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**APPLYING MAPINFO TO WORCESTER**

**COUNTY CENSUS DATA**

**An Interactive Qualifying Project Report  
Submitted to the Faculty  
of the  
WORCESTER POLYTECHNIC INSTITUTE  
in partial fulfillment of the requirements for the  
Degree of Bachelor of Science  
by**

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## **Abstract**

Our primary goal is to improve upon the accessibility and visualization of the valuation data of Central Massachusetts. It is the focus of this project to accomplish this goal through the implementation of the MapInfo software. We will use MapInfo to plot and analyze agricultural census data obtained by Old Sturbridge Village from the period 1781 to 1860. This analysis continues the IQP project “Worcester County Valuation Returns” by Jeff Sinnamon.

## Authorship

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Authorship	Matthew Crandall
Mission Statement	Matthew Crandall, G. Andrew Mellors and Peter Fafard
Introduction	Peter Fafard and Matthew Crandall
Old Sturbridge Village	Peter Fafard
Prior Works	Peter Fafard
MapInfo	Matthew Crandall and Peter Fafard
Map Generation	Matthew Crandall
Analysis	Peter Fafard and Matthew Crandall
Worcester	Peter Fafard
Auburn	Peter Fafard
Worcester versus Auburn	Peter Fafard
Fitchburg	Matthew Crandall
Leominster	Peter Fafard
Fitchburg versus Leominster	Peter Fafard
Future Possibilities of the Project	G. Andrew Mellors
Conclusion	G. Andrew Mellors
Cumulative Results of the Research	Peter Fafard
Possible Enhancements to MapInfo	G. Andrew Mellors
Maps	Matthew Crandall
Bibliography	Matthew Crandall, G. Andrew Mellors and Peter Fafard
Maps for OSV were created by Matthew Crandall and G. Andrew Mellors.	

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### **Mission Statement**

Any visitor of Old Sturbridge Village would see the village as a piece of frozen time from the 1830's. However, to an historian, rural Massachusetts teemed with change. To gain a better understanding of the evolution of early life in Massachusetts, historians can investigate change through variations in state census data collected during this time period. We will use a software program, MapInfo, to plot and analyze the statistical census data used by Old Sturbridge Village. This analysis will be a continuation of the IQP project previously done by Jeff Sinnamon. For this project, we hope to accomplish a number of goals, each tapping our individual talents.

The methods of visual representation for census data at Old Sturbridge Village have long been obsolete. With advances in technology, this data can now be stored and displayed in ways thought impossible years ago. By using MapInfo software, it will be possible to view the census data through maps and tables. These new methods will prove invaluable to historians seeking knowledge of the past. No longer will the data be represented by numbers on a screen because MapInfo can create maps of the data, maps that present the user with information in a manner that is both informative and interesting.

Other institutions specializing in the study of historical places and events could (and should) use the processes the previous project undertook to introduce 'old' data to new technology. Perhaps one of the greatest advantages of having similar historical institutions using the same software program would be their ability to share crucial information now, instead of ten days from now. By limiting the research time and providing data in an organized and easily understandable form, we are allowing for a

much more in-depth analysis and conclusion of the material. We believe that this software will be a great asset to not only Old Sturbridge Village, but to all historical organizations like it.

## Introduction

### **Old Sturbridge Village**

Old Sturbridge Village officially opened in 1946. Since then it has amassed substantial amounts of historical artifacts and documents, becoming an historical haven for scholars, historians, and interested visitors alike, allowing today's generation to view an era of the past with uncanny accuracy. The village's own origins began oddly enough with a game of golf. Scheduled to play golf with a few friends in Vermont in 1926, Albert Wells was discouraged to hear to the pitter-patter of rain. Knowing that his day of golf was cancelled, he set out with his friends on a new mission. They were going on an expedition to collect antiques. Wells had dabbled in collecting before, but this particular day proved quite different. He was entranced by the story and character that each piece brought with it. Coming from a prominent family in Southbridge, Massachusetts, Wells certainly had the funds with which to obtain nearly any item his heart desired, being an owner-executive in the American Optical Company.

His passion for collecting was contagious though, and so his brothers became interested in acquiring objects from the past, although each had their own area of preference. It was at home in Southbridge that the Wells brothers chose to store their new found treasures. Their collection grew until they were forced to move out of their home for lack of adequate living space. By the early 1930's there were more than forty-five rooms full of historical artifacts.

Quite soon it was realized that there was potential for much more given the resources behind the Wells family. A year later, in 1936, the Museum's trustees approved Albert's proposal for the construction of a walk-in village. The main premise

of the walk-in-village was to allow its visitors a glimpse into the everyday life of the 1830's. After suffering several hardships, in 1946, the museum opened to the public. Taking the new name of Old Sturbridge Village, the museum officially opened its doors in June of 1946.

After nearly sixty years of operation, Old Sturbridge Village is still essentially the same as it was when it opened. One important change from when it opened is that now the village acts also an educational outlet for students and historians alike. Now, Old Sturbridge Village looks to the historical documents of the past for insight and understanding of a time that is steadily fading into the past. As such, they have amassed a substantial collection of historical texts and documents, giving interested scholars the tools with which to unlock the mysteries of the past. Jack Larkin and Mark Ashton said of the future of the village, "today the Village faces the challenges of a new century and a new millennium. The information superhighway and rapid social and economic changes are carrying us away from the nineteenth century at breakneck speed. But the pace of change makes the Village's mission more important than ever as the museum begins its second half century committed to preservation, education, interpretation, and the sheer enjoyment of history. The 'live village' has become a national treasure, whose story is of enduring importance to America's collective memory."<sup>1</sup> Larkin and Ashton are explaining the trend of today's society to look toward the future instead of the past and the consequent difficulty of historical education. It is through the application of new and interesting technology that Old Sturbridge Village can interpret the past in ways thought impossible years ago. Our project will present one possible avenue of this, creating maps

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<sup>1</sup> Jack Larkin and Mark Ashton, "Celebrating Fifty Years of History," *Old Sturbridge Visitor*, Spring, 1996 p. 6.



to demonstrate trends and cycles of people and agriculture during the early to mid 19<sup>th</sup>-century.

### **Prior Works and Research**

#### **Jack Larkin, How New England's Rural Landscape Changed**

Current attempts to understand and present the rural New England past at Old Sturbridge Village are lead by Jack Larkin. Larkin is the Director of Research, Collections, and Library at Old Sturbridge Village. He is also the author of several books, such as Northern Comfort, The Reshaping of Everyday Life, and Children Everywhere. Mr. Larkin is an accomplished historian with a particular interest in the everyday life of 19<sup>th</sup>-century America.

Larkin is particularly interested in making historical use of agricultural changes over the period 1791 and 1850. Every ten years, Massachusetts ordered “each town to provide a detailed report on its agricultural, commercial, and manufacturing output. Beginning in 1791, they (state valuation returns) provide data for each community on bushels of crops produced, numbers and types of livestock, acres of land used for field crops, hay pasture, and woodlot, and numbers of houses, barns, and mills.”<sup>2</sup> It took Mr. Larkin months to gather and analyze all of the pertinent information and calculate percentages that would provide useful, quantitative results as to how specific areas of agriculture changed in Central Massachusetts.

It is our responsibility to present him with the means with which he can significantly shorten the amount of time needed to prepare the data for analysis and also

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<sup>2</sup> Jack Larkin, “How New England's Rural Landscape Changed,” *Old Sturbridge Visitor*, 2001.

display the fluctuations in new and interesting ways. For this, we have chosen to use software from MapInfo.

### **Worcester County Valuation Returns**

A previous Interactive Qualifying Project, completed by Jeff Sinnamon, converted all of the old, pertinent census data at Old Sturbridge Village into tables that were readable and easily manipulated. To see in detail the path of the conversion process we suggest using the previous, in-depth IQP as a guide. The purpose of his project was to format the old data into tables that were readable within MapInfo, the software implemented for this project. Our project will be a continuation of the previous one, demonstrating how these tables can be manipulated and used to show important historical changes.

This project will use the information and data obtained from this project as well as Larkin's idea as to where the research should be applied. The next section will describe the process behind making different types of maps that can be created using MapInfo that are of best use to historians.

### **MapInfo**

MapInfo is a software application created by the MapInfo Corporation. MapInfo Corporation is a "global company and software technology leader. They provide location-based solutions and services that help organizations better understand"<sup>3</sup> their respective interests. In the case of Old Sturbridge Village, we are interested in viewing variations in the census data over the period 1781 to 1860.

MapInfo was chosen for this project because of its ability to quickly and colorfully map selected data. When viewing historical data it is much more interesting to

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<sup>3</sup> MapInfo Corporation, (accessed January 21, 2003); available from <http://www.mapinfo.com>; Internet.

