotted on graphs, showing the rise and in the Welsh immigration and the slate business over the time period from 1840 to 1870.

2. In order to illustrate this topic, I have reviewed literature and private collections throughout Poultney and Castleton. Green Mountain College's 'Welsh Room' provided an extensive base to the research, as it is the home to many private recollections, documents and pictures of cultural importance to the Welsh immigrants of the Slate Valley. The Slate Valley Museum is another important resource that was used in order to find many sources for establishing the Welsh impact on Castleton and Poultney. Other information came from old photographs from the era in which the Welsh settled in the area.

3. In discussing this topic, I have reviewed literature and documents. Much of the information came from Vermont State Geologist reports from the personal collection of one of my advisors, Barry Doolan, which discuss and show the active quarries that were established and running during the years between 1901 and 1930. These sources also show an increase in the amount of income that the quarries were bringing in during that same time period. I also reviewed other documents from his collection and tried to show that the Welsh impact during the years 1840-1870 allowed for the expansion and growth of the slate industry of western Vermont.

4. In order to illustrate this topic, I looked over environmental documents that helped to show what sort of environmental impact that quarrying has on the surrounding landscape. I also used personal photographs and old postcards and photos to make a comparison between past and current environmental impact. There are many laws present today that have to do with pollution of the environment and water resources, both of which can be related to the quarrying business. However, in the past there are few or lax regulations. I have compared these environmental remediation techniques that are in place or being reviewed in order to minimize the environmental impact that these businesses have on the surrounding landscape.

## **Results**

### **Welsh immigration and slate quarrying between 1840 and 1870.**

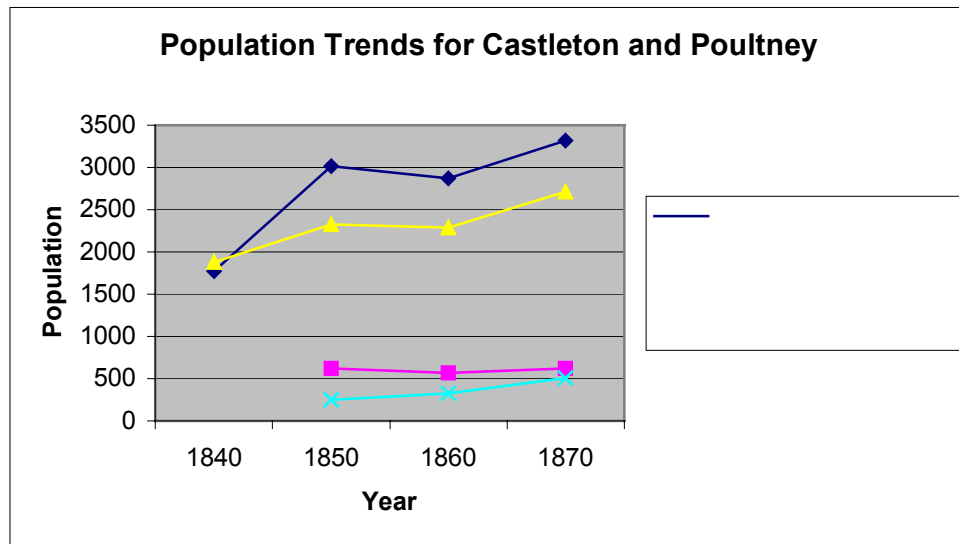
I discussed the Welsh impact on the Slate Valley in terms of immigration and slate quarrying between 1840 and 1870. The census materials from the Building and General Services Department and industrial census materials from the University of Vermont are presented and shown with graphs. This impact means the initial growth of the slate industry because of Welsh knowledge and practice in slate.

In proving this topic, there were many facts and figures that I sifted through in order to find the correlation that was searched for. These figures came from United States census materials between 1840 and 1870.

Welsh immigration began in Castleton and Poultney roughly in about 1850. Although the Welsh were a primary reason for the increase in the slate quarrying, there were also other immigrant groups that outnumbered the Welsh. The Irish immigrants had nearly twice the population numbers as the Welsh for the duration of the study time. This shows that although the Welsh had the knowledge and tools to help develop the slate industry, the Irish were the brunt of the immigrant workforce that also helped the growth in the industry.

Beginning in 1840, the populations of Castleton and Poultney were 1769 and 1880, respectively. Due to a lack of materials from 1840, the immigration numbers were not known. In 1850, Castleton had a population of 3016 with 623 people listed as immigrants. Poultney had a population of 2329 with an immigrant population of 250. In 1860, Castleton had a population of 2861 and 568 were immigrants. Poultney had a population of 2290 and 322 of those were immigrants. Finally, in 1870, Castleton had an

overall population of 3320 and 619 people were immigrants. For the same year, Poultney had a total population of 2712 while 511 were immigrants. Figure 7 is a graphical representation of these figures.



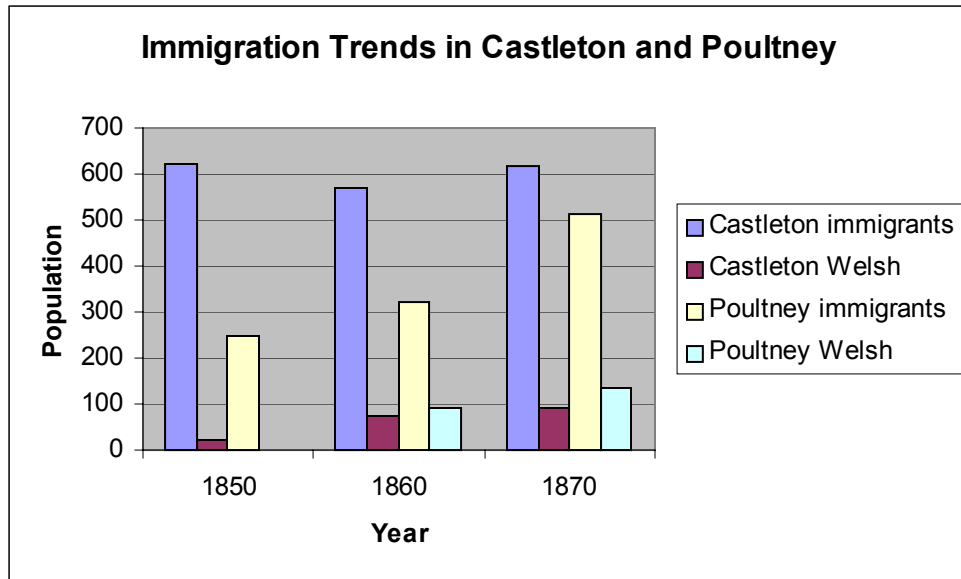


Figure 8. Welsh and general immigrant populations.

In comparing the last two figures, the percentage of immigrants between the two towns can be seen. Although there was limited information for finding an immigrant population in 1840, the real population trend began in 1850 and 1860.

In Castleton, Vermont the percentage of immigrants in the general public were 20.66% in 1850, 19.78% in 1860, and 18.64% in 1870. This shows a general downward trend in the percent of immigrant population. Over that same time period, the percent of Welsh was rising. In 1850, the percentage of Welsh in the population was 0.66%, in 1860 it was 2.54%, and in 1870 it was 2.80%.

