Determining an Apple Supply for the
Greylock WORKS Cider Lab
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Table of Contents
Acknowledgements

We would like to express our thanks to Salvatore Perry and the entire Greylock WORKS team for including us in this process. Their guidance was invaluable throughout this project. We also extend our thanks to Professor Sarah Gardner of the Center for Environmental Studies, Sophia Schmidt CES Teaching Assistant, and our classmates in Environmental Planning 302. This project would also not have been possible without the aid of numerous local apple producers, hard-cider experts, and citizens who took time out of their days to talk to us. Thank you all.
Introduction

Our project was to work with Salvatore Perry of Latent Productions to determine a supply of cider apples for the Greylock WORKS Cider Lab and present recommendations to Greylock WORKS based upon the collected information. The cidery would be part of a larger initiative to transform the former Cariddi Mill Building into a “catalyst for culture and production that celebrates New England values and contributes to the regenerative pride emanating from the City of North Adams.”¹

The goal of the project was to determine which apple suppliers would best suit the Cider Lab’s needs and fit into the development’s vision of Greylock WORKS as an ecosystem of producers and consumers. In determining viable suppliers, we considered environmental impacts, sustainable and ethical business modeling, and market economics. We identified six local apple producers who are interested in expanding their markets to include growing for the Cider Lab. Greylock WORKS will continue to work with these producers as the cidery gets started to determine contracts and plan new plantings, if the growers are interested in propagating new cider varieties. The cidery is planning to scale up its production over the next three years.

Regional and Site History

The site of Greylock WORKS is located along the Mohawk Trail in between North Adams and Williamstown. Greylock Mill, formerly known as the Cariddi Mill, is a 240,000 ft² former fine cotton spinning facility stretching 700 feet along the road. This project seeks to revitalize the abandoned mill, a “deteriorating blight in the community”.²

² Greylock WORKS, “Berkshire CEDS Priority Project Update Form”, 1.
Originally known as the “Greylock Mills,” this textile mill boasted 57,000 spindles and more than 1,200 looms from the early 1800s into the 1900s. In the years following, the structure was also home to an aluminum manufacturing facility, a fine lace weaving operation, and eventually a wallpaper manufacturing firm. The mill was bought by the Cariddi family in 1976 and was subsequently purchased by Latent Productions in 2015. Some of the past uses of the mill have resulted in Brownfield conditions on site, and thus Greylock WORKS is conducting site cleanup “in compliance with MCP protocols under the direction of Ed Weagle of O’Reilly Talbot & Okun”. The plan for the renovated space includes a hotel and amenities, a public park, event space, and retail and production facilities. The food program from the facility includes the Cider Lab, a cheese and yogurt making facility, an affinage cave, an event kitchen, and vertical farming in the form of a rooftop greenhouse. In addition to being a cultural hub, the Greylock WORKS Cider Lab would provide a new market for local apple growers, providing much needed support to regional agriculture.

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4 Ibid.
5 Greylock WORKS, “Berkshire CEDS Priority Project Update Form”, 2.
Regional Agricultural History

Since the 1980s, small farms have been struggling across the United States due to a decline in available, affordable farmland and a general lack of farm profitability. Increasingly, small farmers have found it difficult to compete with large agro-business food suppliers. This graph sums up the plight of small farmers over the past 200 years. As shown, the acreage of farmland has remained relatively stable, while the number of farms has decreased, and the average farm size has increased.

![Graph showing the number of farms, average farm size, and land in farms over the past 200 years.](https://www.washingtonpost.com/news/wonk/wp/2014/09/16/the-decline-of-the-small-american-family-farm-in-one-chart/)

In Massachusetts, the Agricultural Census shows the total acreage of farmland has decreased from the maximum of 617,359 acres in 1978 to 523,517 acres in 2012. The amount of land in orchards has decreased from 489 farms over 9,332 acres in 1982
to 456 farms over 4,146 acres in 2012. In New England, urban development and sprawl continue to claim some of the region’s best farmland. The amount of cropland in New England has declined 11 percent since just 2007.

The Berkshires has a rich agricultural history. However, in the North Adams-Williamstown area, the prominence of agriculture has steadily declined since the 1800s. North Adams’ proximity to the water power provided by the Hoosic River made it the ideal location for manufacturing. Despite the wealth of the town in the early 1900s, the economy was devastated by the closure of the Sprague Electric Company in the 1980s.

