Global Climate Change Influences Wine Production and Tourism In Northern New York

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ABSTRACT

Later in this century, many national wine-producing regions will face significant economic challenges from the impact of global climate change. Others, however, will see new opportunities to develop or expand wine production and related tourism industries. This paper examines existing literature on the economic impacts of global climate change on wine production and wine tourism and uses a qualitative meta-analysis of current climate modeling along with studies of wine tourism as well as qualitative analysis on regional brand equity for wine. It applies these models to forecast a possible future for New York State, USA as an emerging area for wine tourism.

There have been increasing levels of research over the past 20 years into the impact of climate change on tourism and wine production, including both water-based and snow-based outdoor tourism, spurred by increasingly sophisticated climate models and growing awareness of the realities of climate change. In particular, Hannah, et al (2013) predicts that many areas in traditional wine growing regions of Western Europe will experience considerable reduction in production by 2050. At the same time, regions of North America, New Zealand, and South Africa will experience an increase in total acreage suitable for wine production.

If famous wine-producing regions see a decline in production and/or a significant shift in the type of grapes/wine produced, their historic brand equity with wine lovers and tourists may be affected, while new and emerging wine regions will see an opportunity to develop their own brands in wine tourism. Some producers in Bordeaux are forecasting the loss of the Merlot grape and calling for an enhanced emphasis on wine tourism to offset the economic impact (Southam, 2016). The development of wine tourism, as opposed to wine production, requires significant strategic positioning and an understanding of wine tourist demand (Mauracher, Pocidano, & Sacchi, 2016).

These conclusions are used to support a set of specific recommendations for both government and private investment, to improve the economic value of wine tourism in New York State.

Key Words: Climate Change, Wine Production, Wine Tourism, Brand Equity
INTRODUCTION

The northern region of New York in the United States is an underdeveloped area with lower than average population density. The region experiences temperature changes throughout the seasons. Through research and experimentation of genetically altered grapes the region has seen significant growth in wine production, and as a result, a significant increase in wine tourism in recent years.

The Northern New York region discussed in this document is made up of 11,913.57 square miles (30,856 square kilometers) and has varying landscapes, waterways, and mountainous areas. It is bordered on two sides by bodies of water. It includes seven (7) counties illustrated in Figure 13 (Clinton, Essex, Franklin, Hamilton, Jefferson, Lewis, and St. Lawrence) and is the largest economic development region when measured by land mass with the smallest population measuring 433,193 in the census taken in 2010 in New York State. (“QuickFacts: St. Lawrence County, New York; Lewis County, New York; Franklin County, New York; Essex County, New York; Clinton County, New York; Jefferson County, New York,” 2008) The temperatures vary greatly between winter and summer months. The average temperature during the summer months (June, July, August) is 68.5 F (20.3 C). Comparatively, the winter average temperature is 22.1 F (-5.5 C) which includes the months of December, January, February, and March (Centers, 2010). The winters are remarkably cold with heavy amounts of precipitation generated from winds that travel over Lake Ontario, one of the Great Lakes. The annual precipitation for Jefferson County is 43.10 inches (109.5 cm).

The region has built its tourism activities primarily from outdoor activities including the waterways. Lake Ontario is 193 miles (310 km) long and nearly 53 miles (85 km) wide; the lake provides a plethora of water-based activities. (“Lake Ontario - New World Encyclopedia,” 2001) The St. Lawrence River acts as a natural border to Canada. Additionally, the St. Lawrence consists of numerous islands known as the Thousand Islands. The waterway is a glacier made body of water that spans from Lake Ontario to the Atlantic Ocean. This specific portion of the St. Lawrence has been the home of wealthy business owners and dignitaries from around the globe. One such island is known as Heart Island where the George C. Boldt Castle was built in the early 1900’s. This is one of the most visited tourist destinations in the entire state with 200,000 visitors annually. Boldt Castle has a significant economic impact on the region which has been the leader in tourism spending that averages $181.00 per visit to the area, which yields a staggering $39.9 Million for the region from visitors of the castle. (Parsons Brinckerhoff, 2015)

The current global wine market, which includes still wine, sparkling wine, fortified wine, and various others, had $293.7 Billion in total revenue in 2016 (Global Wine Industry Profile, 2017). Still wine captured the majority of the market representing an 80.5% share, followed by sparkling wine at 15.1%, fortified wine capturing 3.7%, and others with 0.7%. Segmented
geographically, Europe led the market with a 48% share, followed by the Asia-Pacific region with 29.0%, the United States with 13.5%, the Middle East at 0.7%, and the rest of the world with 8.8%. The wine industry is highly fragmented consisting of many small privately-owned wineries located in areas containing a suitable climate across the globe. The leading winery in the global wine market is E. & J. Gallo Winery with 3.5% market share, followed by Constellation Brands, Inc. with a 2.3% share, Yantai Changyu Pioneer Wine Co Ltd at 1.7%, Treasury Wine Estates Vintners Limited with 1.5%, and all other wineries making up the remaining 91.0% (Global Wine Industry Profile, 2017).

The U.S. wine market totaled $62.2 Billion in retail sales in 2017 (Statista.com, 2018). There were 9,654 wineries in the U.S. in 2018. California, widely known as the major vinicultural area in the U.S., had 4,391 wineries which accounts for 86% of the total wine production in the U.S., while Oregon, the second largest wine growing region in the U.S., had 774 wineries (Statista.com, 2018). Washington State and New York State are the next two largest wine growing regions in the U.S. New York State has 450 wine facilities (note: a single winery may have more than one facility within New York State and each facility is included in the winery count) (Facts on New York Wine Industry, 2017). New York State receives 4.5 million wine tourists annually that directly impacts the New York State economy with $13.8 Billion in total economic activity, to include wages, taxes, and wine tourism expenditures (Economic Impact of the Wine Industry in New York, 2017). Thus, increasing and improving wine tourism in Northern New York will have a major positive impact on the local and state economy.

PURPOSE

As we examine existing literature regarding the effects of climate change on viticulture, wine tourism, and regional brand equity for wine we apply these models qualitatively to forecast a possible future for New York State, U.S.A. as an emerging wine tourism area. The results will be used to support a set of specific recommendations for both private and government investment to improve the economic value of wine tourism in New York State. The paper also includes data from a set of qualitative interviews of local and regional wine-producers and tourism promoters regarding their experiences and expectations with climate change in northern New York’s emerging wine regions.
OVERVIEW OF PROBLEM

Climate in Northern New York has posed significant challenges for wine producers and tourism in the region. New York State Department of Environmental Conservation notes annual average temperatures have increased in all regions of the state. This data shows an increase of about 0.25°F (0.14°C) per decade since 1900. The Northern region’s annual average temperature statewide has risen about 2.4°F (1.33°C) since 1970, with winter warming exceeding 4.4°F (2.44°C). The average annual precipitation has increased steadily since 1900 with more pronounced and heavier measurable downpours increasing over 70% between 1958-2010. (“Impacts of Climate Change in New York - NYS Dept. of Environmental Conservation,” 2014). Due to climate change the average temperature is forecast to increase by an estimated minimum of 3.33°C by 2050 and 5.6°C by 2080. Much of this warming is predicted to occur in the Northern region of New York and by 2100, the growing season could be about a month longer, with intense summers (extreme heat and heat waves) and milder winters. Research completed by New York State Department of Environmental Conservation shows that New York State is also likely to experience up to a 15% increase in precipitation by the year 2080 as compared to the 1971-2000 period.