Poultney, Vermont had a different trend than Castleton. There were no Welsh immigrants in 1850, making the percentage of the population only in 1860 and 1870. The overall percentage of immigrant population in 1850 was 10.73%, in 1860 it was 14.06%, and in 1870 it was 18.84%. This shows a general upward trend in the proportion of immigrants as compared to the general populous. Over that same time period, the Welsh immigration percentages were: in 1850 it was 0.00%, in 1860 it was 4.02%, and in 1870 it was 4.90%. This trend shows that the Welsh population in Poultney was not only

growing but was also making up a much larger percentage of the general population than in Castleton. Figure 9 is a graphical representation of the percentages of Welsh and immigrant populations between Castleton and Poultney.

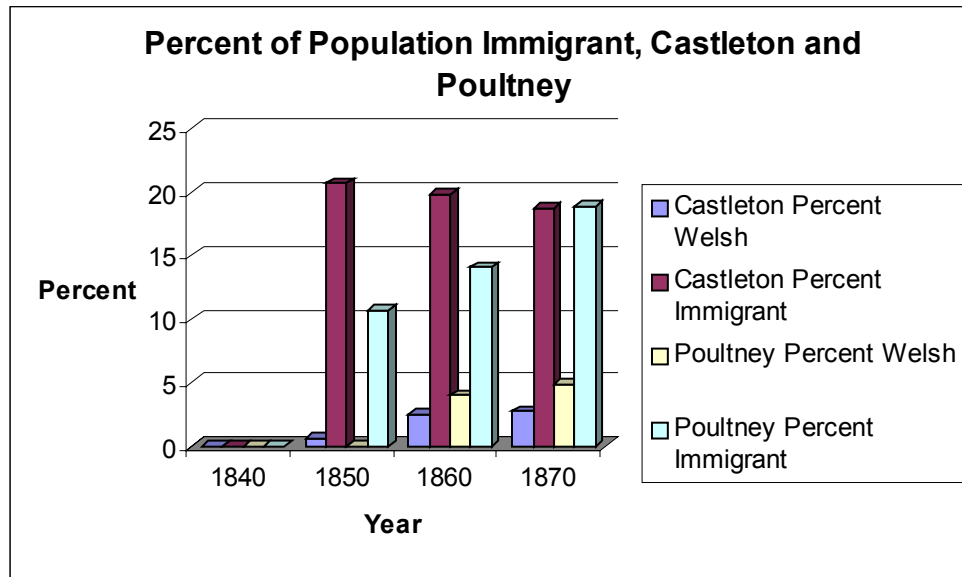


Figure 9. Percent of Welsh and immigrant population as compared to general population.

While looking at the immigrant population of Castleton and Poultney, Vermont, the slate industry was also growing over this same time period. Slate was discovered in this area in around 1839 and quarrying began as a business venture in about 1847, so the figures that were found of slate quarrying and businesses were found after this date.

The general public was a great source of slate quarrying employees. Records of quarrying began between 1840 and 1850 with Castleton, while quarrying in Poultney began sometime between 1850 and 1860. Castleton's slate quarrying workforce in 1850 was 30, which increased to 55 in 1860, and boomed to 479 by 1870. Poultney's general workforce was 0 in 1850 (due to no quarries being open), to 109 by 1860, and 184 by 1870. Figure 10 is a graphical representation of the number of workers employed by the slate industry in Castleton and Poultney between 1850 and 1870.

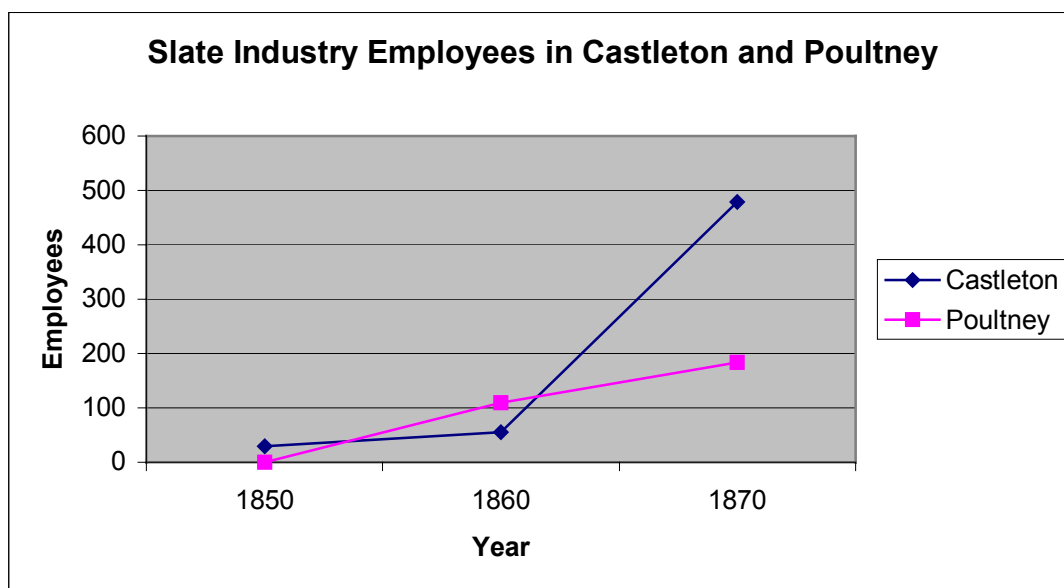


Figure 10. Slate industry employees in Castleton and Poultney.

General employment numbers cannot represent the true boom in the slate industry over this time period. In order to find this out, a percentage representation of employment needs to be looked at, between the slate industry and all other industries.

The percent of employees involved in the slate industry in Castleton increased dramatically over the period between 1850 and 1870. In 1850, there was 15.79% of the total employees in the town involved in the slate industry, while in 1860 that figure jumped to 41.98%, and finally in 1870 it jumped again to 88.54%. All of the employees in the town except for about 11% were involved in the slate industry by 1870.

Over that same time period, Poultney also experienced a great boom in its slate industry. In 1850, the percentage of total employees in Poultney involved in the slate industry was 0% (due to no quarries being open), that figure jumped to 38.11% by 1860, and once again jumped to 66.43% in 1870. Less than 20 years after the first quarry being opened in Poultney, over half of the working force was involved in the slate industry.

Figure 11 is a graphical representation of the percent of workers involved in slate quarrying and manufacturing.

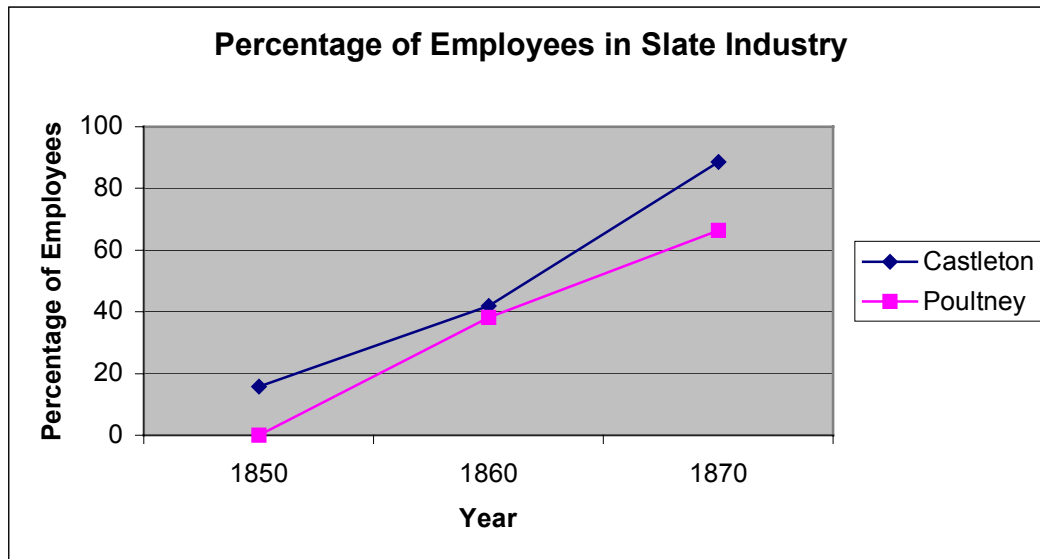


Figure 11. Percentage of employees involved in the slate industry.