As industrial producers exited the North Adams region, they left behind a shattered economy, an epidemic of unemployment, and many vacant mills. The North Adams economy has stayed afloat largely because of cultural endeavors, such as MASS MoCa. Greylock WORKS certainly bolsters the image of North Adams as a center of culture. Greylock WORKS, through “a vibrant mix of production, retail, hospitality, and cultural uses, [hopes to] re-energize this complex and contribute to the growing economic strength of the Berkshire community.”

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6 USDA, “Table 1. Historical Highlights: 2012 Census and Earlier Census Years,” USDA Agricultural Census, https://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_1_State_Level/Massachusetts/st25_1_001_001.pdf


Hard Cider History

Apples originated from Central Asia and gradually spread into Europe by means of trade routes. Apples are perennial and thus relatively easy to grow. Because they prefer temperate climates, apples grow readily in New England. Apple cider was once a staple drink of New England subsistence farmers, since it is simply fermented apple juice. Traditional apple cider bears many similarities to wine. There are four basic steps to making cider: the fruit is gathered, the fruit is ground up, the juice is pressed, and finally, the juice ferments.

The diversity of apples grown in the US has recently begun to make a comeback after being decimated in the 1900s by a combination of factors. In the 1800s there were an estimated 7,500 American apple varieties, but by the 20th century industrial-scale orchards and the decline of the subsistence farm caused a precipitous decline in apple variety. Like many pastoral traditions, cider began to disappear when urbanization caused many people to move away from their orchards. Prohibition had a crushing impact on the cider industry, and practically ended the propagation of cider apples.  

Once prohibition was lifted, the lack of apples and abundance of wheat meant that beer was well positioned to become the drink of choice around the country. This was a change exacerbated by the influx of beer-drinking German immigrants in the late nineteenth century and wine-drinking Italian immigrants in the early twentieth century.

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Cider has made a comeback in recent years, and with its resurgence many farmers and retailers have become more interested in cultivating rare or lost apple varieties. Through its cidery, Greylock WORKS hopes to help cultivate this resurgence in the Berkshires. They hope to achieve this through a “balanced combination of
research, production, strategic grafting and plantings, and effective marketing that celebrates craft cider alongside wine as a truly refined and complex beverage derived from fruit.”

Cider Apple Varieties

Not all apple varieties are suitable for cider. Cider apples are selected for their tannins and acids, which often make them inedible when fresh. New varieties of apples are constantly emerging because of the unique genetics of apples. Apple seeds, contained in five ovaries at the core of an apple, are not genetically true to their parents. Technically, each seed is a new apple variety. This presents a problem when trying to propagate apples, because desired parent tree varieties always produce genetically different offspring. In order to get another tree of the same variety, apple producers graft a stem of the desired variety onto an existing tree or rootstock. Most apple trees take six to eight years to reach maturity from a seedling. Some dwarf varieties reach full production after three to four years. A grafted cultivar will be productive within two years.

There are several cider apple varieties that can be successfully grown in the North Adams region and could be incorporated into Greylock WORKS’ cidery. These include Dabinett, Ellis Bitter, Golden Russet, Harry Masters, Jersey Hewes Crab, Kingston Black, Redfield, and Wickson. A complex and tasty cider requires many different apple varieties in one batch. Greylock WORKS needs a balance of different

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varieties, including those that fall into the categories of sweet-sharp, bitter-sweet, and bitter-sharp.\textsuperscript{15} Greylock WORKS could also use some multi-use varieties of apples in their cider production including Northern Spy, Empire, Mcintosh, Winesap, Gravensteins, Spartan, Jonagold, and some varieties of crab apples.

The fermentation process, which occurs when juice is made into cider, relies heavily on yeast. During the process, yeast breaks down the sugar provided by the apple juice and turns it into carbon dioxide and alcohol. The yeast also contributes greatly to the flavor of the drink. Some cideries use wild yeast, which is present in the air, for their fermentation processes, but most use a dry yeast, for the sake of consistency and style. Additionally, the use of fungicides in orchards destroys the wild yeast present on apples, requiring the use of dry yeast.\textsuperscript{16}

Hard Cider Market

According to Matt Looney, a professor of microeconomics at New York University and a retailer of wine and cider in Brooklyn, the Greylock WORKS cidery would represent a tiny portion of the market share in cider. However, in the craft world, they would “enter as a medium output player, at the lowish end of the price scale for [their] core product.”\textsuperscript{17} In the early phases of the operations, any profit generated would come from direct consumer activity at the Greylock WORKS in North Adams. In this vein, it is important to measure the market share that Greylock WORKS can command. There are currently 72 cideries in New England, 25 of which are in Massachusetts. However,

\textsuperscript{15} Matt Looney. “gWorks Cider.” Message to the author. 20 October 2016. E-mail.
\textsuperscript{17} Matt Looney, “gWorks Cider.” Message to the author. 20 October 2016. E-mail.
although there are quite a lot of cider producers in Massachusetts, there are relatively few in the Berkshires, making Greylock WORKS economically viable on a local scale.