Traditionally, the Northern New York region was not able to participate in grape production and the wine industry due to its extremely cold temperatures in the winter. To combat this issue, growers needed to find a vine that would withstand the extended cold winter months. The University of Minnesota developed several genetically engineered grape varieties that would solve this wide variation in temperature between winter and summer (see Appendix: History of Grapes). The new hardy grape varietals have created an opportunity for diversified wine production and wine tourism in Northern New York. This action has led to the development of a new and expansive wine tourism market for the wineries to enhance the brand equity of their wines. The first Northern New York winery opened in 2002. There are now 29 wineries in the region with the majority opening within the last decade. The challenge is how future climate change will impact viticulture and wine tourism in the region.
REVIEW OF PRIOR RESEARCH

There is an extensive body of literature regarding the definition of brand equity. Aaker (1991) defined brand equity as the set of brand assets and liabilities directly attributed to a brand’s name and symbol, that may add to or detract from the value provided by the product or service, to include: brand loyalty, perceived quality, name awareness, associations with the brand, and intangible assets such as trademarks, channel relationships, etc. Keller (1993) also notes that brand equity, in general, is attributed to the effects of marketing that specifically builds a brand.

While there is a general agreement as to the definition of brand equity, there is a smaller body of articles dedicated to measuring brand equity (Ailawadi, et al 2003). Approaches to measuring brand equity can be summarized using three categories: The “customer mind-set” category, the “financial market” category, and the “product market” category. The “customer mind-set” category utilizes customer-based measurements, such as brand awareness, attitude, loyalties, and associations that customers have toward a brand (Aaker 1991; Keller 1993). While these assessments provide rich detail for several of the sources of brand equity, they tend to be survey-based, are difficult to compute, do not supply a simple objective measure for brand equity, and do not provide a dollar value to measure the brand.

The “financial market” category measures brand equity as a financial asset and include using the purchase price of a brand when it is sold or acquired, discounted cash flow valuation, and finding the residual market value of the firm after other sources of firm value have been identified and accounted for (Ailawadi, et al 2003). The greatest problem with using financial market valuation to determine the brand equity of the various global wine-growing regions is that wineries are typically privately-owned, thus, financial statements are not publicly available.

The third category uses “product market” outcomes and focuses on how the brand performs in the marketplace. A common measure utilizes the price premium, or the difference between what a customer will pay for a branded product versus an unbranded or generic product. Other product market measures include market share and relative prices (Chaudhuri, et al 2001). The advantages of using “product-market” outcomes include providing a dollar value for brand equity, and that it incorporates all of the facets of the “customer-mindset” in the ultimate purchase of the product. (Ailawadi, et al 2003).

When it comes to the global wine industry, the brand equity of wines in different regions of the world have different characteristics that form the basis of prices. Zhao (2008) contributed very interesting research surrounding the classification and determinants of wine prices in the premium wine market comparing the French and California wine industries. French winemakers have a long history of producing wine and emphasize terroir, which is the distinctive characteristics and unique physical environment of a specific vineyard, to include its altitude,
soil composition, slope, drainage, climate, sun exposure, etc. (Cross, et al 2011). The French agency Institut National des Appellations (INAO) strictly regulates and controls the French wine industry. French wines are categorized based on appellation, or geographic area, by Appellations d’Origines Controlees (AOC). An appellation with a high rank is officially acknowledged to be of a superior quality and taste than a low-ranked appellation. Thus, in France, wines affiliated with a high-ranking appellation increase the value that consumers place on that wine, enhancing brand equity and increasing the price. To the consumer, grape usage is secondary to its appellation category. As a result, heavy blending of authorized grape varietals within its appellation is perfectly valid and does not impact brand equity (Zhao 2008).

While winemakers in California also appreciate terroir due to the influence of the French, winemaking in California is largely a scientific endeavor. Winemakers have conducted experiments to improve the quality of the wine and utilize modern techniques. California wineries have the freedom to experiment with any grape varietal and have control over the production due to the relatively loose regulations in the U.S. Ultimately, it is the consumer, not a governmental agency, who determines which wines taste the best. In California, wines are classified and priced based on the variety of the grape, whereas its appellation is secondary. California does have designated American Viticultural Areas (AVA) solely for the wine industry which do require a higher standard; however, there is no official acknowledgement regarding the quality of wine from this region. In the U.S. if the wine label bears a grape varietal, such as Cabernet Sauvignon, it must contain no less than 75% of its volume from that grape. Wine that does not distinguish itself as a specific grape varietal, and does not carry a proprietary winery name, is considered generic and inferior to branded wine. Since quality is not established by a government entity in the U.S. as it is in France, consumers rely on wine tasting ratings (widely available in wine magazines, buying guides, etc.) and past wine quality to distinguish the quality of the wine. Extra specification and differentiation on the wine label, such as estate bottled or late harvest, can increase the price for California wines up to 32%. By contrast, extra specifications on a French label has no effect on price. Lastly, the study found when comparing prices between the California wine industry and the French wine industry that small vineyards charge higher prices for their wines (Zhao 2008).

The Mauracher et al (2016) study regarding the quality perception and customer satisfaction reliability toward wine tourism in Italy provides important insights for wine tourism and brand equity, as customer satisfaction directly impacts brand loyalty which is a component of brand equity (Aaker 1991). Their sample consisted of 200 tourists answering 15 questions concerning customer satisfaction while touring wineries in the Conegliano Valdobbiadene District in Italy renown for producing Prosecco Wine. Using the CUB model both with and without covariates, the study effectively revealed that socio-demographic variables play a strong role in tourism behavior. Creating consumer segments and designing marketing policies for each should be considered. The age for the respondent influences the rating on the winery sales outlet, with the
“under 30” demographic registering the lowest scores for satisfaction and lower average scores overall. The highest level of education also registers the lowest scores for satisfaction, particularly toward the usability of the website. The study noted that the web is rapidly developing into the most strategic factor in the wine business. Higher income levels were associated with higher levels of satisfaction overall. Nationality was also a significant variable for the ratings of “price of wine tasting”, “the price of the Prosecco wine”, “the wine tasting itself”, and “the overall quality of the explanation” from the staff (Mauracher, et al 2016).

There is a growing body of research regarding climate change and viticulture. Hannah, et al (2013) uses grape production to measure the indirect effects of climate change on agriculture as viticulture is very sensitive to climate. Some of the basic elements of terroir include temperature and moisture, with temperature during the growing season being a key factor in viticulture: dry, warm summers and wet, cool winters identified as the most ideal climate. This study utilized 17 global climate models to assess the suitability of wine grapes and projects two representative concentration pathways that take into consideration conflicts with the natural habitat, water stress, and the impact on fresh water with changes in precipitation. From now through the year 2050 (mean of 2041 – 2060), the 17 global climate models were in high agreement that many of the traditional wine-producing regions of the world, such as the Rhone Valley and the Bordeaux region of France, grape suitability will decline, while in northern regions like those in North America and Northern Europe, grape suitability will increase. By 2050, the model indicated that the net area for viticulture suitability in California will experience a decline of 60% and Mediterranean Europe a decline of 68%, while Western North America will increase by 231% and Northern Europe will increase 168%. According to the climate models, another area that is projected to become more suitable for viticulture are parts of New York State (Hannah, et al 2013).

Research by Mozell, et al (2014) defines global warming as in increase in the Earth’s average temperatures. The Intergovernmental Panel on Climate Change (IPCC) established in 1988 by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) found that the average global temperature has increased 1.4°F (0.78°C) since 1900, and that if efforts are not met to address and mitigate the causes of global warming, average global temperatures could escalate 11.5°F (6.4°C) in the 21st century. If global warming is permitted to increase at its current rate, the consequences of global warming include: stronger weather events, altered global weather patterns including droughts and water shortages, rising sea levels, serious farmland reduction, population displacement, and a dramatic increase in the insect population and insect-related diseases. Premium wine grapes are particularly susceptible to these consequences. The range for the climate zones in which grapes are grown is limited to 10°C and is further limited to 2°C for specific grapes such as Pinot noir. Increasing temperatures combined with a reduction in the availability of fresh water in the next 50 years may result in a 50% loss of land in Napa, California, as well as Santa Barbara County, California. However, in
Oregon, Washington State, and other parts of Western North America, the warmer temperatures may support the growth of warmer grape varieties (Mozell, et al 2014).