The past representation was true of the entire populace of the two towns. In looking at the impact that the Welsh had on the slate quarrying industry, the number of immigrant and Welsh workers must be also looked at.

The number of immigrant and Welsh quarry workers between 1850 and 1870 increased steadily. In 1850 in Castleton there were 18 immigrant slate workers while 9 of them were Welsh. In 1860, the number of immigrants increased to 74 and 30 of them were Welsh workers. By 1870, the total number of immigrant slate workers increased to 182 and 47 Welsh were listed as slate industry workers.

In Poultney over the same time span, there was a higher percentage of Welsh quarry workers as compared to the total immigrant figures. In 1850, there were no workers due to no quarries. By 1860, the industry began to boom and there were 63 total immigrant slate workers while 45 of them were of Welsh descent. By 1870, the figure for total immigrant slate workers rose to 137 while the Welsh slate workers increased to

70. Figure 12 is a graphical representation of the numbers of immigrant slate workers in Castleton and Poultney between 1850 and 1870.

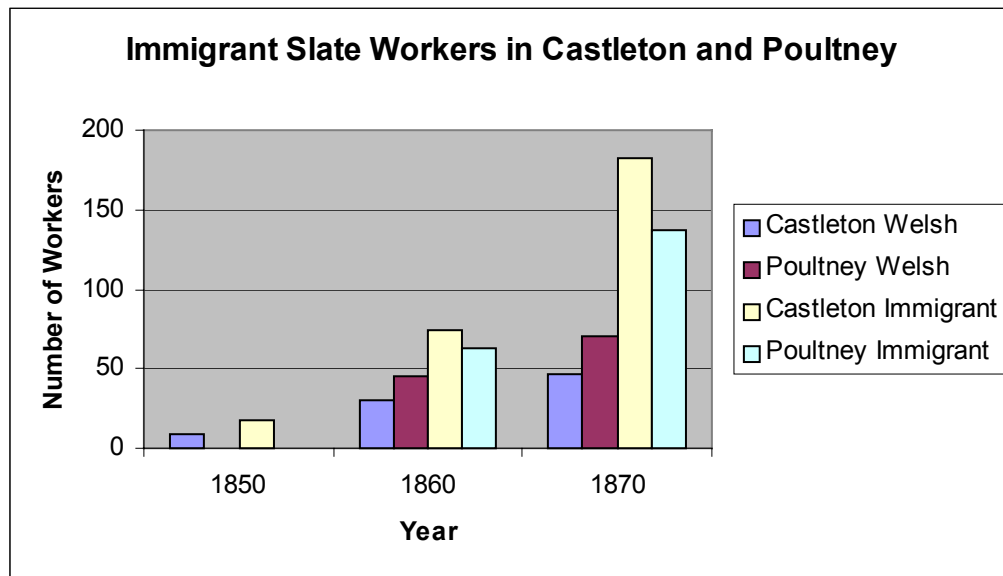


Figure 12. Total immigrant and Welsh employment in the slate industry.

The next impact that will be looked at is the percentage of Welsh slate workers as compared to the total slate industry employment between 1850 and 1870.

In the slate industry in Castleton in 1850, 30.00% of the total workforce was of Welsh descent. By 1860, this figure had jumped to 54.55% and by 1870 it had dropped to 9.81%.

As comparison, in Poultney in 1850, 0.00% of the total slate workforce was of Welsh descent. By 1860, the percentage had increased to 41.28% and finally by 1870 that figure had dropped slightly to 38.04%. Figure 13 is a graphical representation of the percentage of Welsh workers involved in the slate industry.

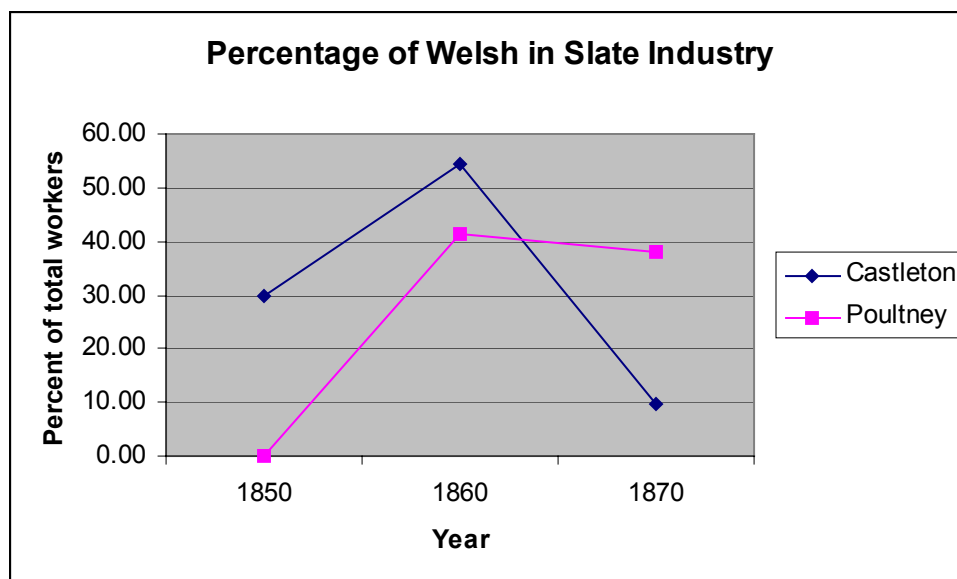


Figure 13. Percentage of slate workers of Welsh descent.

The last representation of the slate industry and Welsh immigration is the direct correlation between the increase in Welsh immigration and the increase of slate quarrying businesses over the same time period.

In Castleton in 1840 there were 0 slate quarrying businesses and the Welsh immigration was unknown at that time. By 1850, there was 1 quarrying business and a total of 20 Welsh immigrants. In 1860, those figures rose to 3 slate quarrying businesses and a total Welsh population of 73. By 1870, the figures once again rose to 5 slate quarrying businesses and a total of 93 Welsh in Castleton.

As in Castleton in 1840, there were 0 slate quarrying businesses and the Welsh immigration was also unknown at the time. In 1850, there were also 0 quarrying businesses and 0 Welsh immigrants to Poultney. By 1860, the slate quarrying industry began with 1 business and a total Welsh population of 92. By 1870, there were 3 slate quarrying businesses and 133 total Welsh located in Poultney. Figure 14 is a graphical representation of both the increases in slate quarries and Welsh population over the same time period between 1840 and 1870.