Figure 3: Map of New England Cideries
The Greylock Works Site is represented by the light green pin on this map of cidery producers. It is located at 508 State Road in North Adams, Massachusetts. The factory space itself is a total of 240,000 square feet, 50,000 square feet of which will be dedicated to craft food production.

Relevant Legal Formalities and Fees

Before beginning a cider operation, it is necessary to take stock of local schools and churches located nearby. The licensing board must explicitly approve that any alcohol manufacturing or retail facility within 500 feet will not negatively impact the
educational or spiritual community.\textsuperscript{18} Greylock WORKS, located at State Road and Protection Avenue, is around 2,800 feet from the nearest Church and more than 10,000 feet from the nearest school, well outside the restricted zone.

For purposes of licensing and taxation, cider is categorized as a malt beverage as opposed to wine or hard liquor. This is important because tax rates rise significantly with alcohol content. In order to sell cider at as low a price point as possible, Greylock WORKS should acquire a farmer-brewery license. At the forecasted starting level of production (5,000 cases per year), Greylock WORKS will have to pay the starting farmer-brewery license fee of $22 per year. The farmer-brewery license fee increases with the scale of production according to the following yearly schedule:

\begin{itemize}
    \item 5,000 to 20,000 barrels: $44
    \item 20,000 to 100,000 barrels: $82
    \item 100,000 to 1,000,000 barrels: $110
    \item Each additional 1,000,000 barrels: $110\textsuperscript{19}
\end{itemize}

If Greylock WORKS decides to sell cider with an alcohol content greater than 6% by weight at 60 degrees Fahrenheit, it will need to acquire a farmer-winery or farmer-distillery license as appropriate. The pay schedule for a farmer-winery license:

\begin{itemize}
    \item 5,000 to 20,000 gallons: $44
    \item 20,000 to 100,000 gallons: $82
    \item 100,000 to 1,000,000: gallons $110
    \item Each additional 1,000,000 gallons: $110\textsuperscript{20}
\end{itemize}

\textsuperscript{18} MA Legislature, General Laws: Part I, Title XX, Chater 138 (Alcohol Laws), Section 16C <https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXX/Chapter138/Section16C>  
\textsuperscript{19} MA Legislature, “General LAws: Part I, Title XX, Chater 138 (Alcohol Laws), Section 19C.” <https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXX/Chapter138/Section19C>  
\textsuperscript{20} “MA Legislature, General Laws: Part I, Title XX, Chapter 138 (Alcohol Laws), Section 19D.” <https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXX/Chapter138/Section19D>
Greylock WORKS will also need to pay a manufacturing fee of $25-$250 dependent on the expected size of the operation as determined by the Commission\(^\text{21}\). To store large quantities of hard cider, Greylock WORKS must obtain a warehouse fee at a cost of $2000 to be renewed annually. Given the potential size of the cider operation, Greylock WORKS should be aware that Massachusetts limits warehouse licenses to 1 per municipality and 3 across the entire state. In the unlikely scenario that more than 3 warehouses (inclusive of the Greylock Works factory site) are required, Greylock WORKS may wish to look into warehousing laws in adjacent states\(^\text{22}\).

**Tasting, Hours, and Other Operational Limitations**

Limitations can be set unilaterally by the permitting commission, however, several limitations remain explicitly codified in law. There are no relevant limitations on free tastings of product made on premises. However, strict regulations govern tastings of alcoholic beverages purchased by the licensee. In the eyes of the law, cider is likely classified as a “cordial (or other),” because this section of the law does not separate out cider from malt, wine, and other alcoholic beverages. If cider qualifies as a cordial, the limit for free tasting is one liter for every 30 days. If cider with alcohol content between 3 and 6% is considered a malt beverage, as it is codified in other parts of the law, the limit for other providers’ alcohol served at Greylock WORKS is 18 liters per 30 days\(^\text{23}\).