Climate change has the ability to alter grape chemistry and impact the quality of the wine, which is already being acknowledged globally (Mozell, et al 2014). Small changes in seasonal temperature can dictate whether a wine is a bad, good, or outstanding vintage. Unseasonably lower temperatures affect the grape via incomplete ripening, which yields wine with higher acid, lower sugar, and unripe flavors. On the other hand, unseasonably higher temperatures can cause overripe fruit yielding wine with lower acid, higher sugar, higher alcohol, and baked flavors. Thus, further climate change will alter the chemistry of the grape and impact the quality of the wine (Mozell, et al 2014).

There is very little research regarding climate change and viticulture in Eastern North America. Jones (2012) performed a study regarding the effects of climate change on viticulture in Quebec, Canada, that has similarities to viticulture in Northern New York. The most successful wineries in Canada are found in Southern Ontario and Southern British Columbia; however, the past 30 years have seen the growth of wineries in cooler climate areas, such as Quebec and Nova Scotia that are producing quality wines and attracting public attention. The study examined the climate data spanning 31 years in the regions of Monteregie and Estrie in Eastern Quebec, the home of more than 40 vineyards, and found that rising temperatures have affected grape production in the region. Interviews with local wineries in the Monteregie area reveal that they have begun growing Vitis vinifera varieties of grapes such as pinot noir, chardonnay, riesling, cabernet franc, and sauvignon blanc. They concluded that the climate is becoming warmer in the region; winters are not as harsh as shown by less intense cold days on record, the growing season is lengthening with fewer days of recorded frost, and the mean minimum temperature has increased over the 31-year study. This trend is expected to continue, allowing greater success for vineyards in Canada (Jones 2012).
METHODOLOGY

In order to gain insight into the current wine tourism environment in Northern New York, we sought information through a variety of sources. The team examined existing literature regarding the effects of climate change on viticulture, wine tourism, and regional brand equity for wine. We reviewed climate data, regional economic data, and historical information to develop recommendations that could be used for future research. The team also conducted a set of seven qualitative interviews with local and regional wineries, Cornell University, and the New York Grape and Wine Foundation. Of the 14 wineries currently operating in Northern New York, five agreed to the interview. The others declined, citing availability of owners due to the end of the season. We asked the following questions regarding how climate change is currently affecting grape growing and wine production in the area and the current marketing programs being utilized to promote wine tourism:

1. In what ways, if any, has climate change affected wineries of this region?
2. What measures, if any, have winery operators taken to minimize the perceived effects of climate change?
3. How do you think climate change will affect tourism in the wine market?
4. How does it affect wine production?
5. What have you done to adapt to the current climate?
6. How will you adapt to future effects of climate change?
7. What activities have you implemented to promote wine tourism?
8. How do you describe our current wine market?
9. What is your outlook of wine tourism in the region for the future?

The interviews are summarized in Tables 1–7 in the Appendix. This data suggests strongly that, while most winemakers and wine tourism promoters in the region are aware of the possible impacts of GCC, they have only begun to think how to best respond to these issues to build regional brand equity in wine production and attract a larger share of the wine tourism market in the US.

Climate data was reviewed through various sources to document the increasing temperature and precipitation the region has experienced and what it is predicted to experience over the next 50 years. In particular, the meta-analysis of 17 separate climate change models by Hannah et al (2013) led to the assumption for this paper that climate conditions in Northern New York will continue to change, leading to longer growing seasons and larger areas of potential grape production, offset by increased challenges from disease and extreme weather. The data charts are included Figures 11 and 12 listed in the Appendix.
Pedigrees of the grapes were reviewed, including scientific data of the region, supporting the conclusion that the current set of cold-hardy hybrid grapes will remain the best choices for production of wine in the region through at least 2050, but with some potential to grow more popular vinifera grape varieties. All of this data was used qualitatively to draw conclusions regarding how these grapes will/will not adapt to the increasing temperatures and precipitation in order to identify opportunities and provide strategic recommendations for New York State as an emerging wine tourism area. The historical and illustrations are included in Figures 1-10 in the Appendix.
STRATEGIC RECOMMENDATIONS FOR NORTHERN NEW YORK

Findings:

We believe through our research that the wine tourism in the Northern New York area is growing due to the popularity of the new developments made from the grape growing industry. Climate change will continue to influence grape growing and the wine industry. Climate models predict that temperatures will continue to rise allowing the area to expand the types of grapes able to be grown in the region. See figure 11 in Appendix II Climate Change Data (Hannah, et al 2014).

The effects of climate change are already apparent in New York State: higher precipitation levels and shifting weather patterns in the past few years have resulted in more rain events with greater than 2 inches (5 cm) of rainfall, with one day recording over 9 inches (22 cm) of rain within two hours in the Finger Lakes region, a phenomenon that has not occurred before, resulting in catastrophic flooding in that area (Table 1). Accordingly, soils becoming more saturated on average than usual in some areas, along with increasing temperatures, with an increase in the randomness of hot and dry spells. The Finger Lakes region experienced a hot and dry summer in 2016 resulting in higher quality vintages, whereas 2017 and 2018 did not fare as well.

Typically, temperatures drop below 50°F (10°C) for more than half of the overnights in September; however, this year, temperatures stayed around 60°F (15.6°C). Wetter soils and warmer temperatures contributed to sour rot in Riesling and Chardonnay grapes in the Finger Lakes region. Warmer temperatures toward the end of the harvest season may see a greater impact of diseases on grape vines. In Northern New York, warmer weather patterns have prolonged the period of frost-free days in the last 6 to 8 years, whereas Cape Vincent experienced no frost at all during the growing season. Since 2003, there are more 90° F (32.2° C) days recorded in the summer and more days of –(45)° F (–(43)° C) persisting in the winter, making it difficult for the grapes to survive.

Many local wineries are considering the recent changes in the climate and are planning for future climate change, monitoring weather data and forecasts and adapting their growing processes accordingly. Wineries are actively investigating new varieties and growing techniques to increase the quality and variety of their wines. When accommodating warmer temperatures, longer growing seasons, and variable rainfall, diversification into new grape varieties must occur. Weather tracking is essential for vineyards to adapt to changing weather conditions.
Organizations such as The New York State MESONET have been created to assist in the recording and planning for differences in the weather around the region and the state. (“NYS Mesonet,” 2015) Water management techniques such as irrigation and creating large retaining ponds help with drainage in periods during greater precipitation and provide water in the event of droughts.

Installing wind turbines to combat frost and cold weather events should be considered to keep warm air circulating in the vineyards. Ultra-cold winters are a huge concern because it kills the grape roots. The current investment in cold-hardy grape varieties helps combat this issue.

Current marketing activities implemented in Northern New York to promote wine tourism are broad and varied. Most vineyards employ their own tactics. There are programs in-place that market the wine tourism industry in Northern New York. Wineries possess multiple locations to increase awareness, promote tastings, and the history of the vineyard. Wineries entering wine competitions has raised awareness to the grape varieties being grown in Northern New York. Additionally, attending festivals, craft fairs, the New York State Fair, and other locations across New York State is increasing attention and interest in Northern New York wines. Collectively, the wineries promote the North Country Wine Trail as a destination when visiting the area (Figure 13).

Climate change is expected to have an impact on wine tourism in Northern New York. An increase in rainy days with temperatures greater than 90°F (>32°C) may dampen visitation to the wineries. Tourists are “turned off” by extremely hot weather and tend to travel to destinations that offer a cooler climate. In Northern New York, the St. Lawrence River draws many tourists that enjoy parks and other water activities, thereby, warmer summers increase tourism (Figure 18). During an abnormally hot summer with many more rainy days recorded, combined with the St. Lawrence sustaining a very high water level, one winery interviewed experienced a 25% increase in sales. The river’s water level plays a critical role in the ability of tourists to enjoy the St. Lawrence Seaway and impacts tourism for the entire region.