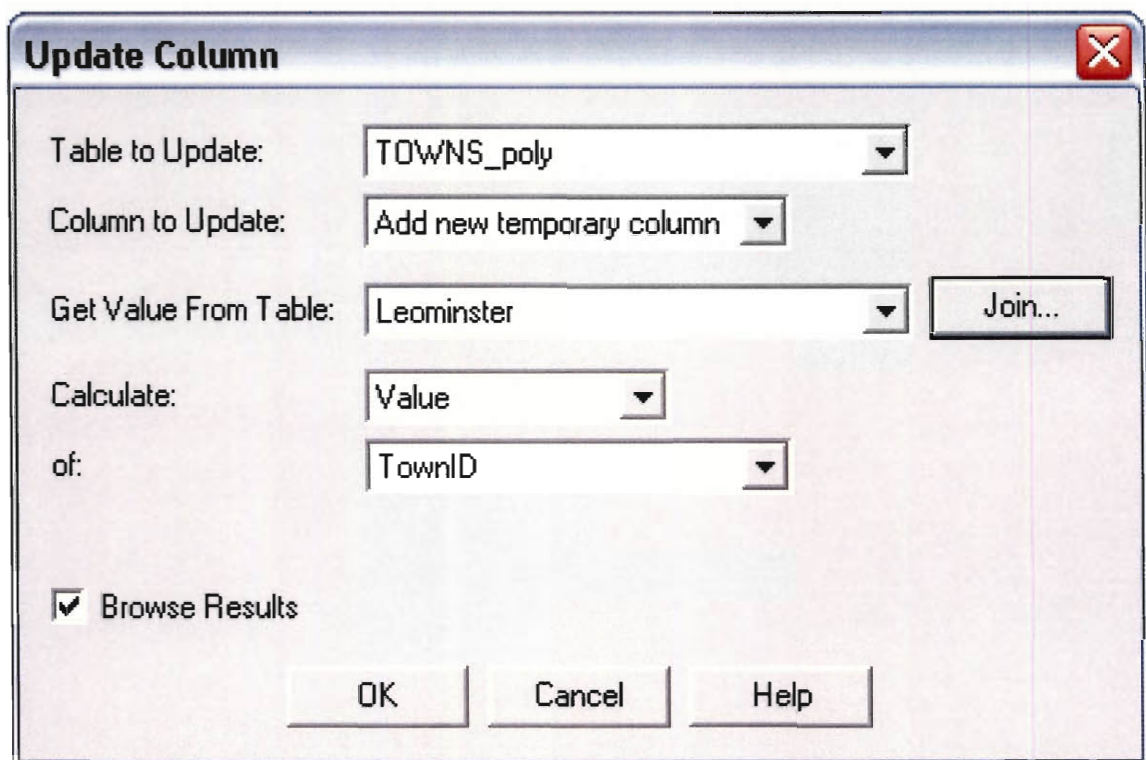
see the information not as numbers on a page, but rather as a map from which you can easily draw educated conclusions. Also equally important, is the ability to merge selected data tables within the application. This is very important, as it saves valuable research time and provides functionality.

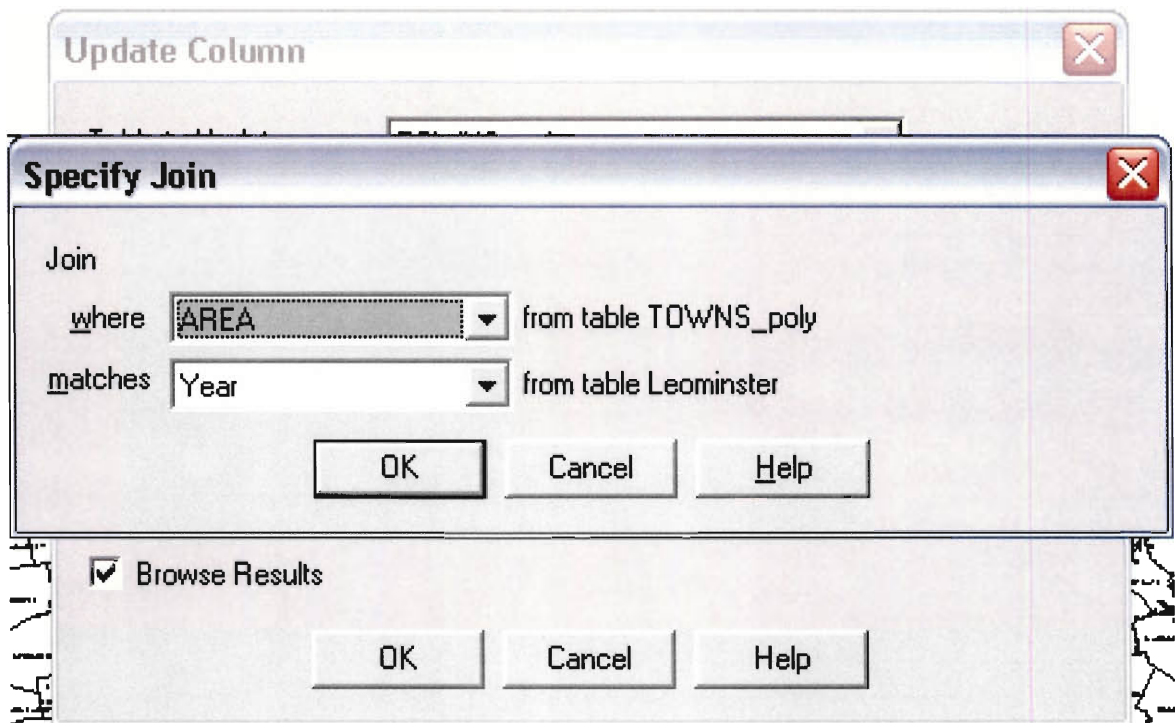
### **Map Generation**

The data that we received from OSV was in SPSS. This is an old program that was originally written for Dos. The format in which this program stores its data, not being compatible with MapInfo, needs to be converted to a format that MapInfo recognizes. Because of its age SPSS has many problems working with modern programs. Some of these problems include short variable names. Since DOS could only handle 8 character file names, that is the most number of characters that could be allocated towards variable names.

SPSS is also inadequate because it has poor data storage. The data storage method has two major flaws. It is command delimited and it has poor or no type casting. Type casting is the ability for the program to know the type of data it is saving, such as an integer or a string. The type casting comes into play when one needs to compare data and match fields. Since there is no type casting then all fields, whether they are numbers or letters, are all treated the same. This makes comparing very hard because you will need to sometimes compare a string of numbers with another string of numbers, this is very difficult compared to comparing two or more numbers in integer or floating point form. The comma-delimited format makes storing large amount of data very hard and very large. With many modern databases there is some sort of compression or other storage method used on the data.

After the data is in a format that MapInfo accepts, we need to make MapInfo know how to map the data for us. Combining a data file that contains polygons for the map and town IDs with our data by comparing the town IDs from both files and adding a variable to the file containing the polygons where the town IDs matches does this. This has to be done for each variable that needs to be added to the polygon table. This is done because the SPSS data does not contain information on how to draw maps. The files that contain polygon information tell MapInfo how to draw maps.

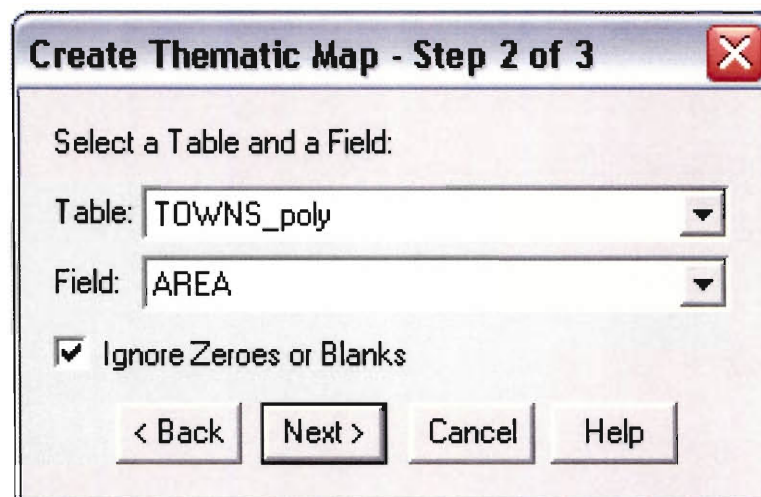
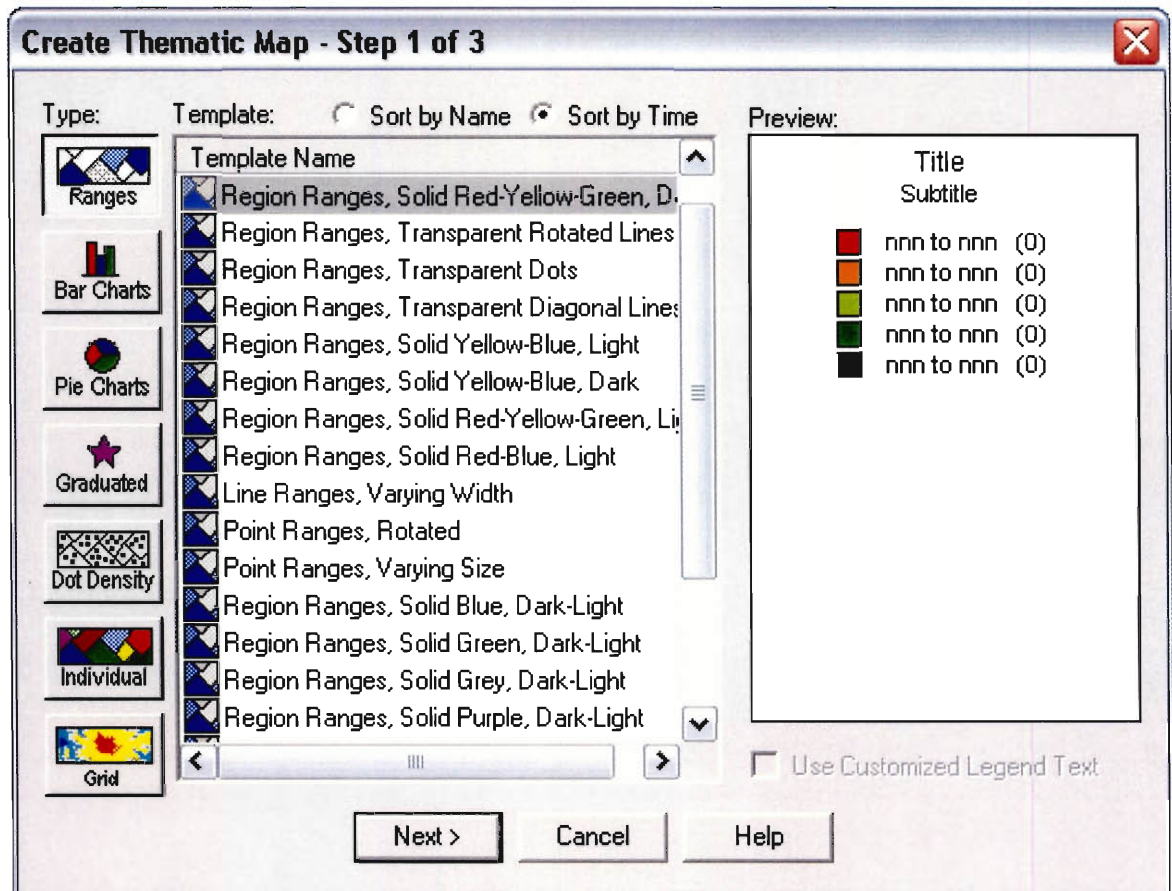