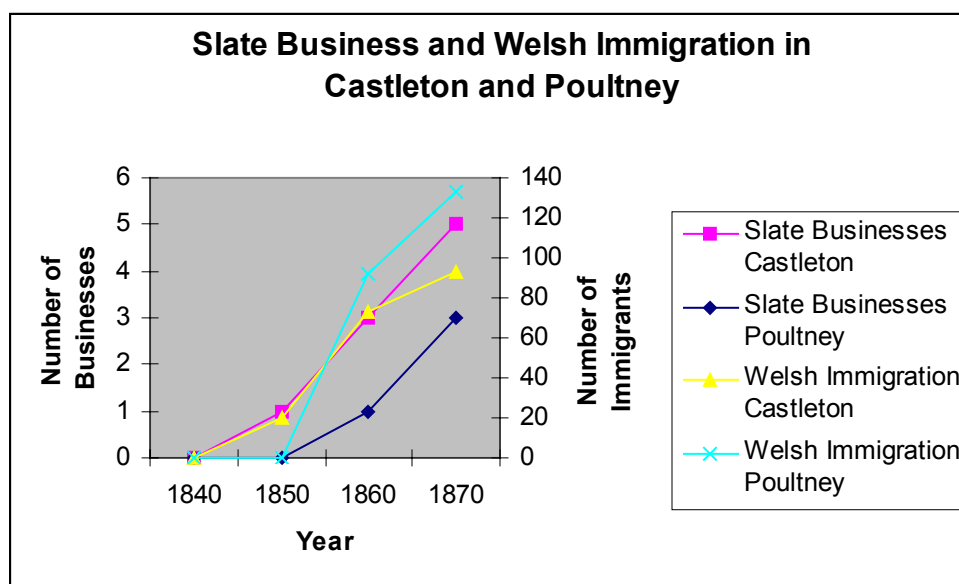


Figure 14. Increase in Slate Businesses and Welsh Immigration.

The main points that were previously discussed state the increase in population trends for Castleton and Poultney and the increase in immigrant population in these towns over the time period between 1840 and 1870. It was also shown that the Welsh were not the largest immigrant group to come to the area over the 30 year time period of interest. Although immigrant populations composed 15-20% of the general population, the percentages of Welsh immigrants were consistently under 5%.

The slate industry workforce grew on a linear scale with small increases over the 30 years for Poultney, but Castleton boomed in the late 1860's and early 1870's, with an increase in over 400 employees in 10 years. The percentage of employees involved in the slate industry for both towns also grew over this time period, going from under 20% in 1850, to around 40% in 1850, up to between 70 and 90% by 1870. The number of immigrant slate workers also grew significantly over the 30 year time span. The highest point of the Welsh workers in the slate industry came by 1860, and by 1870 was on a downward trend.

## **Welsh cultural impacts and traditions**

I showed that the Welsh had a vast impact on towns in the Slate Valley because of their tools, traditions, and other cultural and economic impacts. The Welsh impact on the towns of Castleton and Poultney was not unlike the impact that many immigrants have on the towns that they settle in. Much of the cultures of these immigrant towns come with them to the areas in which they settle, making for the interspersing of different cultures and traditions. Since the landscape was quite similar to their homeland, many of them felt at home in the Slate Valley of Vermont and New York, however still felt quite out of place. This means that the Welsh had a significant impact on the towns of Castleton and Poultney Vermont because of their culture and traditions they brought with them from their native Wales. The impact of the Welsh culture is quite important to the growth of the slate quarrying industry due to the fact that these people felt at home in this area. The Welsh felt at home because they could practice their trade in slate and because the landscape was quite similar to their homeland. If it were not for these two factors, it is quite possible that the slate industry would not have had the success and the growth that it has had.

The Welsh settlements in Castleton and Poultney brought many traditions from their homelands. One of these traditions was that of singing. Singing in a choir is commonplace for the Welsh in their native Wales. The Welsh even call their country the “land of song.” One of the most recognized Welsh choirs is the Penrhyn male choir, which is world renowned for their music.

Another major staple for the Welsh settlements in Vermont is that of their religion. Religion played a big role in all of the immigrants' lives because of the fact that prayer was a way for them to find strength and truth in a strange land. Y Bibl (the Welsh word for Bible) was an important part of every family. Figure 15 is a picture of the Welsh Congregational Church in Granville, New York, a town in the Slate Valley neighboring Poultney and Castleton, Vermont.



Figure 15. Welsh Congregational Church, Granville, New York. (Slate Valley Museum)

The integration of the Welsh in their settled communities led to the many different aspects of Welsh life that have been discussed. Their traditions of song and religion, as well as the building of churches and communities also led to the changing of these villages. One example of this can be illustrated by figure 16, which is a picture depicting a handful of Welsh youth in a baseball league. This is a great example of the integration between Welsh culture and the American established culture.



Figure 16. Welsh-American Baseball League, Granville, New York. (Slate Valley Museum)

The Welsh also had a profound impact on the towns due to their association with slate. These people were pioneers in working with slate as a useful material. They used slate for decorative purposes. One classic Welsh tradition is the making of a slate ‘fan,’ where the artisan would take an inch thick block of slate and split it until there were pieces only about one eighth of an inch thick. He would then carve intricate designs around the edges of the block, fasten it in the center, and fan the pieces to create a decorative piece. This was a tradition that was passed on from generation to generation and only the most proficient artisans could produce these pieces. It was born in the Ffestiniog area in Wales and brought to the Slate Valley by Welsh immigrants. There are many impacts of the Welsh immigration that can still be felt around the Slate Valley today. The interest in preserving the heritage of the Welsh began to reappear in the 1970’s with interest coming from the local college in Poultney.

Green Mountain College is the home to many different Welsh programs. In 1977 the Welsh Collection at the college's library was established, which is a place for collecting Welsh books, manuscripts, pictures, and many other materials. The college has also established many Welsh culture programs in the community of Poultney. There is a Welsh language course at the college. Each fall there is a Welsh Festival that highlights the culture of these people. In 1995, the Welsh Heritage Program was established at Green Mountain College to preserve and celebrate traditional Welsh culture.

The Welsh heritage in the area today is a result of the number of immigrants who made such an impact on a very important staple of the Poultney and Slate Valley communities, the slate quarries.

The Welsh also had a profound impact on the slate industry because of the traditions and tools that they brought with them from their native Wales. These tools revolutionized work in the slate quarries and allowed for the modernizing of the slate quarries and expediting of work in the slate quarries.

There were many locations throughout the quarry where the tools were used. These tools were adapted from tools that the Welsh were able to use in their native country. The simplest of these tools are the drill, chisels, and hammers. In order to begin the process, the slate slab must be broken off the face of the formation. The quarrymen would then use their hammers and chisels to split the piece of slate into a workable, marketable material. Many of the Welsh were not able to own their own tools in their native country due to the low wages and companies that they worked for. In contrast, in the United States, they were many times able to purchase their own tools that they could use throughout their mining careers.

Many of the other tools that the Welsh either brought over from Wales or adapted to use in the quarries in the Slate Valley made a significant impact on the industry of slate quarrying in Vermont. One of the largest tools that is used in the quarry is the quarry stick and its associated derrick mechanism. The quarry stick was a tree about 150 feet tall, which was shipped to Vermont from the western United States. This tree would then be stood up at the top of a quarry pit. Fastened to the top of the quarry stick are cables, on which are swing derricks. These derricks take large blocks out of the quarry hole and bring them to the quarry shanty for further processing (Slate Valley Museum, 2002). The Welsh were able, along with their counterparts from the United States, to rig up this mechanism to lift the slate slabs out of the deep pits of the quarry. In older times in Wales, there were other mechanisms to lift the slate out of the pits, such as rail cars or wagons that worked well in those quarries, but not so much in the smaller quarries in the states.

Since about 90 - 95% of all materials taken out of the quarry are wastes, the derrick also brings the wastes out and drops them at the base of the quarry stick. Over time, the pile of waste, also called 'slag,' becomes so large that it prevents the quarry stick and derrick system from working, and effectively ending the use of that quarry stick. Once a quarry stick was buried in slag, a new one must be shipped and erected in a different location adjacent to the quarry pit. The pile of slag was often used as a gravel source. Figures 17 and 18 show the quarries and the derrick mechanism at work.