The outlook for wine tourism in the North Country is mixed. For many years, the St. Lawrence River and Northern New York have been popular vacation destinations, helping the promotion of wine tourism in the area. Two-thirds of the respondents believe that wine tourism will continue to grow and that the increase in temperatures will positively affect the quality of local wines. Feedback from tourists indicate they are amazed with the quality of the wines and the wine tourism experience. Some wineries are concerned that the market is limited and there are too many wineries, breweries, and distilleries already in the area. Seasonality is an issue because many vineyards in the Northern New York region currently sustain tourism only during the summer and fall seasons.
Based on survey results, the vineyards growing cold hardy grapes should promote the educational experience for their customers. Tourists not familiar with the cold hardy varieties are positively impressed after tasting.

**Opportunities:**

As climate change becomes more pronounced and temperature bandwidth increases, this region will become more conducive to growing premium grapes increasing the total acreage grown.

The region’s location allows for wine tourism to flourish with an expansive number of grapes. The wine maker’s experience will develop wines that meet the needs of the market.

Feedback from the interviewees revealed the wineries banding together to offer consistent hours to the public, improving staff training with regard to the history of the region, vineyards, and increasing promotional efforts across New York State.

Winery information, road signage, social media, and website development should be improved to increase tourism and enhance customer experience.

This region is young in the market with many opportunities to grow. The number of wineries entering the market puts a strain on the market share to the existing wineries; however, it will assist the wine tourism industry by giving the visitor additional time in the region. The following activities should be considered by the current market:

1. Increased year-round seasonal activities that extend the wine tourism season.

2. Conducting surveys and using the results to increase customer satisfaction.

3. Promote the cold-hardy varieties.

**Strategic Recommendations:**

The wineries should strategically position themselves as a unique winery experience destination, featuring some of the world’s most unique cold-hardy grape varieties, focusing on strategic building of brand equity through the promotion and education of cold-hardy grapes in wine production. As in other US wine regions, most wines in New York should concentrate brand equity development around grape varieties and specific winery brands, rather than the more restricted European model of regional identities. By teaching prospective customers to understand and appreciate the specific cold-hardy grapes of the region, local wineries can establish a regional brand equity to supplement the equities of each winery.
Consistency of the region’s marketing efforts will create an industry standard opposed to a diversified individual marketing effort.

The wineries should consider the following suggestions to improve communication as well as building and maintaining relationships to potential customers further enhancing wine tourism in the region:

**Suggested Ideas:**

- Provide education and training to local sommeliers to improve wine pairing with food and overall guest experiences for local wines.
- Supply wines to local restaurants and hotels to pair with regional cuisine.
- Offer campgrounds, hotels and cottage rentals discounted tasting coupons as a promotion to share with their guest.
- Wineries can extend the wine tourism experience via bed and breakfast opportunities.
- Partner with the 27 state parks within the region to create custom labels for each park and donate a portion of the sales.
- Better signage and wine trail maps to build awareness and to allow travelers ease of discovery to the winery as well as GPS smart phone location markers.
- Greater coordination with regional wineries to promote more wide-spread events (fall harvest festivals with hay rides, summer in the vineyard music festivals, river cruises featuring local wines, etc.).
- Link with the historical landmarks in the area.
- Greater connection via the vineyard’s history and story to differentiate themselves from others in the market.
- Segment demographically to each target audience creating a unique experience for visitors.
- Get involved with the community via charities, outreach programs, and donations.
- Provide shuttle service from downtown areas to the wineries on weekends in the summer.
- The wineries in the area will need to improve in the areas of web presence and social media to promote customer relationship marketing from the first visit to build continuous membership and brand loyalty. Smart phone applications should be considered as a medium to push out promotion and connection activities.
- Extend marketing outside of the region into bigger cities throughout the state.
- Outdoor activities offered at the Vineyards: camping on the vineyard, snowshoeing through the vines, family movie nights, inviting the public to help harvest the grapes.
Additional Research Needed:

This research needs continuing review to develop recommendations as it pertains to technological influences, customer satisfaction surveys to improve current wine tourism activities, and regional climate data. Additional development for forecasting specifically for Northern New York, measuring the increase in the extremeness of weather events and its effect on viticulture, and measuring current brand equity and how it will change as the climate changes in the future is greatly needed.
APPENDIXES

HISTORY OF GRAPES

Brianna (*Vitis spp. Hybrid Brianna*) was bred by Elmer Swenson in Osceola, Wisconsin. A cross was made in 1983; it was selected for testing in 1989 and classified as a wine grape in 2001. The grape was officially named in 2002 by Ed Swanson at Cuthills Vineyards in Pierce, NE. On October 27, 2011 Brianna was added to the *Federal Register* as an official wine grape by the Alcohol and Tobacco Tax and Trade Bureau. Brianna is an interspecific hybrid, having an extensive family tree including *Vitis Labrusca*, *Vitis Riparia*, and *Vitis Vinifera* (Camper). Brianna is not currently patented.

Brianna is slightly susceptible to downy and powdery mildews, moderately susceptible to black rot and Botrytis bunch rot, and highly susceptible to crown gall (Smiley). It has been found to have sensitivity to injury from copper applications but does not have sulfur sensitivity (McManus).

The berry is classified as medium-large in size, having a round shape that grows in large clusters, and are greenish gold in color turning gold when fully ripened. Brianna has an early harvest season occurring in mid to late August. The rating for cold hardiness is very hardy which can handle below -20 °F and has handled temperatures and wind chills below -55°F in the North Country.

As the grapes are ripening, they will have a cotton candy flavor. When made into semi-sweet table wine there will be notes of honey, apricot, peaches, pears and mango flavors on the palette and pineapple on the nose.
Frontenac (Vitis spp. Hybrid Frontenac) developed by the University of Minnesota by Peter R. Hemstad and James Luby. A cross was made in 1978; selected for testing in 1983; introduced and named in 1996 after years of testing and registered as an official grape wine in 2011. Frontenac is an interspecific hybrid having a bloodline with Vitis Riparia, Vitis Vinifera and Vitis Labrusca throughout (Camper). Frontenac grape vines do not hold a patent but are available for purchase at nurseries supported by Minnesota Nursery Research Corporation with a small fee attached to help fund University of Minnesota programs.

Frontenac is slightly susceptible to downy mildew, Phomopsis cane and leaf spot; moderately susceptible to black rot, Botrytis bunch rot and powdery mildew. The vines are not sensitive to sulfur application injuries. The leaves are tolerant to phylloxera, but the berries are susceptible (Smiley).

The berries are small to medium sized, having a conic shape that grow in medium clusters and are a blue almost black appearance. The rating for cold hardiness is very hardy with handles below -20°F with no injury to the vines. Frontenac is harvested mid to late season in Northern New York.

The grapes can be used for a variety of wines: Rosé, dry red, semi-sweet, ice wines and port style. Hints of black currant, black cherries, plums and raspberries will be noticed on the palette in the dry to semi-sweet and port varieties. In ice wine is noted to have flavors of chocolate covered raisins. The skins help give a deep purple to garnet color to the wine.
Frontenac Blanc (Vitis spp. Hybrid Frontenac Blanc) discovered in 2006 and named in 2012. The grapes are white-fruited mutations of Frontenac and Frontenac Gris. The berries have a yellow to gold appearance when ripen due to lacking pigment and will yield straw-colored wine. Blanc has many similarities to Frontenac in aspect to immunity to diseases. It is very cold hardy handling temperature near -36°F with no injuries. The berries need full sun exposure to attain the best aromatics. The berries ripen mid to late season and will have mid to high acidity. Frontenac Blanc has been used to produce dry wines, semi-sweet late harvest to ice wines.

Figure 4 Frontenac Blanc Grape
Coyote Moon Vineyards
Frontenac Gris (Vitis spp. hybrid Frontenac Gris)

Frontenac Gris (Vitis spp. hybrid Frontenac Gris) was discovered as a mutation of Frontenac at University of Minnesota; essentially known as the white version of Frontenac. The berries were found in 1992 at the University of Minnesota’s experimental vineyard and introduced in 2003 by Peter Hemstad. Frontenac Gris currently holds a patent USPP16478P3.