\(^{21}\) MA Legislature, “General Laws: Part I, Title XX, Chapter 138 (Alcohol Laws), Section 19.” <https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXX/Chapter138/Section19>

\(^{22}\) MA Legislature, “General Laws: Part I, Title XX, Chapter 138 (Alcohol Laws), Section 20.” <https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXX/Chapter138/Section20>

\(^{23}\) MA Legislature, “General LAws: Part I, Title XX, Chapter 138 (Alcohol Laws), Section 25F.” <https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXX/Chapter138/Section25F>
The full Greylock WORKS space can be used by all visiting guests, regardless of whether they are drinking cider. According to MA law, Greylock WORKS guests may take alcoholic beverages from the cidery around all parts of the building without a seal. Guests may leave the premises with partially full containers of cider as long as the container is sealed\(^24\).

General hours of operation are limited to 8am-2am Monday through Friday and 10am-2am Sunday with serving hours for taverns ending at 1am. The 10am Sunday start time is competitive with Rhode Island and Connecticut but leaves Greylock WORKS at a competitive disadvantage with distributors in New Hampshire and Vermont, which may open at 6am on Sundays\(^25\). Given Greylock WORKS’ location near the Vermont border, this disadvantage may be relevant on Superbowl Sunday, but generally we do not expect limitations on hours of operation to hugely affect the business. Additionally, no sales are allowed during polling hours on election days, 1am-noon on Christmas, Dec. 26, and the last Monday in May\(^26\).

Greylock WORKS’ goal is to sell product primarily on site. However, they have indicated potential interest in also selling to liquor stores. Likely in order to discourage mass overconsumption of alcohol and the resulting overtaxing of the police and hospital forces on particular days, Massachusetts bans the offering of discounts between wholesalers and retailers based on immediacy of purchase or quantity of purchase. To

\(^{24}\) MA Legislature, “General LAws: Part I, Title XX, Chater 138 (Alcohol Laws), Section 12.” <https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXX/Chapter138/Section12>


\(^{26}\) MA Legislature, “General LAws: Part I, Title XX, Chater 138 (Alcohol Laws), Section 12.” <https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXX/Chapter138/Section12>
further discourage any remaining loopholes, prices set between these businesses must remain unchanged for 30 days after a deal is struck.\textsuperscript{27}

\section*{Taxation}

Taxes for run-of-the-mill ciders are affordable. Hard cider with 3-6\% alcohol content by weight at 60 degrees Fahrenheit is taxed at $0.03/gallon. Despite the comparable alcohol content in beer, taxes for malt beverages in Massachusetts are set at $0.11/gallon—nearly quadruple the rate for hard cider. Taxation rates for beverages with higher alcohol content become steeper according to the following schedule:

- Malt Beverages (beer)= $0.11 per gallon
- Still wine (including vermouth) = $0.55 per gallon
- Champagne and other sparkling wine = $0.70 per gallon
- All beverages with less than 15\% alcohol at 60°F = $1.10 per gallon
  - 15\%-50\% alcohol = $4.05 per gallon
  - 50\% alcohol = $4.05 per proof gallon\textsuperscript{28}

A very recent law has stipulated that all hard cider containing more than 6\% alcohol by weight at 60 degrees Fahrenheit must face the same tax rate as champagne and other sparkling wines: $0.70 per gallon. As lampooned in a recent Berkshire Eagle article, this is essentially a 2300\% increase from the $0.03 per gallon rate stipulated for cider with alcoholic content between 3 and 6\%.\textsuperscript{29} However, effects of this on the Greylock WORKS business may be minimal, since Greylock WORKS products with alcoholic content greater than 6\% may sell for roughly $30 per liter, resulting in a tax of

\footnotesize
\begin{itemize}
  \item MA Legislature, “General LAws: Part I, Title XX, Chater 138 (Alcohol Laws), Section 25A.” <https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXX/Chapter138/Section25A> \\
  \item MA Legislature, “General LAws: Part I, Title XX, Chater 138 (Alcohol Laws), Section 21.” <https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXX/Chapter138/Section21>.
\end{itemize}

less than 1% of the selling price. Some are working to change this new law so that the
tax increase will only occur on ciders with alcohol content greater than 8.5%.

Alcohol purchased for research purposes may be exempt from taxation.

Additionally, taxes may differ on Greylock WORKS cider sold to buyers located in states
with different excise taxes on alcoholic or other beverages.