Figure 17. Derrick mechanism pulling slate out of quarry. (Slate Valley Museum)

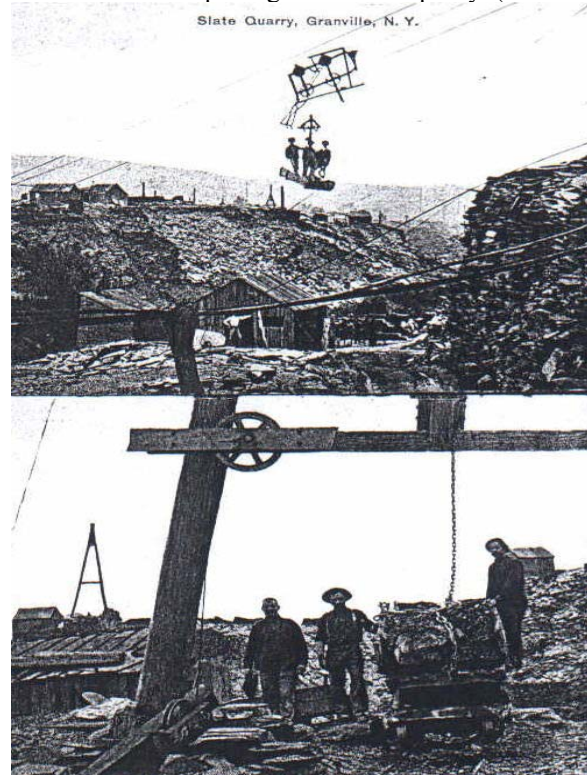


Figure 18. Quarrymen and swing derrick at quarry. (Slate Valley Museum)

Other tools that were used and adapted include those tools that are housed in the quarry shanty, the punchers and trimmers. These tools are both mechanically or belt-

driven tools that are used to finalize the finished product and ready it for sale. The puncher is a machine that would take the finished piece of slate and punch one or two holes in the top edge so that it could be fastened to a roof. The trimmer is a machine that takes a piece of slate and lobs the uneven edges off so that it makes a perfectly square or rectangular piece of roofing slate. Both of these machines were used in manufacturing roofing slate. Other machines that were developed include the sawing machine and the planer. The sawing machine is the first machine that the slate gets to after it is quarried out of the pit. This machine chunks the large piece of slate into smaller pieces, easily able to be handled. The slate planer is a machine that is used right after the sawing machine. This machine automatically trims the edges of the irregular block of slate and makes the surface smooth. After the planing machine, the slate is then placed on a large iron disk, on which it is ground smooth. During the early 1900's many of these machines automated the milling processes (Perkins, 1906). Figure 19 is a picture of the quarry shanties near the base of a slag pile. Figures 20, 21, and 22 show the tools used in slate manufacturing that were housed in a quarry shanty.

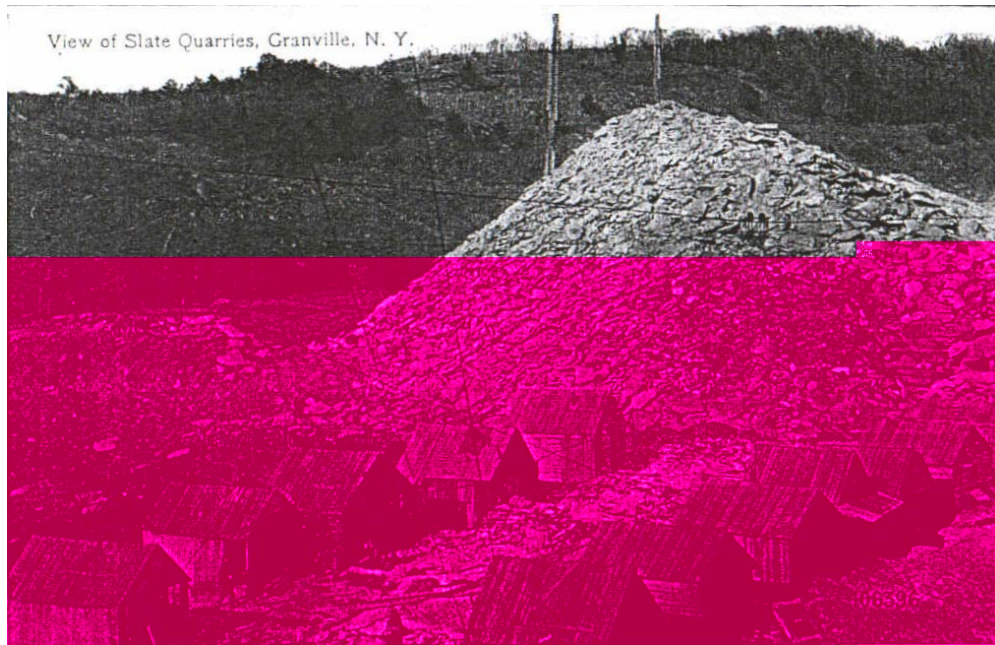


Figure 19. Quarry shanties by slag pile. (Slate Valley Museum)

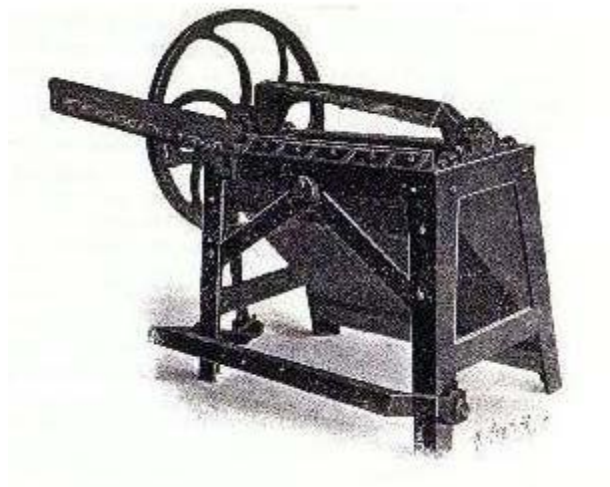


Figure 20. Slate trimmer. (Perkins, 1906).

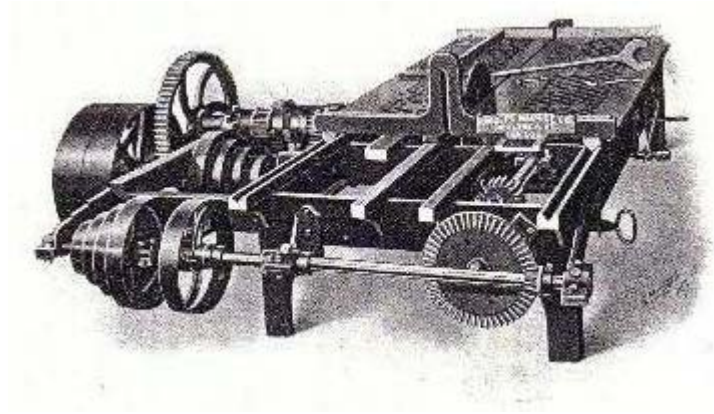


Figure 21. Slate sawing machine. (Perkins, 1906).