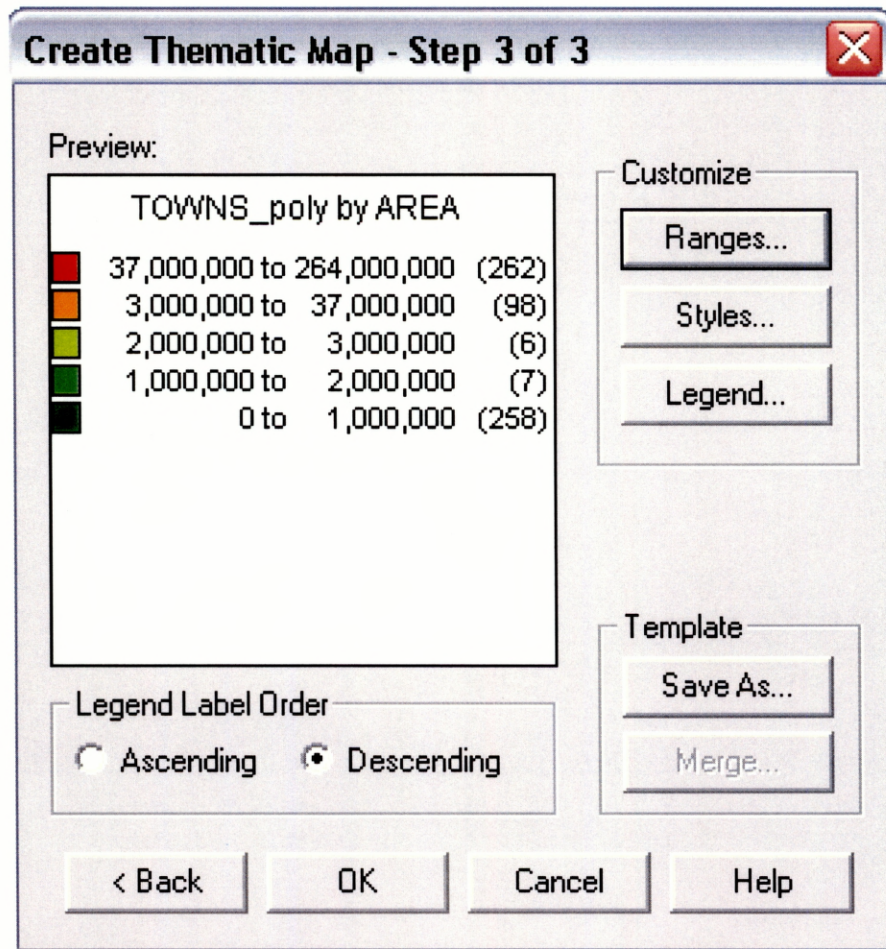


Since the polygon data is from 1990 and the SPSS data is from 1780 to 1860 some town IDs do not match up. The explanation for most non-matching towns is that they no longer exist, since the town IDs have not been changed.

MapInfo allows the user to create many different types of maps. Choices for two-dimensional maps include: region ranges, line ranges, point ranges, dot density, and grid. Region range maps shade or color ranges of the created map with the given data. Line ranges are maps that represent the given data through the thickness of the drawn lines. Point ranges represent their data through the size of dots or the angle at which a specified icon is rotated. Maps that use dot density to represent their data represent data through the number of dots in a given area. Grid maps do not represent data but creates a polygon drawing specified by the user. The most useful of these maps has turned out to be the regional maps. Their representation of data is shown more than any other, and more clearly, through their vivid colors and clean shading. It is much easier to make a

distinction between colors than the thickness of a line or how far an icon may be rotated or how many dots are within a square inch.



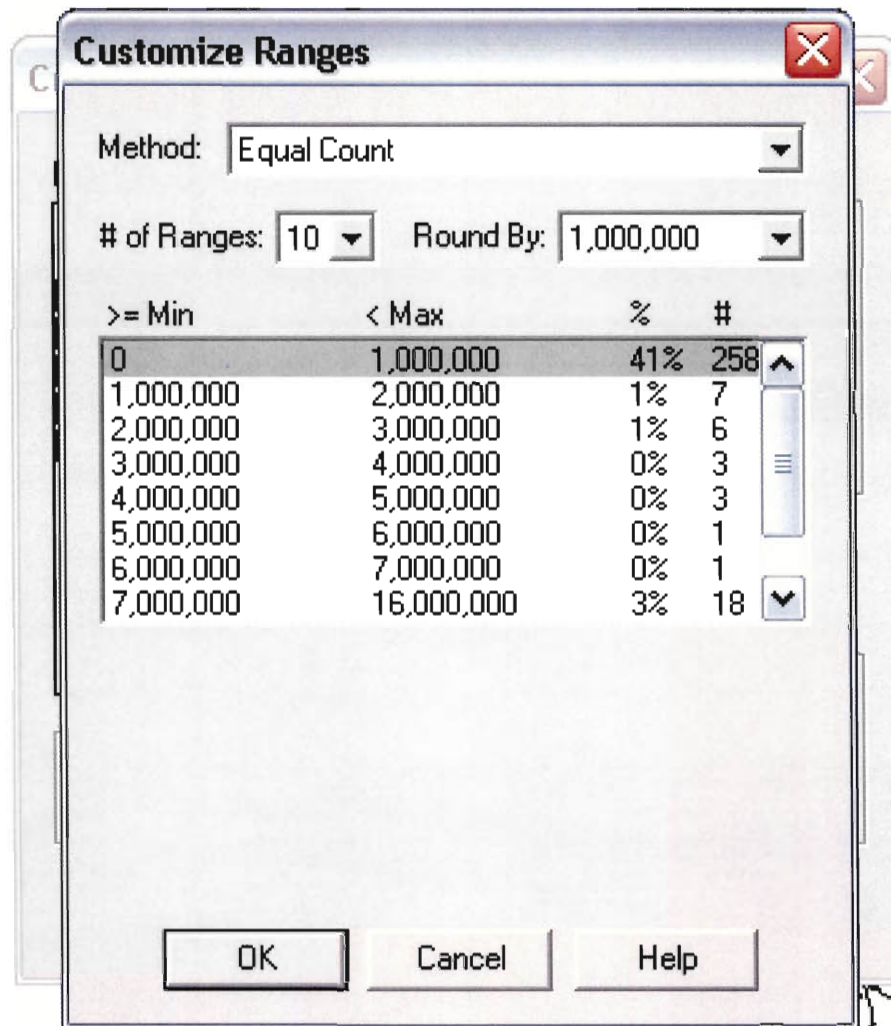


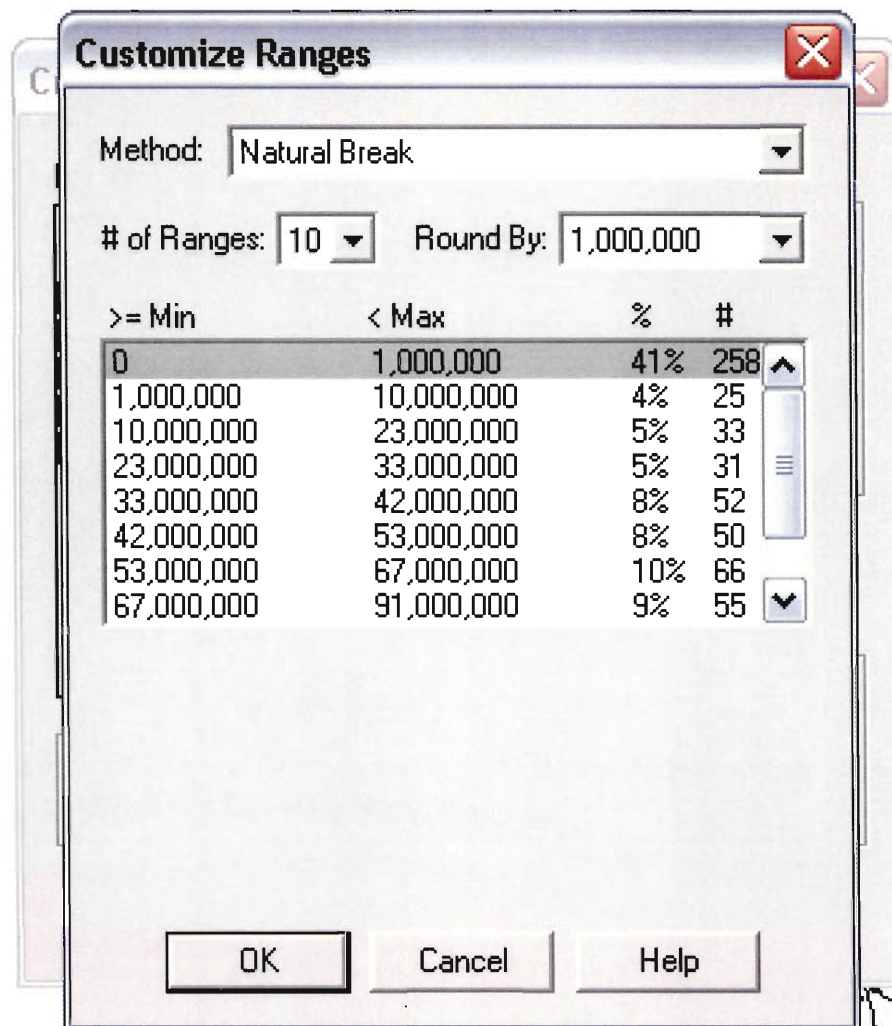
Three-dimensional mapping is also an option in MapInfo. The implementation feels very underdeveloped. The maps are unclear and unreadable. This makes creating a three-dimensional map pointless.