**Greylock WORKS Production**

Once Greylock WORKS has secured its apple stock and any new plantings have
matured, production should be around 5000 cases of cider per year. This output would
cover fixed costs, basic labor requirements, and capital amortization. Greylock WORKS
plans to gradually increase production toward this level over the first three years, while
experimenting and selling small batches. Because one bushel of apples makes
roughly one case of cider, the Greylock WORKS apple supply must sustain a harvest of
5000 bushels of apples per year. Greylock WORKS intends to enter 3-year
commitments with suppliers at the price of roughly $24 per bushel, with the expectation
of a certain level of quality. Greylock WORKS hopes to also purchase heirloom varieties
wholesale. To provide a comparative example of supply, Bear Swamp Cidery boasts 7
acres of apple trees, 85% of which contribute to their cider, yielding about 1000 gallons
from 500 bushels. Considering fluctuations in production efficiency and apple usage, the
output of Greylock WORKS will be roughly 10 times that of Bear Swamp Cidery.

The end goal is to produce 5000 cases, which at a rate of 1 bushel (126 apples)
per case involves acquiring a supply of 5000 bushels. The combined acreage required
from supply sites will vary based on the size and types of trees grown. For instance,

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30 Ibid.,
31 A bushel is about 26 apples.
dwarf apple trees supply one to four bushels, semi-dwarf trees supply five to ten bushels, and standard sized trees provide ten to twenty bushels.\textsuperscript{32} Using Minnesota as an example because of its similar latitude to Williamstown, we can attain a good guess of required acreage to support 5000 bushels. In Minnesota, crops of dwarf apple trees planted at a density of 388 per acre typically yield between 300 and 500 bushels per acre.\textsuperscript{33} Trying to meet our goal of 5,000 bushels, we can thus estimate a need for at least 10-17 acres on an annual basis. Given that apples are biennial, the cidery supply may need to alternate on an annual basis between two different orchards. Thus Greylock WORKS will need roughly 20 to 34 acres of supply orchard in rotation.

However, as mentioned in more detail in the interview summary on page 22, David Dolginow of Shacksbury Cider managed to plant dwarf trees 4 feet apart. This arrangement yields a minimum of 2,700 bushels per acre. Bearing in mind our stated goal of 5,000 bushels and the biennial nature of apples, our calculations reveal a need for a \textit{bare minimum} of 4 supply acres.

\textbf{Economic Conditions of the Local North Adams Community}

The town of North Adams, where Greylock WORKS is located, is relatively impoverished. Median household income in North Adams, often including more than one earner, is $37,654, with annual income per capita at $22,672. The North Adams median household income is just over half of the Massachusetts statewide median of $69,160 and well below the median income for the US, New York, and Vermont. The

\begin{flushright}
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poverty rate, defined by the Federal Poverty Level of $11,880 for individuals and $24,300 for a family of 4\textsuperscript{34}, is 18.9\%\textsuperscript{35}. The North Adams poverty rate is 60\% higher than the next closest regional poverty rate in Adams (11.8\%) and nearly three times as high as the (unweighted) regional poverty rate of all surrounding counties (6.8\%).

**Figure 8: Median Household Income, 2000-2009**

![Median Household Income Chart]

*Sources: U.S. Census Bureau: 2000 Census and 2005-2009 American Community Survey data*

**Figure 4.** North Adams population trends reflect the low prospects for young families to make a good living in the area.

**Figure 3: Age Distribution, 2000-2010**

![Age Distribution Chart]

*Source: U.S. Census Bureau, 2000 and 2010 Census data*

**Figures 5 & 6.** This figure presents the age distribution and number of citizens in North Adams, MA. It should be noted that there is a low and decreasing number of young professional and working age residents.


From 2000 to 2010, the town of roughly 13,500 people lost about 200 25-34 year-olds and 700 35-44 year-olds. During the same time period, the number of 45-54 year-olds living in North Adams increased by roughly 100 individuals. These changes represent an aggregate loss of 6% of the working-age people over 10 years. Figure 5 and 6 show that in 2000, North Adams' working-age population as a percent of total population aligned with the US average. However, this measure has now sunk below the US average due nearly entirely to the out-migration of young 25-44-year-old workers.