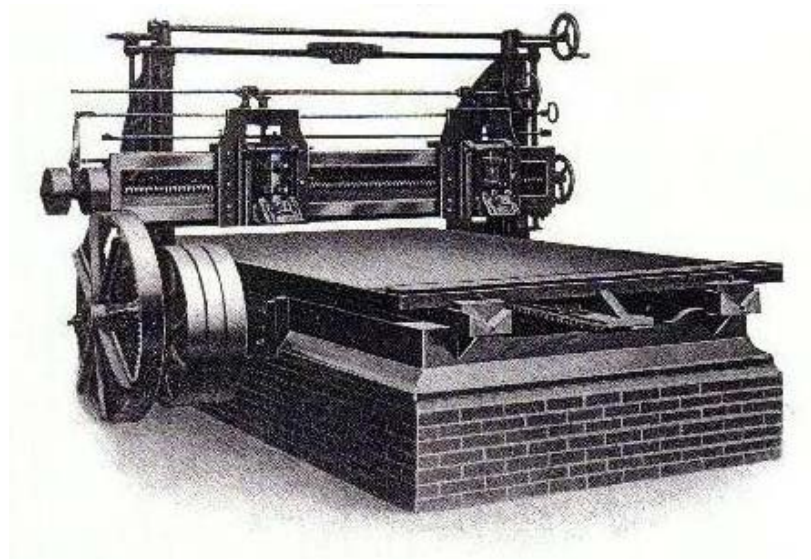


Figure 22. Slate planing machine. (Perkins, 1906).

Although many of these tools have gone by the wayside as technology has taken over the business, the ideas of them are still essentially the same. Newer quarries use newer technology such as transport vehicles and saws in order to manufacture the slate. There are tools today such as diamond-plated saw blades that make trimming slate a very precise practice, with less of the stone going to waste. Essentially, much of the practice of removing slate from the ground has remained the same; with explosions being the

main source of breaking the stone apart. However, today, there are fewer employees as compared to quarries of the past. This is because technology has been able to expedite practices such as transporting slate from the quarry to the processing building. Laser levels, diamond-plated saw blades, and stone cutting machinery have been able to make the quarrying process much faster and more profitable.

The Welsh were able to find a better way of life in the United States than in their native Wales. This was due to the fact that the tools and traditions brought with them to this country were able to change the slate industry in this area. This meant that the Welsh were very important to the slate industry. However, the landscape was forever changed due to these advancements in technology. The environmental impacts grew greatly as slate quarrying boomed. Due to the Welsh and their advancements in slate quarrying, it became one of the most important industries to the state of Vermont.

### **Slate quarrying between 1901 and 1930**

I looked at slate quarrying between 1901 and 1930, the number of quarries that were established and in business during that time, and economic impact of the quarries on the towns of the Slate Valley in order to show the projection of the growth of the slate industry over time. In researching this topic, I reviewed and researched literature from the Vermont State Geologist of the time, George H. Perkins. His reports every two years ([Report of the State Geologist on the Mineral Industries and Geology of Vermont](#)) established a way to see and discuss the growth of the slate industry throughout the Slate Valley.

The towns that I researched for this part were as follows, Poultney, Castleton, Fair Haven, West Pawlet, Pawlet, and Wells. Each of these towns were greatly impacted by the slate quarrying business, although Poultney, Castleton, and Fair Haven have a greater number of quarries during this time. I can deduct from researching immigration records for Poultney and Castleton that much of the increase of the quarrying business can be attributed to the Welsh immigration from the 1850s and 1860s. Since the Welsh had such an impact on these two towns, it can be projected that between 1870 and 1901 that the slate industry continued to grow until 1901 when the record is picked back up.

The following (Table 1) is a data record of the number of slate quarries in each town and the year in which they were recorded. Figure 23 is a graphical representation of table 1, showing the fluctuations of the number of slate quarries existing in each township. This table shows that the two towns that I focused my study on, Castleton and Poultney, had the greatest number of slate quarries (except for Fair Haven) over the time period between 1904 and 1930. This shows that the slate industry continued to grow over time from the 1870's up until the early 1900's.

Year	Poultney	Castleton	Fair Haven	West Pawlet	Pawlet	Wells
1904	15	6	3	7	2	3
1906	15	5	11	6	1	1
1908	14	10	21	5		1
1910	15	9	19	5		1
1912	13	8	11	5		1
1914	13	8	11	6		2
1916	13	8	11	6		2
1918	9	6	10	2		9
1920	6	5	11	1		8
1922	8	5	11	1		8

1924	8	5	11	1	8
1926	9	6	12	1	9
1928	9	6	12	1	9
1930	18	9	12	1	6

Table 1. Slate quarries in business in 6 towns from 1904-1930. (Perkins)

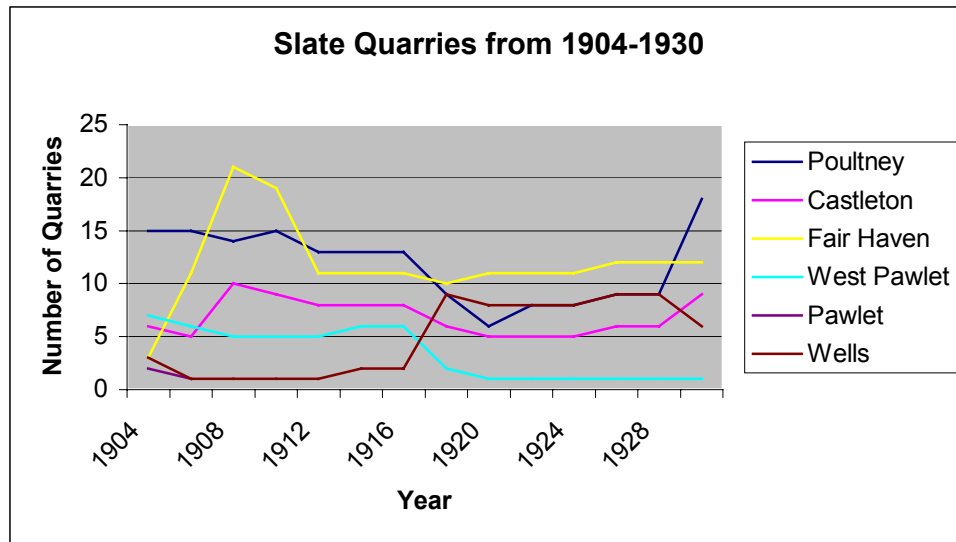


Figure 23. Slate Quarries in 6 towns from 1904-1930.

In looking at the graph above, one can see that there is a decline in the number of quarries from about 1912-1920. Much of this decline can be attributed to a national decline in the businesses of all stone industries, including marble and slate in Vermont. Some can also be attributed to a slate industry strike in 1907, which lasted for nine months. This strike affected many quarries in Vermont during that time because much of the buyers of Vermont slate began to buy from the quarries in Pennsylvania and never returned. However, the strike only affected quarries that produced ‘mill stock’ slate, which is used for billiard board tops, stair treads, and other commercial uses. The roofing slate business did not seem to suffer as much as the latter.

In looking at the nature of the slate quarries during this time, profits from the slate industry in Vermont must also be looked at. Although the records for profits are not as

regular as the records for the number of quarries in business, the general trend can be seen of an increase in profits until the last report in 1924. Figure 24 shows a graphical representation of the profits of slate quarries in Vermont (namely western Vermont) between 1902 and 1924.