The next step in creating a map in MapInfo is choosing how the data is to be divided up. Two important decisions need to be made. The first decision is how many divisions should be in the data. If there are too many divisions the legend becomes complicated and the colors in the map become hard to differentiate. If the user chooses too few divisions then the information displayed in the map tells less because too many regions will be displayed as the same even though their data may be very different. The second important decision that needs to be made by the user is what formula to have

MapInfo use to split the data between the desired number of regions. The user has the following choices: an equal count, equal ranges, natural break, standard deviation, or quantile. Equal count attempts to put the same number of records in each region. If the number of records is not evenly divisible by the number of ranges, the remaining records are placed into the most appropriate ranges. In equal ranges, MapInfo creates ranges in which the difference between the value of the top and bottom records is the same across the ranges. Natural break is determined by each range having the difference of the value of its records and the average value of the records to a minimum, so that the values can be as close to the average as is mathematically possible. Standard deviation is computed by taking the middle range at the mean of the record's value and the other ranges are one standard deviation away from the neighbor range. In quantile MapInfo lets you choose a variable in the data that the variable that is about to be mapped is distributed across. The user must use this knowledge and decide the amount of ranges and the formula to apply to the data to determine how the ranges are determined on a map-by-map basis.

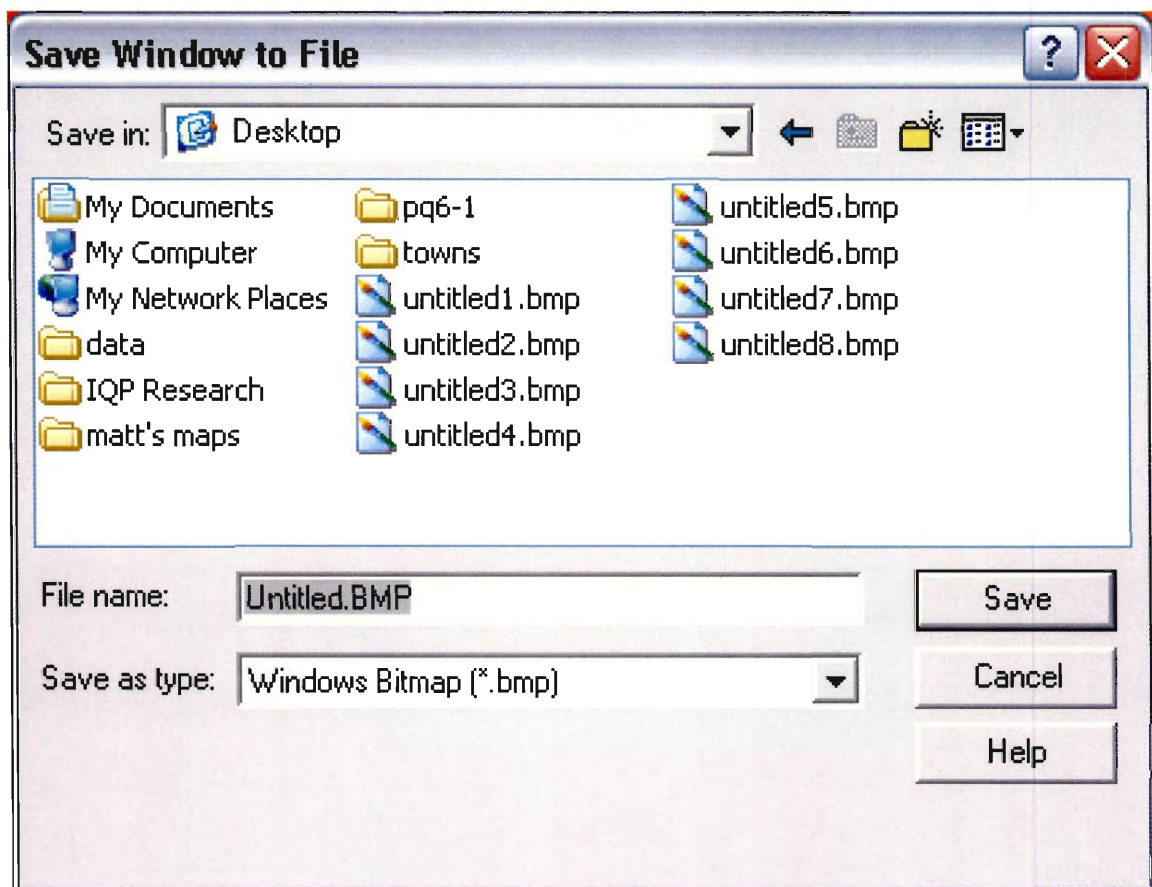
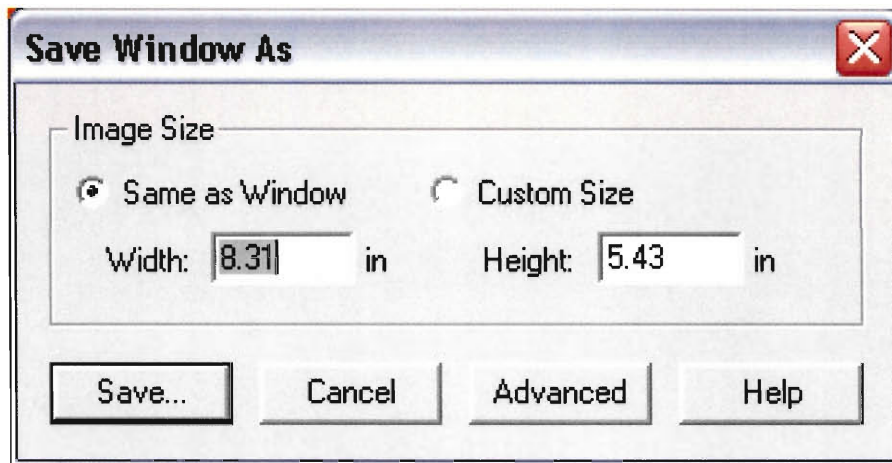






Once the map is created it is important to be able to share the information created with other people. MapInfo allows saving generated maps as raster images. A raster image saves image data by saying pixel “a” is color “b”. This has severe limitations. Enlargement of a raster image brings out problems with quality. The image loses sharpness and becomes harder to read. That is why it is important for the user to be certain that when the user is saving the map to a raster image what the map currently looks like is what the user wants as an end product.

Choosing “Save Window As” from the “File” menu saves a map to a raster image. Then proceed to the standard Windows save dialog box.



Now that we know how to create maps using MapInfo, we can then use these maps to analyze the historical data that was received with Jeff's Project. The data that will be looked at will be derived from Jack's vision of where this project should be going.

### Research Analysis

We will examine two major cities of Central Massachusetts, Worcester and Fitchburg, over the years 1781 to 1860 and use data and maps created within MapInfo to view variations in the census data. From there, we will further elaborate on these variations so as to explain their causes and subsequent effects upon the region as a whole. We will also choose a neighboring town for each city and view the subsequent effects of an industrializing city upon a largely rural community. From there we will compare the relevant variations of both the cities and towns against one another and the region as a whole.

We chose two major cities as a focal point because change, in general, occurs in the cities first and is then reflected in the outlying, rural communities second. In this manner we hope to present a logical sequence of change within the cities and towns. From this point, we will then apply our findings to generalize the changes throughout Central Massachusetts.

In the following analyses we will show the path of several agricultural communities during the period 1781 to 1860 and the subsequent effects brought about by the changes in economical and social transitions. We will show how the farmers of old were forced to compete and adapt to the changing economy of the 19<sup>th</sup> century.

#### **Worcester**

Prior to the late 18<sup>th</sup> century, Worcester was a sparsely populated community with little industry. However, as time progressed and the methods and means of transportation improved, Worcester became an attractive possibility to many farmers seeking profit within the crossroads of Worcester. Having a central location, water sources (Blackstone

River and Lake Quinsigamond), large areas of undeveloped land (4,246 acres in 1801), and untapped industrial potential, Worcester began to quickly grow into the sizeable city of today. In his report on the Geology of Massachusetts in 1841, Professor Hitchcock wrote,

“This valley (Worcester’s chief business portion was located in a narrow valley extending north and south) possesses precisely those features which art is capable of rendering extremely fascinating. And there is scarcely to be met with, in this or any other country, a more charming landscape than Worcester presents from almost any of the moderately elevated hills that surround it. The high state of agriculture in every part of the valley, and the fine taste and neatness exhibited in all the buildings of this flourishing town, with the great elegance of many edifices, and the intermingling of so many and fine shade and fruit trees, spread over the prospect beauty of a high order, on which the eye delights to linger.”<sup>4</sup>

Between the years of 1781 and 1821, Worcester did not experience much change. There was the steadily increasing population, but not so much as to distinguish it from any of its other neighboring towns. During these years Worcester was a rural community in every sense of the word. Over this period the population increased by about 41 percent (2095 to 2962). Given the area of the city (22,809 acres), this was only a 3 percent increase in the number of people per square acre within Worcester.

However, between the years of 1821 and 1850 Worcester experienced a tremendous boom in its residential sectors. People filtered in to Worcester at an astounding rate. Worcester averaged 486 new citizens per year, making it the fastest growing city in Central Massachusetts. The population of Worcester grew from 2,962 in 1821 to 17,049 in 1850 (see Map 2). That was a 476 percent increase.

Concurrent to the rapid increase in population there was an equally impressive growth in housing. During this time period, the number of new houses grew at a slightly

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<sup>4</sup> Abijah Marvin, *history of Worcester County, Massachusetts Volume II*, (Boston: C.R. Jewett and Company, 1879), pp. 569-571.

lower, but equally impressive, rate than that of the population of Worcester (see Map 6). Beginning at 385 dwellings in 1821, this number skyrocketed to a remarkable 1,972 dwellings by 1850 (see Map 1). That was a 412 percent increase. However, we know that most of the “New Englanders who grew up on Worcester County farms during these years went elsewhere—to farm in the West or to swell the population of the region’s cities and villages.”<sup>5</sup> This reflected in the dramatic growth of Worcester over the period 1781 to 1860.