**Where Greylock WORKS Fits In**

The primary issue in the North Adams economy is not unemployment per se, which stands at 6% and is declining alongside the national average of 5%. The labor participation rate in North Adams is 6 points below the national average, which may show that residents have simply given up on employment due to the minimal opportunities. The primary issue with the North Adams economy appears to be the lack of well-paying jobs. The prosperous age of North Adams centered around manufacturing and service industry jobs. Still today, given that 79% of residents over the age of 25 do not have Bachelor’s degrees, the key to employment success in North Adams lies in well-paying manufacturing and service industry jobs. Greylock WORKS will contribute to this type of job supply through 100+ on-site jobs across the

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cheese-aging department, the hard cider apple departments (supply, production, and packaging), the hospitality department, and the public event space department.

With its annual budget of just $37.7 million\textsuperscript{39}, North Adams could benefit from the additional money provided by a Greylock WORKS property tax. With the combined private and public investment of more than $5 million on a 260,000 square foot property and facing the current tax rate of $36.07 per $1000 of property value\textsuperscript{40}, Greylock WORKS will be paying tens to hundreds of thousands of dollars in property tax directly to the North Adams municipal government.

Alongside the more substantial property tax, Greylock WORKS will be paying several hundred to several thousand dollars to the Commonwealth of Massachusetts in alcohol taxes, a farmer-brewery license, a manufacturing license, and possible warehouse license. The final way Greylock WORKS will contribute to the local community is via its large public event space. Last summer, 2000 people attended the Orpheus in the Berkshires play, and, during the off-season, 600 local residents attended a free concert also held at the site. Those uses, as well as a dinner party, are depicted below:

Background Interview

David Dolginow of Shacksbury Orchards

In order to get a better sense of the intricacies of starting a cidery and sourcing apples, we interviewed David Dolginow of Shacksbury Cider in Vermont, who readily answered all of our questions. Dolginow spoke with us by way of “Facetime” in front of Shacksbury’s dry storage area. He noted that they were currently in the process of retrofitting a creamery from 1959 to serve as Shacksbury’s new location, an endeavor similar to that of Greylock WORKS. Our discussion began with the question of apple supply and collection. Dolginow indicated that he had previously worked for Sunrise Orchard, one of the largest orchards in Vermont. His experience at Sunrise allowed him to form a reliable partnership from which to build his cidery. Sunrise Orchard planted traditional cider apples in 2011 that reached production maturity in 2016. Through a “lost apple project,” they foraged for apples with which to supplement their planted
supply. However, the success of this initiative varied year to year (Dolginow noted, “One can’t much rely on wild apples”). For the bulk of its supply, Shacksbury Cider relies heavily on imported apples from orchards in England to make up for local deficiencies. While Dolginow was somewhat optimistic that the incidence of new plantings in New England is slowly increasing, he commented that “almost every [local cider] apple is spoken for.” Shacksbury has recently sourced some apples from Steve Wood of Poverty Lane Orchard in New Hampshire, Scott Farm in Brattleboro, Vermont, and from Windfall Orchard in Middlebury, Vermont.

Dolginow also mentioned that Shacksbury holds no written contracts with growers, relying on handshake deals and “small business-to-small business” relationships. Under these handshake deals, Shacksbury is given the right of first refusal to the apple crops in question. Dolginow pointed out that the local market price of cider apples is effectively set by Steve Wood, one of the only producers in the country who sells large amounts of cider apples such as Northern Spy. Prices per volume of eating apples and cider apples are different because, although cider apples have highly concentrated flavor, they produce a lower juice yield than their edible counterparts. According to Dolginow, cider apples should cost $18-$22 per bushel. Supplementary utility grade apples—those that are edible but cannot sell in stores—were once so cheap that orchards neglected to pick them. The local price for these utility apples, also known as culls, has recently risen from roughly $2 to $6 a bushel. Even apples that fall from trees but remain undamaged are kept and used by Shacksbury. Because cider not only utilizes otherwise unsellable grades of apples but is
also a value-added product, partnerships with cideries can be very beneficial to orchardists.

During Dolginow’s time at Sunrise Orchard, fully dwarfed cider trees were planted four feet apart and ripe apples were handpicked. Dwarfed trees allow more sunlight to reach neighboring trees and reduce the need for spraying. Steve Wood argues in favor of semi-dwarfed trees as they can be harvested by mechanical shakers, like those used in European orchards. According to Dolginow, the yield for fully dwarfed trees varies largely by year, so it is hard to give accurate yield estimates. However, using the Stark Bros. standard estimate of 1-4 bushels per dwarf tree, we estimate that the yield from 1 acre of fully dwarfed cider trees will range from 2,722 to 10,890 bushels, although small reductions in yield may result from the need for paths every few rows.