It is identical to Frontenac with high vigor and yields. The vines have a low susceptibility to downy mildew and moderately susceptible to powdery mildew and black rot. The berries have a grayish color in appearance and make amber to straw colored wine. Ripening occurs in mid to late season with berries having a medium size in loose hanging clusters. Gris is very cold hardy handling temperatures dipping below -38°F or more. On the nose hints of peach and apricot aromas with hints of tropical fruits while on the palette an intense green apple flavor will be prominent with hints of lemon grass. It typically makes a higher acidic wine with complex flavors. Gris is used for table, ice and dessert wines.
Fronenac (Noir, Gris, Blanc)

Figure 6 Pedigree of Frontenac Grapes. (2018)
La Crescent (Vitis spp Hybrid La Crescent)

La Crescent (Vitis spp Hybrid La Crescent) developed by Peter Hemstad and James Luby at the University of Minnesota. A cross was made in 1988, with selection in 1992 and released to the public in 2002 after years of testing. La Crescent is an interspecific hybrid including Vitis vinifera, Vitis riparia, Vitis rupestris, Vitis labrusca and Vitis aestivalis in the bloodline on the pedigree chart (Smiley). Two well known grapes include St. Pepin and Muscat. The grape plant named La Crescent holds a patent USPP14617P3 as of 2001.

La Crescent has a low susceptibility to Botrytis bunch rot, crown gall, Eutypa dieback and Phomopsis cane and leaf spot; a moderate susceptibility to black rot and powdery mildew; and highly susceptible to anthracnose and foliar phylloxera (Smiley).

The berries are a yellow-amber color with a round shape remaining small. The clusters are loose and have a medium size. The rating on cold hardy scale is very hardy and can withstand -36°F. The berries are known to have higher sugar levels and acidity at harvest. La Crescent grapes are early in the season to be harvested.

La Crescent has been used to produce dry tart acidic wines but more known for semi-sweets, late harvest and dessert wines and used as a blending wine. On the nose, peaches, tangerines with other citrus fruits along with a floral aspect. On the palette it is comparable to Riesling with apricot and honey flavors.
La Crescent

Figure 8. La Crescent Pedigree (2018)
Marquette (Vitis spp. Hybrid Marquette) was created by Peter Hemstad and James Luby at the University of Minnesota. A cross was made in 1989; selected for testing in 1994 and released to the public in 2006. Marquette is an interspecific hybrid includes *Vitis vinifera, Vitis riparia, Vitis labrusca, Vitis aestivalis, Vitis lineecicumii, Vitis rupestris, Vitis cinera*, and *Vitis berlandier* (Camper). Pinot Noir, Merlot and Cabernet Sauvignon are all in the bloodline of Marquette. It is a cousin to another cold hardy grape, the Frontenac. Marquette holds a patent USPP19579P3 as of 2005.

Marquette has a low susceptibility to black rot, Botrytis bunch rot, downy mildew and powdery mildew. It has a moderate susceptibility to foliar phylloxera and crown gall has not been observed (Smiley).

The berries are a bluish-black color with a round shape in small to medium clusters. Harvest time is midseason into September. They are rated very hardy on the cold hardiness scale with temperatures below -35°F. Marquette has high sugar and moderate acidity; making it manageable to maintain. The wine will have ruby color. On the nose Marquette will black cherry and black currant flavors. On the palette flavors of tobacco, plum, blackberries, raspberries, leather and spices. The characteristics are similar to Pinot Noir when made into light bodied to medium bodied red wines. Marquette can also be made in Rosé, table wines, and Port style wines.
Figure 10 Marquette Pedigree (2018)
Severity of leaf injury was rated on a visual scale of 1 (=no injury) to 4 (= severe injury). Bars with the same letter are not significantly different according to Tukey-Kramer Honestly Significantly Different test. Control, P=0.6981; copper P <0.0001; sulfur, P= 0.4217. (McManus)
Figure 12: Global change in viticulture suitability RCP 8.5.

Figure 12: Global change in viticulture suitability RCP 8.5. Change in viticulture suitability is shown between current (1961–2000) and 2050 (2041–2060) time periods, showing agreement among a 17-GCM ensemble. Areas with current suitability that decreases by midcentury are indicated in red (>50% GCM agreement). Areas with current suitability that is retained are indicated in light green (>50% GCM agreement) and dark green (>90% GCM agreement), whereas areas not suitable in the current time period but suitable in the future are shown in light blue (>50% GCM agreement) and dark blue (>90% GCM agreement). Insets: Greater detail for major wine-growing regions: California/western North America (A), Chile (B), Cape of South Africa (C), New Zealand (D), and Australia (E). (Hannah et al., 2013)
## ATTRACTIONS OF NORTHERN NEW YORK

<table>
<thead>
<tr>
<th>Attraction</th>
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<tr>
<td>Antique Boat Museum</td>
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<td>Boldt Castle</td>
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<td>Singer Castle on Dark Island</td>
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<td>Old McDonald’s Farm</td>
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<td>Battlefield State Historic Site</td>
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<tr>
<td>Drive-In Theatres</td>
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(“1000 Island Seaway: Fact Sheet,” 2014)
DATA OF NORTHERN NEW YORK REGION

The Northern New York Region is made up of 7 counties and is bordered by Lake Ontario. The St. Lawrence River acts as a natural border to Canada.

Figure 13 Northern New York Region

Figure 14 Seaway Wine Trail
Figure 15: Wineries opening over last 70 years

Figure 16: Primary reason for visiting wineries
### Tasting Room Survey

#### Key Findings

**Overall Wine Consumption**
- Drink wine at home almost everyday: 19%
  - 59% 1 or more times/week
- 43% typically pay $9-$11.99 for wine at home
- 72% willing to pay more for local foods
  - 69% for local wines
  - 58% for MI wines

**Cold Hardy Wines**
- 65% said they’d tasted wines from cold hardy grapes
- 42% “Liked a Lot”
  - 30% “Liked a Little”
  - 4% “Disliked” or “Strongly Disliked”
- Most common cold hardy grapes they’d heard of:
  - Edelweiss (17%)
  - Frontenac (16%)
  - Marquette (6%)
- More had heard of Snow Bird than
  - Brianna
  - La Crescent
  - St. Pepin
  - La Crosse
- 42% hadn’t heard of any

---

**Tasting Room Visitor Satisfaction**

Dr. Miguel Gomez & Erin Kelly (Cornell University)

**Marginal Effect of Each Factor**

- Service
  - Friendliness
  - Wait times
  - Elbow room
- Retail Execution
  - Wine quality
  - Presentation of wines
  - Wine prices
- Ambience
  - Atmosphere
  - Cleanliness
  - Appearance of grounds
  - Lighting & sounds

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*Figure 17 Survey Key Findings*

*Figure 18 Visitor satisfaction from winery visits*
Figure 19 State Parks within Thousand Island Region
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The following summary list represents the visual representation of the viticulture and climate data used in this document.