“Three factors have been mainly responsible for the growth of Worcester: a location in the geographical center of Massachusetts, a complete transportation system, and a long succession of inventive geniuses.”<sup>6</sup> The improved methods of transportation were responsible for the large increase of people in Worcester. In 1828 the Blackstone Valley Canal was completed, linking Worcester to Providence, Rhode Island.<sup>7</sup> “It is the testimony of business men who remember the events of the time when the canal (Blackstone Canal) was traversed by many boats deeply laden, that the prosperity of the two termini, Providence and Worcester, was greatly advanced, while the villages between were called into existence, or much enlarged. The population of Worcester took a start in the decade following the opening of the canal, which it has never lost. The town rapidly took the proportions of a city, and it became the center of a more extensive trade.”<sup>8</sup> Three years after the canal had been opened its whole length, the Boston and Worcester Railroad was incorporated.

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<sup>5</sup> Jack Larkin, “How New England’s Rural Landscape Changed,” (Old Sturbridge Visitor, 2001), p. 15.

<sup>6</sup> Albert Farnsworth, *The Story of Worcester, Massachusetts*, (Worcester: The Davis Press, Inc., 1934), p. 99.

<sup>7</sup> New England Trails: Trail History, (Accessed on February 6, 2003); available from <http://www.umass.edu/greenway/NETrails/5NET-his1.html>; Internet.

<sup>8</sup> Marvin, Vol. I, p. 82.

The introduction of the railroad to Worcester no doubt played the largest part in the remarkable population increase. The first train through Worcester arrived July 4, 1835. During the first six months a total of 72, 558 passengers travelled on the Boston and Worcester Railroad. For the first time, the people of Worcester and the surrounding areas had rapid access to places outside of Central Massachusetts

With the introduction of railroads to Worcester in the 1830's, farmers had access to new markets outside of their previously limited borders. However, the railroads also had negative effects upon the farmers of Worcester. Eager to gain a foothold in new markets, farmers outside Central Massachusetts were given the opportunity to sell their own crop and goods to new and growing markets. As a result, the agricultural side of Worcester grew very little over the 1821 to 1850 period. Those who chose to remain farmers had to specialize and become more efficient in the crops that they chose to grow in order to compete with new suppliers. A noticeable change was that while the number of farms remained stable<sup>9</sup>, their sizes and types of crop were subject to improvements. For instance the number of barns in Worcester more than doubled, signifying the need for more storage and better housing for livestock (Map 5).

Dairy became increasingly important as the number of cows increased 82 percent. "From 1791 to 1850 the output of rye, New England's principal bread grain, declined steadily and its production relative to population fell by 70 percent (based on all of Central Massachusetts)."<sup>10</sup> Since Worcester underwent such an extreme population increase, it is not fair to use such a comparison against Worcester. However, one can clearly see that the production of rye did in fact steadily decline over the same period,

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<sup>9</sup> Larkin, "How New England's Rural Landscape Changed," p. 14.

<sup>10</sup> Larkin, "How New England's Rural Landscape Changed," p. 15.

falling more than 78 percent (see Map 3). Along with this, the cultivation of corn, oats, and barley grew significantly, increasing by 243 percent, 110 percent, and 414 percent respectively.

While trains were becoming an increasingly efficient and more effective means of travel, horses were still the preferred means of transport for short distances and were also beginning to replace oxen, since the horses could move much faster to power the new agricultural machinery. Over the period, 1831 to 1850, the number of horses grew by 124 percent. In order to keep the horses in top form, owners had to feed them well. Horses ate mostly hay and since cows, which also eat hay, increased as well one would therefore expect the total hay in Worcester to increase. Hay did in fact go up. Total hay increased by 82 percent, going from 3,704 in 1821 to 6,757 in 1850.

An industrialization wave struck America in the early 19<sup>th</sup> century. “Probably no city in the country has so great a variety of manufactures in proportion to its size as Worcester. Even before the introduction of the railroads there was a goodly variety, and with the era of steam communication began a development of manufacturing interests which has steadily increased to the present time.”<sup>11</sup> Like a magnet, Worcester pulled people from all over attracted by the promise of opportunity and change. Men and women alike entered the industrial field, where the hours were long and the pay at a minimum. Many entered this field out of necessity. Immigrants arriving from Europe and beyond, who owned no land, had two choices, work on a farm or work in a factory. A farm was only arable for at most three quarters of the year which left a lot of down time where money was tight and food scarce. Unlike the farm, the factory job offered year round employment so long as they proved themselves to upper management. Both

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<sup>11</sup> Marvin, Vol. II, p. 65.



suffered from risk of drought and seasonal disasters. In the case of a drought, the farmer would understandably be hurt and his crop would be weakened, leaving him with no need for hired help and the factory worker would also feel the loss, in that he/she could receive a pay cut or even lose their job to make up for increased shipping and manufacturing costs. The Embargo Act, passed in 1807, “stimulated manufacturing and from then until about 1840 there was a considerable increase in the number and type of mills built. The modern period begins with the use of steam as a motive power and rail connection with the south and west.”<sup>12</sup> And so with the passage of the Embargo Act Worcester gradually became less and less dependent upon its own agricultural products. Able to import such goods with ease, Worcester now turned over a new leaf and focused on becoming a leading industrial city in America.

Using the change in population as a means with which to measure the tendencies of the people, it is obvious that more and more people were coming to the city for reasons other than to work on a farm. Once again, this was due to the progress of industrialization. People saw that this was the future of America and tried to integrate themselves within the system. While it may have taken other cities and towns longer for such a change to occur, make no mistake about it, this change did occur. The gradual movement away from agriculture to a more stable and less competitive industrial job was a path many citizens chose to make all over Central Massachusetts.

### **Auburn**

The neighboring town of Auburn shows several interesting changes over the same seventy year period. Auburn was a largely rural community with a majority of the

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<sup>12</sup> Farnsworth, p. 129.

populace living or working on farms. As the years progressed, however, certain aspects of this small town began to change.

“The town of Auburn lies hard by the heart of the Commonwealth. The distance from Worcester is six miles,”<sup>13</sup> which certainly held advantages for a small town like Auburn. The increased usage of horses in the beginning of the 19<sup>th</sup> century as a major means of transportation meant that people did not have to live in the city to sell their goods there. The creation of the Blackstone Valley Canal and the subsequent incorporation of the Boston and Worcester Railroad also had positive effects upon the town of Auburn. “Not only did the stages and the great teams of six, eight and nine horses meet the railway at its western terminus, but new business sprung up in the outlying towns, and people were incited travel by the facility offered.”<sup>14</sup> And so, people were able to take up residence in the towns neighboring Worcester.

There was an increase in the population of Auburn, although much less dramatic than that of Worcester, over the years 1801 to 1850 (up 65 percent, Map 1). This trend continued throughout the remainder of the century. Worth mentioning though, is the fact that over the period 1830 to 1840, the population of Auburn actually decreased. We attribute this to the border disputes of the 1830’s. Some people were counted as belonging to a town with which they did not belong because of the ever-changing parish borders. One must remember that during this time church and state were strongly connected. Many small towns chartered during the early years of the United States were centered about a church or parish. As a result it only made sense for towns to establish borders based upon the parish limits.

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<sup>13</sup> Marvin, Vol. I, p. 240.

<sup>14</sup> Marvin, Vol. I, p. 83.

There were also increases, as one would expect, in the number of dwellings (up 46 percent, Map 2) and in the number of barns (up 65 percent, Map 5). Contrary to the cumulative facts, “the number of barns increased sharply (in Worcester County), almost doubling through 1841,”<sup>15</sup> here it was evident that there were some towns where the population actually surpassed the growth in dwellings (Map 7). This was reflected in the variation in census data over the period 1801 to 1850, where the number of people per dwelling increased from 6.7 to 7.6.

Auburn had an abundant supply of water and so the agricultural parts of Auburn flourished. “From the center radiate four roads and on these and their branches are the farms and tilled lands that make Auburn what it claims to be--a producing, agricultural district. The soil is dark, strong loam, growing lighter in the southern part of the town, and produces abundantly.”<sup>16</sup> In comparing the agricultural numbers of 1801 to 1850, it became apparent that farmers were specializing in order to get the biggest bang for their buck.

Opening in 1838, the station of the Norwich and Worcester branch of the Hartford and Erie Railroad brought about much change to the small town of Auburn. The addition of the new railroad station and the use of the recently constructed canals no doubt caused the need for crop specialization. Crops and goods from the West could be moved cheaply and swiftly to New England, and competition soon increased significantly. If a New England farmer was to survive, he had to become cheaper and more efficient than his western counterparts. Farmers were forced to curb costs by any means necessary in order to survive and so many were forced to convert to cash crops and stock. The only crops to

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<sup>15</sup> Larkin, “How New England’s Rural Landscape Changed,” p. 14.

<sup>16</sup> Marvin, Vol. I, p. 248.

have significant positive changes were oats and corn. Oats and corn made up 93 percent of the crop produced by farmers in Auburn and in 1850 they constituted 96 percent of the total crop produced, showing the increased specialization of oats and corn. Another important change was the decrease in pigs and the subsequent increase in cows, oxen, and horses. Like so many towns and cities of the times, horses were being used both for transportation and plowing.

During the period 1841 to 1850, the amount of unimproved land decreased by 36 percent. Out of this, only 0.05 percent was tilled, showing the stabilization of farming and the growth of new industries in Auburn. Buildings began popping up all over Auburn at this time, going from having 16 miscellaneous buildings in 1801 all the way to 53 in 1850. The number and types of mills present in Auburn also grew, adding a paper mill, losing a saw mill, and also adding shops and storage buildings throughout the town.