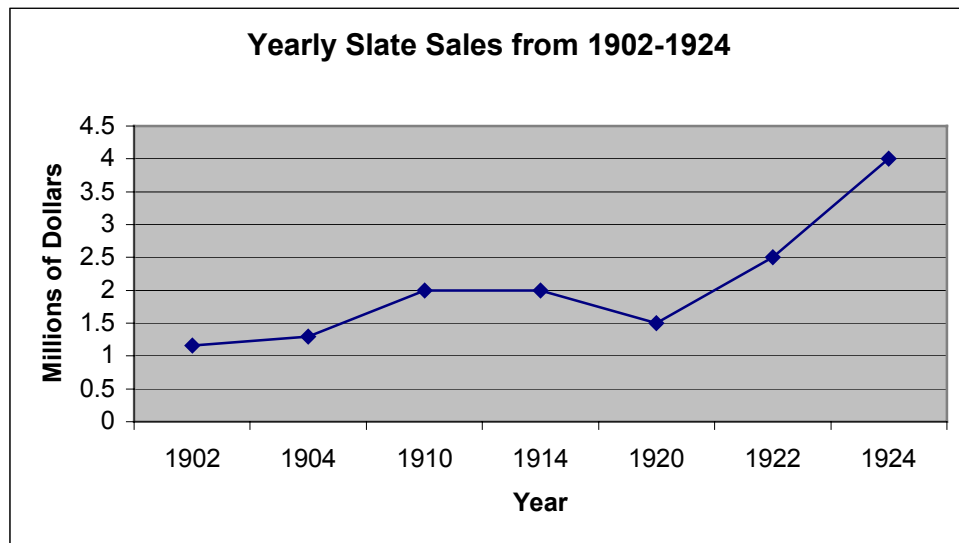


Figure 24. Yearly slate sales from 1902-1924.

One can observe that the revenue from yearly slate sales is continually increasing, with a slight decrease in profits between 1914 and 1920. There were no figures for the years 1916 or 1918, however Perkins elaborated that the reason for the slight decrease in profits was due to a decline in demand for ‘mill stock’ (as discussed previously) slate products. In 1918, Perkins stated that he believed that the slate industry is suffering in business much like the marble and granite industries, however there is evidence that an upward trend was about to begin. In looking at the graph, one can clearly see that the industry did actually rebound and became very profitable during the late 1920s.

The states that produced the largest quantities in 1912 were Pennsylvania, Vermont, Maine, Virginia, New York, and Maryland, named in order of production. For

as long as the quarries have been in business in Vermont, this state has been second in production amongst all the states that quarry the stone. For example, in 1922, Vermont produced 2/3 as much slate as Pennsylvania. This can probably be attributed to the vast areal differences in land between the two different states and the limited area of quarrying practices in Vermont.

In this section of the study, it is shown that between the years of 1900 and 1930, the slate industry was a very sustainable industry in all towns throughout the Slate Valley. There were a few small hiccups in the industry over this time period, including a strike of slate workers and a decrease in demand for the product. Slate quarries in other states, particularly Pennsylvania, became important during the short decrease in the slate businesses in Vermont. The value of yearly slate sales has an overall positive trend, peaking in 1924 at around \$4 million.

### **Environmental impacts of slate quarries**

I established that the slate quarries have a large environmental impact on the surrounding towns, from the beginning of quarrying until present day. These impacts are all environmental, but can be placed in different categories such as land degradation and damage to the environmental landscape and also environmental in the sense of the changing economic background in each of these towns affected. The impacts of the slate quarries can be felt all around the Slate Valley, not only in towns that are directly related to these businesses.

The first type of environmental impact that the quarries have is the degradation and damage to the surrounding landscape. These quarries essentially are large pits that

are cut into the ground wherever there is slate worthy of being mined. According to Perkins in his 1912 State Geologist Report, “A common beginning for a slate quarry is a strip of land twenty rods wide and on variable length determined by the character of the mass of slate.” To begin, the quarries damage the landscape by having to dig a large hole into the ground. This requires moving massive amounts of earth and large explosions to take away the first layer of soil and dirt in order to get to the slate. The environmental impacts here are obvious, including noise pollution, air pollution, and soil pollution, all due to using machinery to dig up the surface of the earth.

The next part of quarrying includes using explosions once again to break up the stone and haul it out of the quarry pit. The construction of many buildings causes more degradation to the land and its surrounding landscape. Trees must be felled in order to make way for land and lumber for processing facilities. Water is needed in order to cool the machinery and so that the slate will split uniformly. Exhaust from machinery also is produced and let into the air. Air pollution from machinery, water pollution due to use for cooling purposes and the juxtaposition of waterways next to quarries, and the degradation of the surrounding landscape by felling trees and digging up the ground all can be attributed to the quarrying processes. Figures 25, 26, and 27 all show the dramatic land degradation associated with slate quarrying and the surrounding landscape. Figure 28 shows a slate quarry with close proximity to a water source, a source of direct water pollution.

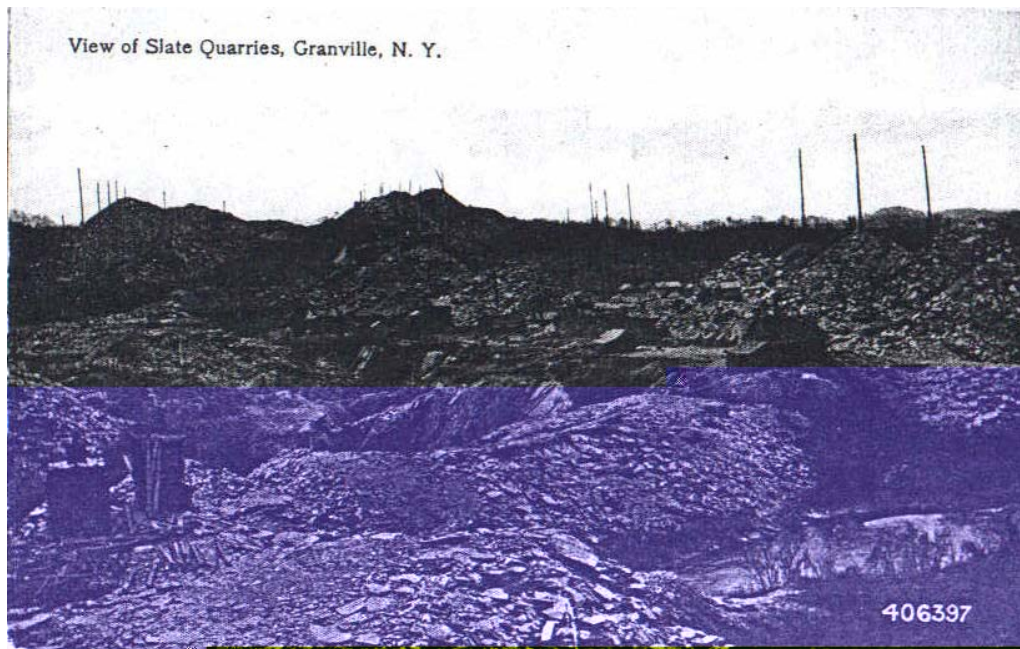


Figure 25. Slate quarry in Granville, New York and land degradation. (Slate Valley Museum)



Figure 26. Slate quarry and associated land degradation. (Slate Valley Museum)