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| Figure 4: | Photo of Frontenac Blanc Grape |
| Figure 5: | Photo of Frontenac Gris Grape |
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| Figure 18: | Visitor Satisfaction from winery visits |
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| Table 4: | Dave Fralick- Owner- Cape Vincent Winery, Northern New York Region |
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| Table 6: | Kyle Hafemann- Owner- Otter Creek Winery, Northern New York Region |
| Table 7: | Erica Paolicelli- Partner- 3 Brothers Winery, Finger Lakes Region |
INTERVIEW TRANSCRIPTS

Wineries interviewed:

- **Cornell University**- Timothy Martinson- Senior Extension Associate, Cornell University
- **NY Grape & Wine Foundation**- Julie Purpura Hosbach- Communications Manager, New York Grape & Wine Foundation; Adjunct Professor, Jefferson Community College
- **Coyote Moon Vineyards**- Tony Randazzo, Owner- Coyote Moon Vineyards, Northern New York Region
- **Cape Vincent Winery**- Dave Fralick- Owner- Cape Vincent Winery, Northern New York Region
- **Thousand Island Winery**- Stephen J Conaway- Owner-Thousand Island Winery, Northern New York Region
- **Otter Creek Winery**- Kyle Hafemann- Owner- Otter Creek Winery, Northern New York Region
- **3 Brothers Winery**- Erica Paolicelli- Partner- 3 Brothers Winery, Finger Lakes Region

Table 1: Timothy Martinson, Senior Extension Associate, Cornell University

| In what ways, if any, has climate change affected wineries of this region? | Let me start with what we had here in the Finger Lakes related to climate change. In the Lake Erie region, we had a lot over 2-inch rain falls, more than one. We had a catastrophic day with over 9 inches in 2 hours on Seneca Lake. It flooded all the side valleys. Not directly but in the previous 4 years, going back, we never had the experience of that happening. The projected impact of climate change is more frequent heavy rainfall events. My global view of the growing seasons here, once we hit August right through harvest, it was really unusual we had very steady rainfall which I think we had warmer temperatures at night. In September at night it gets down below 50 degrees, typically half the days are down below 50 at night. This year all we saw was, pretty vividly, the temperatures would stay at 60 degrees. The other thing is the soils were way more saturated than usual. We got rainfall in July august, it dries up quite a bit, the water in the soil dwindles down but if you get more rainfall it comes but it usually isn’t saturated. This year, the soil was totally saturated the whole ripening season. If you got rainfall and lots of puddles of water in vineyard, which you typically don’t see that time of year. Warmer night temps and heavy amount of soil moisture, not the same thing in NNY, you had a very dry season. That is what contributed to a lot of sour rot in some of our susceptible grapes like Riesling and chardonnay. I think I look at climate challenges going forward, if we have warmer season towards the tail end of harvest season, that will have |
big impact on vines towards diseases, I think. Particularly like Botrytis bunch rot and sour rot.

| What measures, if any, have winery operators taken to minimize the perceived effects of climate change? | Part of that is vineyard management obviously. I do not know. Long term, we are not at a static place, this year and last year is not the future, it’s only going to be more. As we get up to middle of century are you going to be able to grow more cold hardy grapes in New York, I certainly don’t think so, but you will have longer seasons and have more variable rainfall. It is conceivable that you can grow different grapes because of the temperature. Maybe some vinifera or other hybrids that it is still too cold to grow up there. The problem with that is things will stay warmer longer but when you get to Jan and Feb the hammer is still going to fall with the brutal cold. It’s hard to predict, I have dealt with people interested at Cornell in the farmers market and things ppl should do to prepare and mitigate it. I have a hard time coming up with things, grapes are a perennial crop that are sensitive to the conditions and the best thing you can do is change the varieties eventually. In some sense you are stuck with what you have, you will have to manage and mitigate that as things get warmer, but it will get to the point, Riesling comes to mind. It used to grow in Virginia but it’s too hot and humid so not it ripens and rots. The warming might make it a little easier for people in some respects up to a point. Up in Northern New York, it might mean you can think about diversifying what you have now and gradually introduce some new varieties. On the winemaking end there could be some consequences, but I’m not sure. I think the classic things in warmer climates is that the acids get low, the robust acidity in the finger lakes is part of the character, Riesling for example, might turn out to be a little flabby when it gets warmer with 6 grams of acid instead of 9 grams of acid when you harvest them, the flavors will be boring. In Western New York, with concords, which are the Finger Lakes number one grape, they saw cluster diseases coming in, after the 4 weeks of taking samples, the brix levels leveled off the grapes stopped ripening, sugar increasing then level off faster than it normally does. |

| How do you think climate change will affect tourism in the wine market? | Finger Lakes are going to keep on producing wine, tourists are going to continue to come. Instead of 10 days of rainfall in summer and now having 30 days, that will stop people from driving and going to wineries. If you have a lot of 90- and 100-degree days, that may have a damper on visitation. I don’t see the lakes or river going away, we will still have tourist. I do not see a big impact unless the whole economy goes to hell. |

**Table 2:** Julie Purpura Hosbach- Communications Manager, New York Grape & Wine Foundation; Adjunct Professor, Jefferson Community College

| In what ways, if any, has climate change affected wineries of this region? | Climate change has affected everyone in New York. Assuming it is getting hotter for example 2016 was a very hot and dry summer; this was great for the grapes. That vintage of wine had better quality. 2017 and 2018 did not do so well. We had shifting weather patterns. July, we had no rain whereas August we had lots. Mother Nature was throwing us... |
In Northern New York, the region has more extreme challenges because of how cold the temperature dip down to.

<table>
<thead>
<tr>
<th>Question</th>
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<tbody>
<tr>
<td>What measures, if any, have winery operators taken to minimize the perceived effects of climate change?</td>
<td>Vineyard management practices are important for vineyard owners. They need to track the weather in order to know what their next steps will be.</td>
</tr>
<tr>
<td>How do you think climate change will affect tourism in the wine market?</td>
<td>I think it will affect different regions because they all have different qualities. People will flock to the cool climate regions to get away from the heat. Tourist do not prefer totally hot weather, they want to escape the heat and enjoy their vacation. If it is too hot the tourist will look for somewhere else to go.</td>
</tr>
<tr>
<td>How does it affect wine production?</td>
<td>The hotter temps will have a positive affect because the vineyard owners will have a better quality- great quality even- but they will have a smaller quantity. Another issue that will affect the wine production is the hail storms that we have seen in recent years; they damage the grapes. There is also more rain which is causing flooding- suddenly all at once- the rain is not over time. The flooding causes erosion and can affect the grapes. Other vineyards do not have the resources to irrigate the grapes and yes, they like the sun but having too much sun can have negative effects on grapes. The pH and sugar levels will rise, but that is not always wanted.</td>
</tr>
<tr>
<td>What activities have you implemented to promote wine tourism?</td>
<td>At the Grape &amp; Wine Foundation we have many programs to promote the vineyards. We are currently working on a wine tourism project; which the details will be released in 2019. We like to profile the New York State vineyards to increase their popularity and help generate more funds. The FLX Grape Program provides unbiased research for grape growers. The Foundation also uses social media, press releases, 6K newsletter and links to all the vineyards regardless if they are associated with the foundation.</td>
</tr>
<tr>
<td>How do you describe our current wine market?</td>
<td>The current wine market is growing with all the new vineyards opening. The North Country is known as a vacation area for tourist in the Thousand Islands and that is helping promote the wineries.</td>
</tr>
<tr>
<td>What is your outlook of wine tourism in the region for the future?</td>
<td>I think wine tourism will continue to grow. Climate change will have a positive effect on the region, other than the excessive rainfall, but the temperature increase will raise the bar on the quality of wine that is being produces. New York is expanding in wine production and making a name for the state.</td>
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**Table 3:** Tony Randazzo- Owner- Coyote Moon Vineyards, Northern New York Region