It is ideal to handpick apples in order to produce high quality cider, though this is very labor intensive. Dolginow mentioned that Windfall Farm has one dedicated staff member who successfully manages 3 acres, but much more labor is often required.

David pointed to a few local varieties used that would lend themselves well to the Cider Lab’s production. They included McIntosh, Cortland, and Empires, as well as other crossover varieties such as Dabinett, Golden Russet, Foxwhelp, Wickson, Harry Masters, and Jersey. He noted that Dabinett grow well in New Hampshire and would likely grow well in the Berkshires.
Survey Instrument

Selecting Farms

We selected the subjects of our interest-gauging interviews from a list of local producers (within a 100-mile radius) provided by Greylock WORKS. This was supplemented by recommendations from Prof. Gardner, including Jaeschke's orchard in Adams, MA. We searched for any other current apple producers within 100 miles.

Interview Instrument

The interview instrument was designed to gauge whether producers would be interested in supplying cider apples to the Greylock Cidery. In order to engage with producers on a more personal level, we conducted interviews over the phone instead of by mail. Given our short time frame, we hoped to contact producers most quickly and effectively through phone calls.

An interview script was written to ensure that each producer was asked the same set of questions. Each phone call began with a short description of the project and its goals. Each producer was then asked if they had time for a brief conversation. If they could not talk at that moment, a follow-up time was scheduled. If the producer was available to talk, the interview began with asking whether they might be interested in growing cider apples for Greylock WORKS. The interviewer then asked different follow-up questions depending on whether the producer showed interest. If the producer was not interested, the interviewer asked whether the producer was satisfied with the current market for their apples. This question illuminated whether all apple producers are interested in a new market. If the producer was interested in potentially supplying apples to the Greylock WORKS cidery, the interviewer then asked whether the orchard
currently grows any varieties of cider apples, what types, how many, and whether the producer would want to sell some of those apples to Greylock WORKS. This section of the interviews aimed to understand how much of the cidery’s supply could be filled by a particular producer. The producers were also asked whether they would be interested in new plantings of cider apple varieties on their land. The interviews ended with a discussion of what kinds of assurances the producer would want if they were to grow for Greylock WORKS, as well as what sort of provisions they would like to see in a contract. Overall, the phone calls gave us a comprehensive image of what producers in the area are willing to offer the cidery and what they would like to see in return. We conducted site visits to particularly interested producers.

Survey Results:

Q: Are you interested in collaborating with Greylock WORKS to provide apples for their Cider Lab?

1. “Yes” or positive responses:

   - Hilltop Orchards, Contact: John (800-833-6274)
   - Cortland Hill Orchard, Contact: (802-254-6925)
   - Jaeschke Orchard, Contact: Chuck Wandrei (413-743-3896) cwandrei44@yahoo.com
   - Scott Farm, Contact: Zeke (802-254-6868)
   - Southern Vermont Orchards, Contact: Lia (802-447-7780)
   - Yonder Farms, Contact: Don (518-758-7011)

2. “Maybe” or requires more information:

   - Bartlett’s Orchard, Contact: (413-698-2559)
   - Champlain Orchards, (802-897-2777, ext. 303)

3. “No” or otherwise negative responses:
- Bear Swamp Orchard and Cidery, Contact: Steve Gudgeon
- Brook Farm, Contact: (413-625-9615)
- Green River Farm, Contact: Dr. Frank Lewis (frank@fclewis.com)

4. N/A (No response to survey):

- Appleberry Farm, Contact: (802-442-3203)
- Golden Harvest Farms, Contact:(518-758-7683)
- Pine Hill Orchard, Contact: (413-624-3325)
- Lakeview Orchard, Contact: (N/A, closed for season)
- Mad Tom Orchard, Contact: Tom (802-366-8107)
- Klein’s Kill Farm, Contact: Russ Bartolotta (518-821-6594)
- Terry’s Orchard, Contact: (802-558-0334)
- Windy Hill Farm, Contact: (413-298-3217)

Apple Producer Map
Producers are marked on the map to demonstrate proximity to Greylock WORKS (purple house icon). Interested producers (“yes”) are marked with green points. “Maybe” responses are shown in yellow, “No” responses are in red, and “Non-responders” are in grey. Champlain Orchards is the most distant orchard contacted at roughly 85 miles away and Jaeschke’s Orchard is the most proximate at about 5 miles from Greylock WORKS. View the online map at: https://www.google.com/maps/d/u/0/edit?mid=1ECSSn6D2D6xO62nhD4If4Xo9So&ll=43.000455411300194%2C-73.19109314999997&z=8

Figure 8: Apple producers map.
Q: Do you currently grow any varieties typically used in cider production? (Examples include market apples like Empires and Gravensteins as well as higher acidity cider apples like Golden Russett, Northern Spy, MacIntosh, Cortland, JonaGold, and Dabinett.)