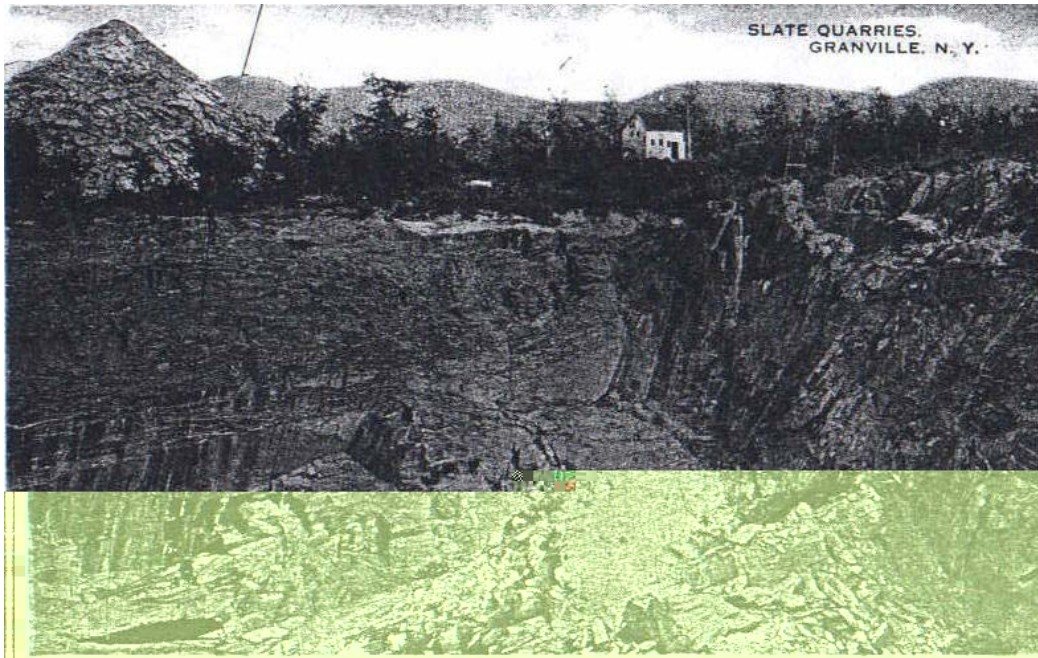


Figure 27. Slate pit with slag pile in background, landscape damage. (Slate Valley Museum)



Figure 28. Slate quarry with close juxtaposition to direct water source.

Many effects happen when quarries operate for a period of time and then close. One problem is that the quarry pit fills up with water, creating an artificial pond in its place. This can be a problem due to the various amounts of pollutants that have been

used in the extraction process and are now allowed to be washed away and diluted into a man-made water source. Figure 29 shows an abandoned slate quarry with a slag pile to the right and a quarry pit that is full of water, showing the landscape damage.



Figure 29. Abandoned slate quarry with artificial pond.

Other abandoned quarries are just left for nature to take its processes on. This includes the natural succession of plant life. This, many times, takes a very long time due to the amount of land that is affected by the quarrying processes. Much of the land is compacted by the vast amounts of machinery that move over it during the quarrying operations. Other land is covered in waste slate piles on which little or no plant life can grow due to lack of soil. The next two pictured depict a slate quarry on the shore of Lake Bomoseen, in Castleton, Vermont. The first photograph (Figure 30) shows the quarry at the height of its production in the late 1800s while the second photograph (Figure 31) shows the abandoned quarry as it is today.



Figure 30. Lake Bomoseen quarry in late 1800s, looking north. (Slate Valley Museum)



Figure 31. Lake Bomoseen quarry as seen today, looking west.

As can be seen by comparing and contrasting the previous two photographs, the slate quarries leave a lasting impact on the area in which they are working. While the quarry was in business, vast amounts of slag were dumped right along the shore of Lake Bomoseen. One can see that in the years since the waste was dumped, very few trees and plants have been able to survive in the rocky slag. It will, undoubtedly, take many more years before the plants are able to come back to the point in which they were before quarrying began.

## **Conclusions**

In beginning this thesis, I set out to learn about the slate quarries that dot the Slate Valley. The amount of information that I have processed is absolutely amazing and very enlightening to the workings of this entire area. The three main topics that I covered were that the Welsh had a tremendous impact on not only the quarries of the area but also of the social demographic of the towns in which they settled. The second topic was to look at the slate quarries a little down the line, namely 30 years past the end of the Welsh immigration study, to see what, if any, changes occurred. The third part was to discuss the environmental impacts that slate quarries have on the surrounding landscape in which they are located. The following are my conclusions.

### **The Welsh had a great impact**

In immigrating to the United States, the Welsh had found an area in which they could practice their trade learned in their home country. The tools and traditions that the Welsh brought with them from Wales helped to begin or jump-start many of the quarries that exist in the area. There is a definite increase in the number of quarries that started after the Welsh began arriving in the area, meaning that they helped to establish this business throughout the towns of Castleton and Poultney.

The Welsh also had a very profound impact on the social aspects of the towns of Castleton and Poultney, Vermont. Although they had settled in a very strange location, they held on to their traditions. I believe much of the reason the traditions were very strong in this area is because many were able to feel quite at home in the quarries. The

Welsh integrated themselves into community life and forever changed these towns.

Welsh heritage is still strong today in Poultney, where the local college has established a Welsh Heritage Program that preserves the history of these people. Green Mountain College has also started an exchange program with the University of Wales and a Welsh language program. The heritage and traditions are being preserved due to the hard work and efforts of many professors at this school.

**The slate industry business kept increasing for 80 years and beyond.**

In looking at the Vermont State Geologist Reports by George Perkins, much information could be derived. The quarries that had been established with the help of the Welsh immigrants years earlier were still very strong in the early 1900s. Due to the tools and traditions that the Welsh brought over, the processes in slate quarrying were able to continue on a grand scale. The trend was, overall, increasing over the time period from 1901 to 1930. In about 80 years, the slate industry had gone from being completely non-existent to being a \$4 million per year industry that had become a very important economic factor to the state of Vermont.

**There are great environmental impacts associated with quarrying.**

Although slate quarrying was a very important staple for the economies of the small towns in which they are located; there was a vast amount of environmental damage associated with this process. The landscape was a strictly agricultural one previous to the

establishment of the slate industry. This means that prime farmland was lost under tons of debris, waste piles, and quarry buildings. There was a great financial gain in beginning the quarries, however, the environmental damage is immense. All three of the main natural resources are polluted in relation to the slate quarries. Air pollution is because of the running of machinery and explosions that are required to extract slate out of the formations. The land is polluted because the previous landscape is torn apart in order to cut a hole in the ground where the quarry lies. Water is polluted because it is needed in many processes on the quarry, including cooling machinery and washing slate. There also tends to be very little environmental cleanup or remediation after a quarry closes down, leaving signs of the past.

### **Overall conclusions and personal reflection**

Overall, many of the methods that I set out to understand were able to be proven with some investigative work. I was able to show that the Welsh impact on the towns and the slate industry were a very lasting impact, with many parts of it still being felt in the communities of Poultney and Castleton even to this day. The tools that the Welsh brought to the area were quite revolutionary and helped to bring the slate industry to the mainstream, making it a very profitable business for the area, and probably allowing for the continual growth that has been exhibited to this day and beyond. That can also be seen with the glimpse of the slate industry between 1900 and 1930. Also, beginning with the Welsh during the mid 1800's, the environmental impacts on the surrounding landscape began and have continued, also up to this day. However, there are many

environmental regulations and laws that the slate quarries need to comply with today that were not in existence in the early days of slate quarrying. All in all, the Welsh were one of the most important groups to the slate industry on many different levels.

I have had a great time researching and learning about the slate quarries and the Welsh in the Slate Valley of Vermont. This topic can almost be researched indefinitely; much like the quarrying in the area can be mined almost indefinitely. There is still a vast amount of materials out there that could add to this paper, and possibly, in the future I would like to.

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