In what ways, if any, has climate change affected wineries of this region? Depending on what size of climate change argument you are on. Growing the kind of grapes that we grow seem to hedge that bet, no matter which way the climate goes. Since we have not been in the business 40-50-60 years to really see a swing, you hear the old timers tell you about the ten-foot snow drifts they saw as a kid. Our grapes can...
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<tr>
<td>How does climate change affect wine production?</td>
<td>The production with it getting warmer longer could allow us to grow the opportunity to start growing different varieties. Cavite is colder winters which make that almost impossible to do. In one hand depending on how the climate really balances out we could have the opportunity for more traditional styles of growing, it could deter that like the professors at University of Minnesota who are able to develop more varieties that are tolerant to the extreme weathers.</td>
</tr>
<tr>
<td>What activities have you implemented to promote wine tourism?</td>
<td>Wine competitions, globally or coast to coast to raise awareness of the grapes were growing. Working with land trust, partnering with other non-profits like to land trust at Zenda farms to promote and educate people on grape growing, cold climate grape growing and what we can do in the frozen tundra of the north. We have three locations, the vineyard where we grow a lot of our grapes and tourist can see where the production happens. We put our restroom in the production room, so customers would have to walk in and see what we do. We have our downtown location on the river, overlooking the St. Lawrence River, enjoying a boat cruise while sipping on our legendary wine and having a howling good time. Then we have our mall location in Watertown where visitors can stop in for a tasting and a small appetizer or have a glass of wine while taking a break from shopping. We advertise on the wine trail and tell everyone our story, the history of how my dad Phil started the vineyard. We help promote other vineyards.</td>
</tr>
<tr>
<td>What measures, if any, have winery operators taken to minimize the perceived effects of climate change?</td>
<td>We are doing some of already, more as an inadvertently we are doing things that will help. Putting in large ponds to help rain management water, manage ground water and that out and retain it. Keep our cover crops down. Opening fields around vineyard to maintain a stable environment. Water management, we can reuse it. If we had to do irrigation, we wouldn’t have to install wells, or ground water we have the water on hand if were looking at drought and higher temps. Looking at putting in wind turbines for frost and cold weather events and keep that warm air down keep air moving on the farm. We have a plan, but have not implemented yet.</td>
</tr>
<tr>
<td>How do you think climate change will affect tourism in the wine market?</td>
<td>In our region, Climate change hotter summers and warmer summers on the St. Lawrence River it will initially affect it positively. The river may see a decline in its water levels, but it will increase tourism, places for people to go on the water. That will help increase our business from a tourism economy standpoint. Long term effects, how you do business. We sit in environment where we don’t have to water our plants, we would have to look at different ways and techniques, like in California. Growing grapes in the desert. Increased cost over time. To manage the vineyards and growing grapes. In short term, increase in tourism, warmer hotter and more people come for longer.</td>
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as well, people think we all hate each other and that is not the case, we respect each other and tell our staff to tell them about some of the other vineyards, because they do the same thing for us. We all grow together and help the economy grow. Bus tours, limo groups, wine cruises on the river, utilizing why people come up here, the river.

| What is your outlook of wine tourism in the region for the future? | It is growing, it’s hasn’t stopped. Over 10 years more wineries, breweries and distilleries have opened. The market has grown in all adult beverage industry, but not them alone. You have the cheese people utilizing the cows and making more cheese. Christmas trees growing more trees. The region itself is really is becoming a hub again like it did at the turn of the century. It is a destination a place to go, like we did in olden days, when trains used to come from NYC and [bring] people here. |

Table 4: Dave Fralick- Owner- Cape Vincent Winery, Northern New York Region

| In what ways, if any, has climate change affected wineries of this region? | That is kind of hard to say really because we haven’t seen many changes here at Cape Vincent. Overall, we still get -40 degrees in the winter. What I have seen is many swings in the weather, hot and dry one year, cold and wet the following year. Every year is not the same so having a weather station to monitor the weather. I would say it has made it more difficult for the wine production and grape production because you must monitor the environment, day to day and week to week numbers to make sure we can spray our crops. In the last 15 years since I have been growing grapes, the last 10 years have gotten better with late spring frost we have had. You go back in early 2000s we were getting hit every other year. In the last 6 to 8 years we have not had frost. WE have had other things, shut down problems. The grapes do not shut down, as you can see Thanksgiving this year was 28 degrees colder than normal and it affects the grapes. More dependent on tools to keep up with the weather and how to counteract it. 4-5 years ago, I had to bring in 40k gallons of water, loading tanks and hoses to water the vines. I currently have 6 acres. |
| What measures, if any, have winery operators taken to minimize the perceived effects of climate change? | We have not done as much as we probably could have. Most of the things you can do is very expensive. For late spring frost you can put up wind turbines, some do fires, use heat. We spray KDL, a Potassium Oil, to hold them back so the vines do not awaken early, because we do not have a lot of funds in Feb. If you have a perfect year, you just wasted hours and money to spray to protect the vines. Time and Money are needed to minimize the effects. We are a very young industry and to spend the money, we cannot afford it as a region. |
| How do you think climate change will affect tourism in the wine market? | It will bring more people up here, what we must watch. The water problems, the river, was its climate change or was it the river with extra rain and an abnormal summer. That was fabulous for us. People came here and there was nothing to do. It helped up because so many cottage owners saw their cottage and said “I need a drink” or because the river was too high, they did not want to even try going out on it and came to the vineyard. That was one of our biggest growth years, 25% increase. |
We are about even with last year, but the prior year was Awesome. Tourism in general, the west and Midwest, people are looking for somewhere that is different. It is bringing more people to check us out and then they stay, or they keep coming back. The wine trail which I head, we have our wine trail maps, we are talking about doing some wine trail apps, it will tell you how to get around from place to place and where to stay in the area, what to eat, which is in the works. We are trying to make a change to our wine trail so more people will visit The Cape. Everything is done in baby steps because it takes money and time, and the group is made up of wine owners and busy people. We are trying to build the wine trail up. It was costing the vineyards a lot of money each year and was not benefiting any of us. We are having meetings again and building it up again. We have a lot to consider with all the wineries, breweries and distilleries popping up.

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<td>How does it affect wine production?</td>
<td>Are there other grapes varieties that we can bring up, that way we can support additional acreages with some sort of vinifera grape, give us a unique grape in the area. I was listening to Watertown weather and mine is so different than everyone else. We have a different climate than anyone else. It was -1 degrees here and -45 degrees at Otter Creek.</td>
</tr>
<tr>
<td>What have you done to adapt to the current climate?</td>
<td>Governor Cuomo has helped with the weather stations so I can monitor daily and compare to the past two years that it has been installed.</td>
</tr>
<tr>
<td>What activities have you implemented to promote wine tourism?</td>
<td>Wine trail, festivals, we opened tasting room downtown for 3 years, that did not pay. In three weeks, starting the first of the year, we are on the road all over the state, going to casinos and selling wine. Promoting the Thousand Islands, all over the state, getting people to see what we have and then in June, all the people are coming up. My craft fair brought 2k people on a Saturday. We must continue doing dinners and promoting the vineyard and the region in order to bring the people up from all over the state. We are not concentrating the market in Buffalo and Rochester, that market is done. We are heading towards Albany, Utica and the east side of the state. We have more dinners and even a picnic coming up to bring the family out, kids included. Making plans 8 months in advance, you must hope the weather is good. We take our maps and everything about the wine trail to travel the state. They try the wines, they are hooked. We do not distribute, we ship throughout the state, offering free shipping or give our customers a discount for picking up at the vineyard.</td>
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<td>How do you describe our current wine market?</td>
<td>The current market is good, its building because of new wineries opening and the tourism that we currently have. More people are coming up the explore the Thousand Islands and escape the hotter climate regions.</td>
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<td>What is your outlook of wine tourism in the</td>
<td>It is getting better, I am getting a little concerned, because some of the wineries I do not know if they are going to make it, I do not know half the time if they are open or why not. That kills tourism. We bring buses, we know in advance, so we can plan for it, but that’s for busses, they</td>
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have it coordinated. The individual people coming in, its hard if everyone isn’t open. I have made a conscious decision to stay open even though people driving out here I haven’t seen people here in 2 weeks. I stay open every day and have consistent hours. If we can get people to stay involved, and work, I think we can increase tourism. We are different than any other region, we need to promote more throughout the state, not just Rochester and Buffalo region. People are amazing when they show up and they are amazed by the quality of the wine and experience our wines. I make sure my staff is trained and know the history of the vineyard, I have a 4 page write up that everyone had to learn because people like the stories and histories of the wineries.