### **Worcester versus Auburn**

“Cities were noisier, dirtier and more unhealthy than rural communities, but far more exciting, more anonymous, quicker-paced and immersed in cash and trade. They were the focal points of culture as well as commerce.”<sup>17</sup> Worcester was to Auburn what a host is to a symbiote. During the early stages of both communities’ lives, a mutual partnership was crucial to both their survival and development. Auburn was helpful to Worcester in that the town had benefits of its own for the city. For instance, Auburn brought with it the addition of both new customers and producers to Worcester markets, bilaterally increasing both sides of the marketing equation. Auburn also added product differentiation to Worcester’s market place since some things were cheaper and more efficiently grown in the rural town of Auburn, where land was less costly and more

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<sup>17</sup> Jack Larkin, *Reshaping Everyday Life*, (New York: Harper and Row, Publishers, 1988), p. 9.

available. As time progressed though, Worcester developed the ability to exist independent of Auburn. With the introduction of canals and railroads Worcester had access to an abundant market place outside its city walls.

Of course Worcester had a similar, positive effect upon Auburn. With the increasing usage of horses as a major means of transportation and the recent improvements in other methods of travel, people who wished to do business in Worcester no longer needed to actually live in Worcester. Auburn was a logical choice to set up residence, being close to Worcester, water, and several neighboring farm towns.

Based solely on data relevant to the topics previously discussed, one can average the variations within both places to infer that the city of Worcester, on average, had an 85 percent rate of growth over the town of Auburn.

### **Fitchburg**

If Worcester was the big city of southern Massachusetts, then Fitchburg would be the chief city of the North. With a population of 7,805 in 1860, Fitchburg was by far and away the biggest city in northern Worcester County. Rev. Peter Whitney, in his history of Worcester County, published in 1793, says of Fitchburg: "It is a very hilly and uneven but fertile town. The hills are large, high, and steep; however, on them there is not broken, poor, and waste land. In general, the soil is excellent."<sup>18</sup> Unfortunately, having only a handful of streams from which to gather water for their crop, farmers were forced to strategically build their farms so that they would not be too far from water. However, as time progressed tributaries and dams allowed farmers to overcome these problems. By 1835, there were a dozen dams on the Nashua River alone.

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<sup>18</sup> Marvin, Vol. I, p. 444.

Much like Worcester, Fitchburg began experiencing sharp increases in its population and dwellings over the period 1801 to 1850. The main difference though, was that this increase was nowhere near as dramatic as that of Worcester. In these years, Fitchburg underwent a 270 percent increase in population (Map 1) and a 280 percent increase in the number of dwellings (Map 2). The biggest increase came during the 1840's when the population increased by more than 96 percent. This was a direct result of the creation of the railroad systems in Fitchburg, whose impact will be discussed in the pages to come.

It is also quite apparent that the city of Fitchburg was steadily moving away from agricultural areas towards a more industrialized community. One can see this in the decrease of tilled land, down 20 percent (1,106 acres in 1850 and 881 acres in 1860). It is interesting to see this decrease and to consequently notice an increase in the number of barns, up 25 percent over the same period. This leads to an interesting conclusion: if the need for barns was not in farming land, we can then assume this means there was a large increase in the number of agricultural livestock. Between 1831 and 1860, the number of horses nearly tripled. This is understandable because during the same period the population more than tripled. As was typical of nearly all cities and towns of this time, horses were replacing oxen on the farm as the muscle for cultivation. Horses were also a major means of transportation for those too poor to secure alternate means of transportation. "Hundreds of thousands of people still travelled primarily on foot. Many poorer Americans were accustomed to walking 'from three to six miles on Sabbath to meeting,' or to visit stores and taverns."<sup>19</sup>

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<sup>19</sup> Larkin, *The Reshaping of Everyday Life*, p. 214.

Pastureland made a steady increase from 1791 to 1850, but in 1860, there was a drop of about 15 percent, signifying the effects of industrialization. Prior to the 1840's, the valuations show that Fitchburg was mainly an agricultural society, however, with the introduction of the railroad to Fitchburg in 1845 farmers felt the pressures of outside influence. Much like the farmers of Worcester, Fitchburg farmers were forced to rethink their needs and priorities.

It is also interesting to note that woodland throughout the period of 1811 to 1860 also steadily increased. In addition, the amount of wetlands for Fitchburg increased. Since there was a steady increase in the population, we believe that the area of Fitchburg was increasing during this period. Borders were always a reason of dispute during this time and in many instances small towns were overtaken by larger neighboring towns. Sometimes this was done as a means for survival and other times it was simply politics.

After 1840, with the addition of the railroad, came an industrial boom. Cotton, paper, and iron were the biggest industries in Fitchburg, easily eclipsing all others. No longer was agriculture the main attraction, now the future of the city rest on factories, mills, and the machines that essentially run them. Fitchburg became a leader in the manufacturing industry, producing iron products that came to be known nationally.

### **Leominster**

Like any big city, Fitchburg was surrounded by smaller suburbs. One suburb in particular, Leominster, will be given a closer look. The town of Leominster was "considered one of the best agricultural towns in the county. It is true that the surface is uneven and that there are twelve distinct hills, or greater or less magnitude. But only a small portion of the town is mountainous or abrupt in formation, and seven out of the

twelve hills are cultivated, or capable of cultivation, to their very tops, having good roads over them, accessible in all parts for agricultural purposes, and furnishing some of the best grass and tillage in the state.’<sup>20</sup> Other portions of the remaining five hills were cultivated, and yielded excellent pastureland. Having ample water sources, Leominster was the perfect location for a farmer and his family to start fresh. As a result, many people did in fact take up new homes within this rural community.

Leominster had a 196 percent increase in population (Map 1) over the period, 1791 to 1860. Averaging similar data of other rural towns, we found that this change in population was the typical increase for many rural communities during the 19<sup>th</sup> century. The population increased nearly uniformly over this seventy year period, averaging an increase of 34 people per year. Again, this was typical of a rural community whose main industry was farming.

The number of dwellings increased linearly with the size of the population, averaging six new dwellings per year. Thus, the number of dwellings grew 216 percent (Map 2) over the period 1791 to 1860. Since the average number of people per house was 6.1 in 1860, the previous revelations were not unexpected.

The first railroad to run through Leominster, the Fitchburg Railroad, was chartered on March 3, 1842. Like the town of Auburn, Leominster too was forced to adapt to the increase in supply and demand brought about by the innovations in transportation. The most noticeable change to the surface of Leominster was the construction of buildings throughout the town. From 1841 to 1860, the number of miscellaneous buildings increased from 44 to 308, a 600 percent increase. Miscellaneous buildings was a very broad category during this time, including everything from

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<sup>20</sup> Marvin, Vol. II, p. 2.



professional office buildings to saloons. In contrast to this, the number of barns actually decreased, falling by 6 percent. Oddly enough, there was an 18 percent increase in the amount of tilled land. These changes were a direct result of the strength of industrialization and the response of the agricultural community to it.

The response of the agricultural community was to specialize and mechanize the farming crop and equipment as much as possible. During the first forty years in Leominster (1791 to 1831), oats, rye, corn, barley, and hay were the major crops of farmers. However, after the introduction of the railroad to Leominster, farmers specialized in oats, corn, barley, and hay, essentially dropping rye and wheat by most farmers. Over the period 1841 to 1850 oats, corn, barley, and hay increased by 39 percent, 12 percent, 34 percent, and 15 percent respectively. Also, over the period 1841 to 1860, horses were quickly replacing oxen as the muscle power used for plowing, averaging over two horses per ox in 1860. Other farm animals were also slowly fading from the farming landscape, as the number of swine and sheep went down, decreasing by 53 percent and 80 percent respectively.

Throughout this time period, Leominster remained a largely agricultural society. The ability to adapt and survive allowed Leominster to survive during this difficult transition period. However, Leominster was not alone, as this was typical of so many farming communities that were too small to abandon their farms for the factories. Without the resources and connections of a big city, rural communities were forced to become more efficient and profitable in their agricultural tendencies. Thus, specialization and improved farming equipment were crucial to the livelihood of the small town farmer.

### **Fitchburg versus Leominster**

Much like the connection between Worcester and Auburn, Fitchburg and Leominster had a mutually beneficial relationship over the period 1791 to 1860. Both began as rural communities, living almost exclusively on the profitability of the farming industry. However, as time progressed, Fitchburg was heavily affected by industrialization, turning from solely farming to a mix of crop and machine. This was typical of many of the other large, rural communities of the time, with the introduction of canals and especially the railroad to Worcester County, there was less and less need for such an abundant number of farmers. As a result, many were forced to take up work in the increasingly numerous factories and mills. Fitchburg grew as a direct result of the resources available to it.

Leominster, on the other hand, was not nearly as connected as Fitchburg and, like so many rural towns, underwent industrialization at a much slower rate. By the end of the 1850's, farming was still the major industry of the town and would remain so for more years still to come. The proximity of Leominster to Fitchburg allowed the town to have all the benefits of a large city without the hassle and problems often associated with a city, such as noise, sanitation, and overpopulation. Trade flowed freely between the two communities and both places benefited from new and larger markets. Without the need for change, it was not as vital for Leominster to convert as rapidly as Fitchburg did to an industrialized township. This is evident when one views the rate of growth of Leominster compared to Fitchburg. On average, Fitchburg grew 72 percent faster than Leominster.

### **Cumulative Results of the Research**

At the end of this eighty year period certain areas of America were just recently starting to undergo major changes. The use of railroads, the construction of canals, and the creation of the mills and factories gave nearly all Americans the means and the opportunity to improve their standard of living. Families no longer remained together as more and more young people left home to work in the industrialized cities. This was also evident in viewing the changes in people per dwelling over the fifty year period. There were slight decreases in almost all towns and cities. However, new methods of transport, while advantageous to most, had a negative effect upon some of the rural farmers of Central Massachusetts. The ability of outside suppliers to sell their goods on an open market increased supply where supply was already at a high. In this way competition was born, which lead to the need for specialization and profitability maximization. The agricultural face of Central Massachusetts changed dramatically over this time period. We witnessed a change from oxen to horses, rye to hay, and transformation of nearly all unimproved land. There was also another extremely important change. In nearly all cities and some towns, a conversion from agriculture to industry was occurring, beginning the future path of American society.