Table 5: Stephen J Conaway- Owner-Thousand Island Winery, Northern New York Region

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<td>In what ways, if any, has climate change affected wineries of this region?</td>
<td>In 15 years, I observed, no noticeable change from historical temperature norms.</td>
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<td>What measures, if any, have winery operators taken to minimize the perceived effects of climate change?</td>
<td>Thousand Islands Winery tried to be proactive concerning climate change. It experimented by planting grapes that are less cold tolerant on its farm. For example, it planted a block of Riesling. These grape varieties not only did not fruit during the cold years but totally died. We also tried planting other more temperature tender grape varieties that were a 100% loss. So, by taking these actions, I lost my farm’s tax agricultural exemption on Wellesley Island. Our local government was not sympathetic that we were trying to adjust to climate change, by planting less cold hardy varieties and experienced 100% losses. In 2016 we even had severe cold losses on our known cold hardy grapes like La Crescent and received federal assistance for our cold losses. So, from an agricultural perspective there has been no noticeable changes from historical averages in the Thousand Islands Region. I would base all agricultural decisions on historical norms and not current scientific predictions and recommendations. We suffered worst losses due to coldness instead of heat related losses.</td>
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<td>How do you think climate change will affect tourism in the wine market?</td>
<td>Again, I do not see any tourism changes related to climate changes. I see tourism challenges more related to fuel costs, river levels based on outflows at dams, and economic and social changes that are occurring routinely.</td>
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<td>How does it affect wine production?</td>
<td>Wine Production is not affected by climate change since it is done indoors. Climate Change would affect outside grape growing.</td>
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<td>What have you done to adapt to the current climate?</td>
<td>As stated above, I tried to plant less cold hardy varieties and had 100% failure. In turn it caused our winery not only to suffer financial losses due to opportunity costs, but also our agricultural tax exemption, since the crop failures did not meet local taxing jurisdiction’s regulations.</td>
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How will you adapt to future effects of climate change? | Follow traditional agricultural planting and schedules based on historical temperature averages. Climate Change appears to have negligible effects based on viticulture.

What activities have you implemented to promote wine tourism? | Became a member of the local wine trail, host public and private events at the winery, and serve wine tastings and winery tours daily.

How do you describe our current wine market? | Unsustainable from a year-round perspective. Due to the limited number of populations in the Thousand Islands region during the winter months, it appears that too many wineries have been developed. This puts a high level of pressure to obtain sales of wine to only a small demographic of customers. The results are low profits. Therefore, it will require most future growth to be conducted outside of the region in the form of online wine sales and wholesale activities.

What is your outlook of wine tourism in the region for the future? | Limited. If the number of new opening wineries ends and some of the existing wineries close due to attrition, the area will become more successful. 4 – 6 wineries in the Thousand Islands region would be sustainable. However, in my opinion, there is currently an oversaturation of wineries, distilleries, and breweries in the Thousand Islands Region that compete for basically the same customers. The high density of craft beverage producers is cannibalizing themselves for sales due to the area’s small customer base.

Table 6: Kyle Hafemann- Owner- Otter Creek Winery, Northern New York Region

| In what ways, if any, has climate change affected wineries of this region? | So being that had I had grapes since 2003, the highs and the highs and the lows and lows the last couple years are more dramatic than I have seen, ever since I have done it. I remember as a kid we had 40 below weather, but then you did not have it for a very long time. the last few years we have had it I was getting down below 45. I hardly remember 90-degree days and now we have them more quite often. The highs don’t bother me, the highs you can deal with. The lows you cannot fix. That makes it tough, I don’t care what we’re doing, 45 below, these grapes cannot make it through the winter. Some of my old vines shot up, but we must whack the vines down to the root every year for last three years.

| What measures, if any, have winery operators taken to minimize the perceived effects of climate change? | Cape Vincent, Wellesley Island and myself all have weather stations, I can tell what the temperatures are. Steve at Thousand Islands is warmer than it is here which is why he can grow Riesling and I am having issues growing any grapes here. My weather station will say it is -40 degrees and it only -20 degrees at the island. I will be -20 degrees and have 3 feet of snow, it will be 1 degree and have a dusting of snow. For the high temperatures, vineyards need to think about irrigation or water sources to provide the vines with the necessary water. When I get the extreme lows, I have contracts in line, so I can come up with the grapes I need. There are enough grapes in the state, that you
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<td>How do you think climate change will affect tourism in the wine market?</td>
<td>Up here you have mixed reviews about what caused the flooding, I have my own personal ideas, it was rainy that year and someone could have helped. Coyote Moon was under water and you lost business with your basement being underwater. The hot days were extremely hot, people did not want to come out. People wanted to stay at their camp on the hot days and enjoy the river, I would not want to leave the river on a hot day. 100-degree days, nobody is coming out in that, you must hope they come out. When you lose those days, there is no getting them back, especially in our limited season that we have already. If you lose two weeks in the summer time, you won’t gain it back in November. The Finger Lakes can absorb that and have continued tourist through November- December, we do not have that up here.</td>
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<td>What have you done to adapt to the current climate?</td>
<td>I had to stop putting grapes in, they cannot weather the winter, every year cutting them back, I had to restart at the root stock. Until I can figure it out or come up with a better solution, I really don’t know. I have enough data to know at this site, it will not work. At my satellite store in Alexandria Bay, I have 5 acres, if I chose to stay there and buy it, I could grow grapes there, I would move most of them over, because it is easier to deal with. I own 200 acres here in Philadelphia, but it is not about the land, it’s the cold weather affecting the grapes. Part of it is help as well. If I have to come back from the ground every year, I can’t dedicate 2 people to work in the vineyard and knowing I won’t get anything out of the vines, it is not worth the cost or time. The rootstock I have is 15 years old, if it dies and I don’t choke down it in the summer, the shoots can come too fast and kill itself again. We don’t spray it, we don’t mow it. We don’t do anything to choke the growth down. We will start over and it’s a pain, it’s a lot of work. Some I am pulling, like La Crescent, I just do not have good luck with it and I do not have enough to keep the vines going.</td>
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<td>What activities have you implemented to promote wine tourism?</td>
<td>We are trying to get the wine trail going again better. I have a second location, my satellite store in Alex Bay, going into the main area. I did the State Fair for the first time, you invest a lot of money and hope you get some return, which we did but having all that money tied into it and not knowing how it’s going to be. You need to get recognized and be known there, this is my first year.</td>
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<td>What is your outlook of wine tourism in the region for the future?</td>
<td>To be blatantly honest, there is too much of everything and I’m not talking just in this region, this is a NY State problem. Too many breweries, wineries and distilleries too many everything. So, you must take it, get back to the main, the people who can absorb it and have a business monologue. I don’t care what happens on that part. The people that come and think they are going to make fast cash you must figure out, is it a tax write off because they have too much money and don’t know what to do with it or they are going to fold and the downfall of the</td>
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business. First, they lose the care factor, you hope it doesn’t ruin the image of the area before they have the time to succeed or go out. I don’t care which one it is. Other vineyards are never open when they say they are going to be, and that can do with people and not having the employees to hire, or the business does not care anymore. You hope the quality doesn’t fall to the backside to ruin the image you built up to. I opened in 2007 with Yellow Barn and River Myst, we were all open within 3 months of each other. Thousand Island has been open the longest, then Coyote Moon joined us. We all worked hard to make a name for the area.

Table 7: Erica Paolicelli- Partner- 3 Brothers Winery, Finger Lakes Region

| In what ways, if any, has climate change affected wineries of this region? | The fact of the matter is that we’ve been a winery for 11 years and climate change hasn't had much effect on our place yet. |
| What measures, if any, have winery operators taken to minimize the perceived effects of climate change? | As you know, extreme weather events aren’t good for anyone and make farming tough. I would say that working with these extreme events is the challenge for our farmers. |
| How does it affect wine production? | I’m hearing that drought like conditions in California are making it increasingly more difficult for grape growers out there- along with the wildfires. If we began to experience more extreme weather, it will become more difficult to farm. |
| What activities have you implemented to promote wine tourism? | We promote wine tourism through tourism affiliate organizations, board involvement and guest experience |
| How do you describe our current wine market? | Wine is more approachable than it has ever been- the wine market is better than it's ever been. Consumers are increasingly becoming more comfortable with purchasing wine online, so it's also more accessible than ever. |
| What is your outlook of wine tourism in the region for the future? | The wine outlook in the Finger Lakes is bright! As long as we can preserve our region and keep it tourism focused, we'll continue to experience growth. As we continue to spread the word about the world class wine region that we have in New York, I anticipate increased visitation. |
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