MapInfo allowed us to view these changes in an organized and informative manner. It became merely a need to apply the historical facts of the past to the changes we saw before us in order to get a clear image of what had actually occurred. We believe that this project will be the foundation on which many future research projects are based. In this next section will talk about how this project, as well as the previous one, can be used as stepping stones for future projects.

## Analysis of MapInfo

### **Future Possibilities for Projects**

All projects must come to an end, but many projects are just the beginning. The problem with this is that one can never get every thing done that they need to. The great thing about this project is that it can be used as a starting point for many future projects. These projects include creating lesson plans for teachers or schools, expanding historical understanding, and expanding upon the data set.

This project and the data and maps gathered from it are the perfect beginning point for a project that further analyzes the historical aspect of that data. The research completed for this project was very thorough, but it can be expanded. The research was one in a limited area, only four towns, and with only a few select data points selected for the paper by Jack Larkin. Future projects could look at other aspects of the data.

Other projects could include an agricultural analysis of a larger area, looking at more variables, or using mathematical expressions to compare variables. Viewing a larger area would provide researchers with the ability to create maps on a per town basis showing specifically what happened from year to year. Other projects could also include getting town maps from the time, and making more accurate maps of the time period. There are many errors in the maps that were made because of towns merging, or changing names.

If one were to consider more variables per town, then one could find the reason(s) why agriculture was increasing or decreasing in certain areas. You would be able to see if there was an increase in industry or just a decrease of population in general. Also one could look at how industry increased the yields of the crops they had, or allowed more

land to be cultivated. More variables would open up more possibilities for future analysis.

Generating maps with mathematical expressions will allow two things to happen. The first is that the maps can show anything that can be mathematically modeled, not just simple comparisons. So they could show how the rate of change changed between years and between towns. The other thing that would be made easier with expressions is the comparisons of two maps. This is much easier since a mathematical expression comparing two maps can then be mapped onto one, which makes it much easier to look at.

One of the last things that can be done to expand from this project is to apply this IQP, as well as Jeff's, to other data. This data could range from geographical data to historical data. The geographical data could range from looking at larger areas, such as the rest of Massachusetts or the entire United States, to looking at different types of boundaries, such as political versus geographical boundaries of towns, counties, or states. Also comparing the results mentioned above to other known historical information such as what is previously known about the agricultural changes in the area, or look at the birth and death records to find out exactly what was going on with the growth rates of certain towns.

The teaching applications of this project are plentiful. This project can be used as a stepping-stone for those projects that wish to develop maps, graphs, and corresponding questions. They can be the basis for a lesson plan or the group can create a lesson plan for their project that will utilize the maps and graphs created by MapInfo.

As one may very well gather after reading this paper, the possibilities are limited only by the user's imagination. The concept of this project can be applied to nearly all fields of research, from history to biology. However, it is the historian whom we see as gaining the greatest reward from this project. Using the maps and charts created within this software, the historian will have the ability to formulate quick, intelligent analyses of complex periods in the space of time that will put to shame older methods of research and deduction. Ironically enough, as time progresses our ability to view events and places of the past becomes clearer as technology continually improves, making the distant past appear not so distant after all.

#### **Possible Enhancements to MapInfo**

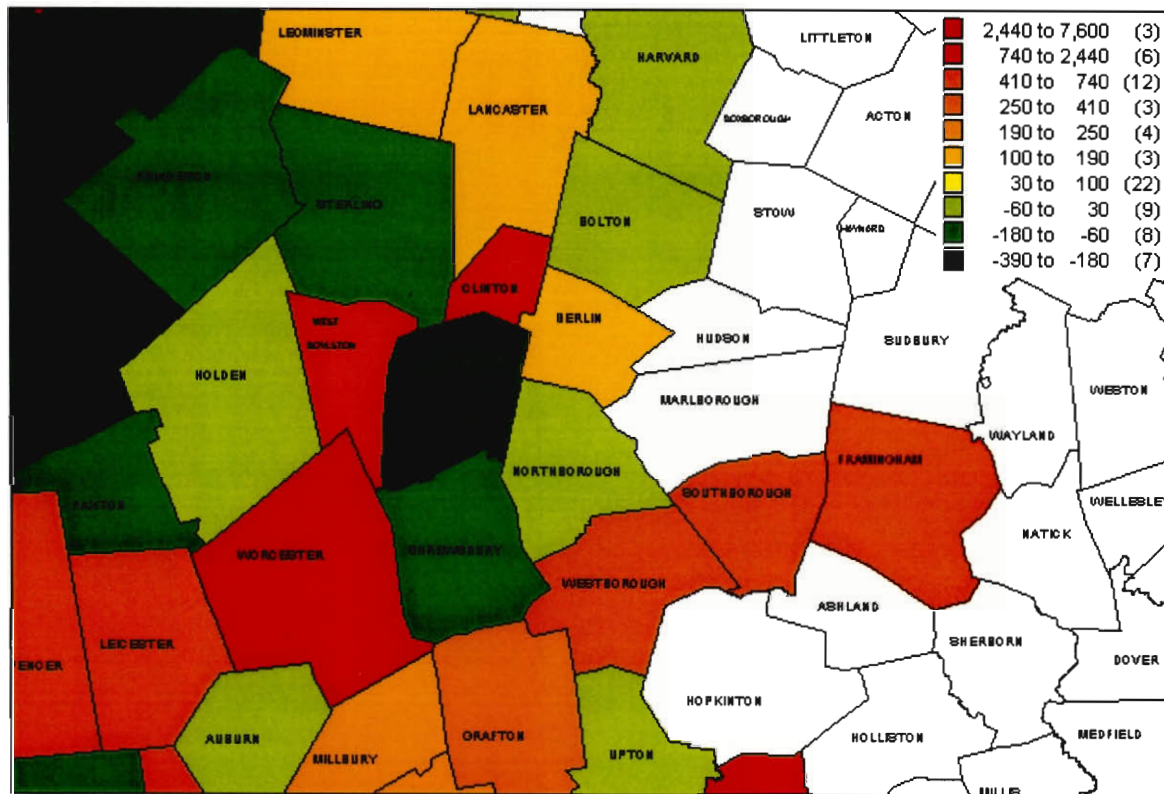
While using MapInfo, a number of problems presented themselves to us. These problems are not show-stopping, but they do limit its usefulness. Undoubtedly, MapInfo software will be updated in the future. There are several likely areas of improvement that we foresee with the software. The first area for improvement is quite obviously that of the data inputting process. Another area for improvement would be the advancement of the interactive features of the software. Perhaps one day they will create the software with touch screen capabilities. This would allow for a more efficient and effective interaction between human and computer. It would also serve to lessen the risk of human typing error. An obvious third improvement would be the addition of alternate displays and upgrading of older displays. While maps are a central focus of the program, it would also prove useful to have more options in creating graphs and charts. This would allow for a more in-depth analysis of the data, along with an alternate means of displaying information that may have been previously been obscured in a map diagram.

#### **Conclusions**

We found MapInfo to be an ideal software package for displaying census data. This project has provided a beginning for future projects that will further analyze and identify important trends and changes in the agriculture of the 19<sup>th</sup>-century. The information is literally at your fingertips and, following the prescribed steps for creating a map, an informed analysis a step further. We feel that MapInfo would be a beneficial addition to Old Sturbridge Village, providing researchers with a new and interesting tool with which they can display various historical agricultural results and findings.

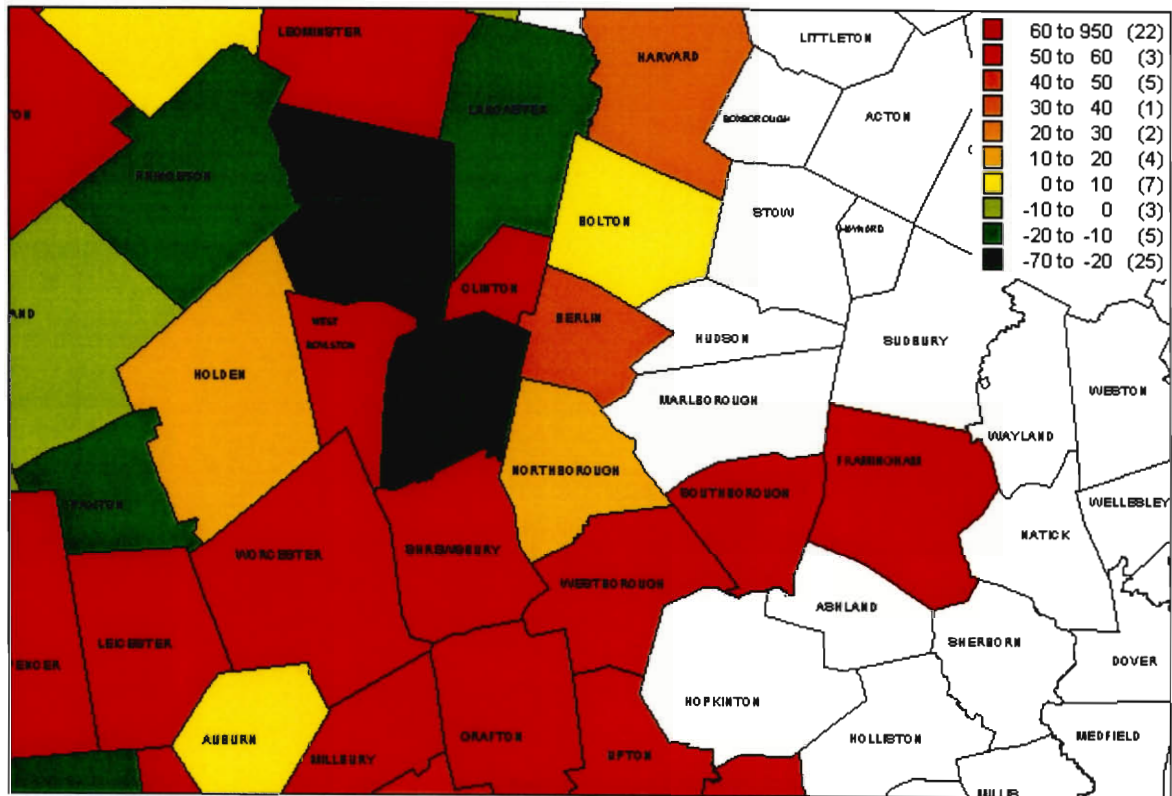
Maps:

Map 1- Difference in Population from 1781 to 1860

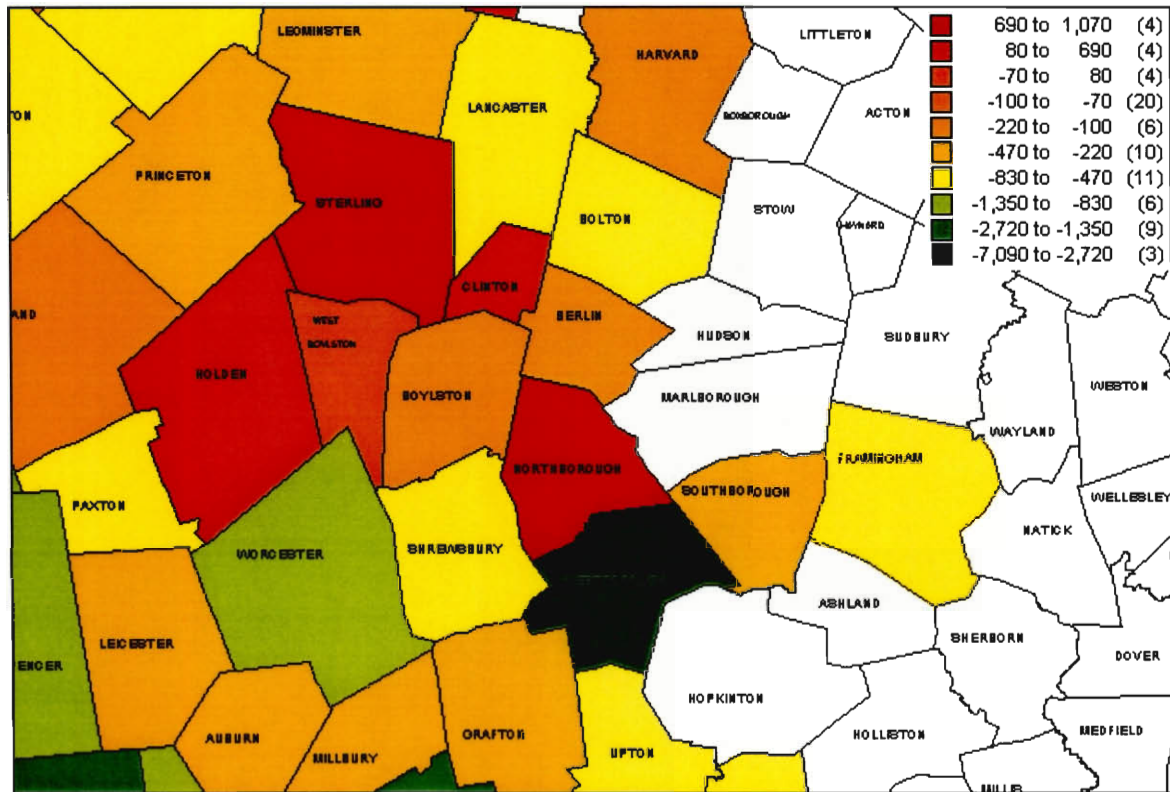




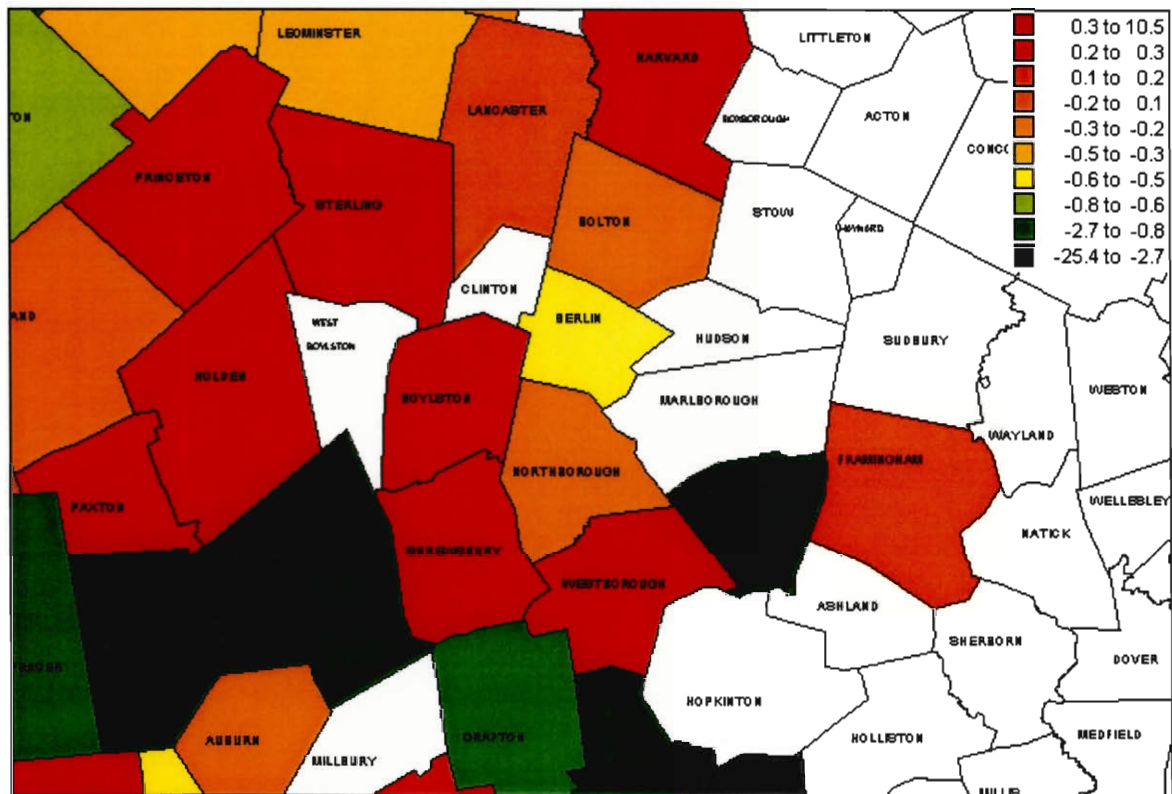
Map 2-Difference in Dwellings from 1781 to 1860



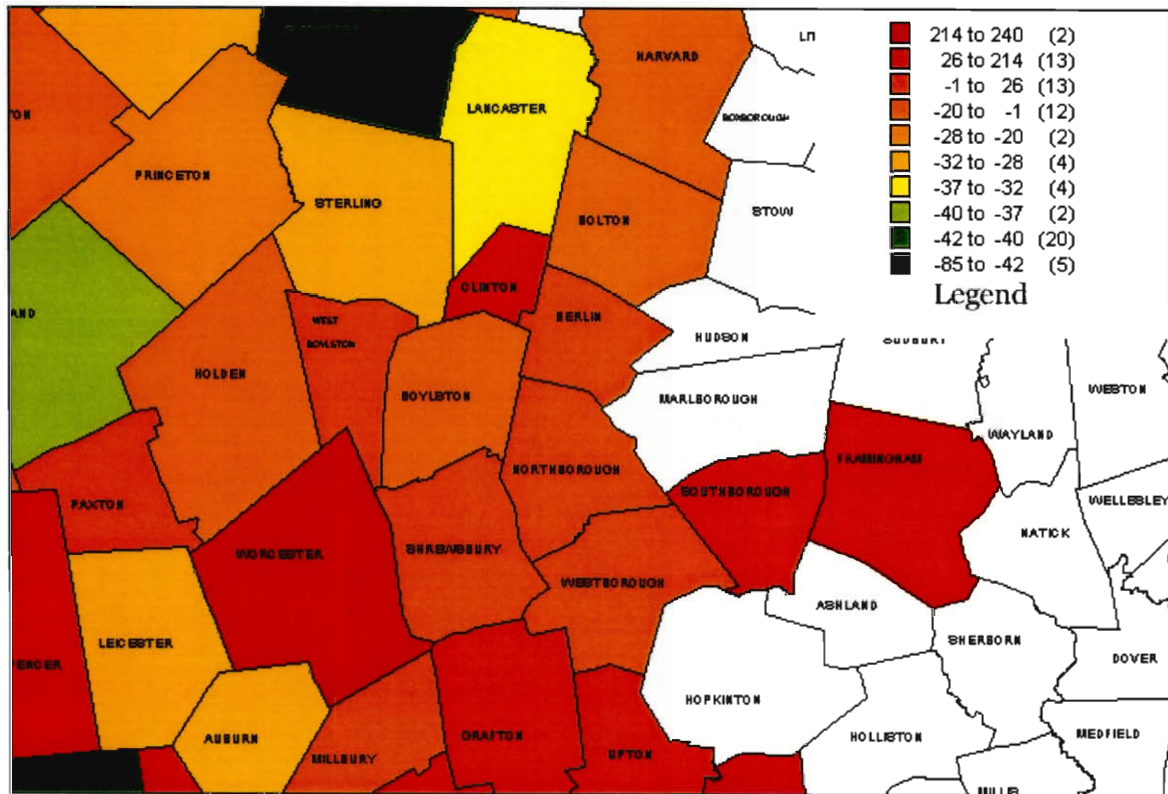
Map 3- Difference in Rye from 1781 to 1860



Map 4- Difference in Population per Dwellings from 1781 to 1860



Map 5- Difference in Barns from 1781 to 1860



Map 6- Difference in Barns per Population from 1781 to 1860



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