“Yes”
- Hilltop Orchards: Over 20 varieties of Northeast regional apples are grown at Hilltop Orchards. The orchard is noted for its cool and crisp micro-climate that results in outstanding Macoun, Honeycrisp, and Fuji eating apples. Traditional McIntosh, Cortland, Golden Russet, Northern Spy, and many others are available.
- Cortland Hill Orchard: Cortlands are the only variety grown.
- Jaeschke Orchard: Currently sells JonaGold, Cortland, Empire, and McIntosh apples in on-site store. Also produces surplus of Northern Spy.
- Scott Farm: Grows a vast range of 90 varieties from Ashmead's Kernel to Zabergau Reinette.
- Southern Vermont Orchards: Grows Cortland, MacIntosh and various other varieties.
- Yonder Farms: Grows Cortland and MacIntosh.
- Bartlett’s Orchard: They grow Paula Reds, Cortland, Northern Spy, Red Delicious, Mutsu, Idared, Empire, and McIntosh.

“Maybe”
- Champlain Orchard: Over 100 varieties are produced at Champlain Orchard.

Q: Would you be willing to sell some of those apples wholesale to Greylock WORKS? If so, how many? At what price? Which varieties? Acreage? Number of trees? Number of bushels? (etc.)

“Yes”
- Hilltop Orchards: Would be willing to sell no more than a couple tons, a range of 50-100 bushels.
- Cortland Hill Orchard: Interested in sale, no specified quantity or price.
- Jaeschke Orchard: Interested in selling, has oversupply of Northern Spy (several 100 bushels).
- Scott Farm: Strong Interest, will have a few thousand bushels for sales at $25 per bushel from 40 acres of land.
- Southern Vermont Orchards: Most of current apples are spoken for, but would like to maintain further contact next season.
- Yonder Farms: Interested, only sells apples in 800lb crates (20 bushels).

“Maybe”
- Bartlett’s Orchard: Awaiting further contact.
- Champlain Orchard: Awaiting further contact.
Q: If no cider varieties are grown, would you be interested in new plantings or graftings of cider apples?
How much land/ how many trees would you be willing to devote?

“Yes”
- Hilltop Orchards: They have 10 acres available for new plantings or graftings.
- Cortland Hill Orchard: They have 15 non-fenced acres available for new plantings.
- Jaeschke Orchard: Unsure about possibility of new plantings and graftings.
- Scott Farm: Not interested in new plantings.
- Southern Vermont Orchards: Potentially interested in new plantings or grafting, wanted more information.
- Yonder Farms: Not interested in new plantings or graftings.

“Maybe”
- Bartlett’s Orchard: Awaiting further contact.
- Champlain Orchard: Awaiting further contact.

Q: Is there anything you would like to see in a contract?

“Yes”
- Hilltop Orchards: Nothing specified.
- Cortland Hill Orchard: Nothing specified.
- Jaeschke Orchard: Nothing specified.
- Scott Farm: Does not enter into formal contracts, handshake deals only.
- Southern Vermont Orchards: Not specified.
- Yonder Farms: Not specified.

“Maybe”
- Bartlett’s Orchard: Awaiting further contact.
- Champlain Orchard: Awaiting further contact.

Q: If no, what is your reason for being uninterested?

“No”
- Bear Swamp Orchard and Cidery: Already has cider operation with personal orchard.
- Brook Farm, Contact: Unknown.
- Green River Farm: Private Ownership is not interested in any collaboration.

*Note: the above responses to survey questions only include the information provided by “yes” and “maybe” responders because they are the producers we have identified as relevant to Greylock WORKS.*
Findings from Survey Process:

Of the 19 total apple producers surveyed, we received 11 responses, a response rate of about 57%. This figure presents a more optimistic picture of the survey process than was actually the case. Many of the producers were difficult to contact, requiring two or three phone calls or emails before any information was provided. This was largely due to the fact that this project was conducted in the “off-season” when many of the farms are not expecting correspondence or new orders. Some producers chose not to respond to our messages or hung up during our calls for reasons unknown. Those that did respond and indicated interest were generally compliant with the survey and provided much of the information asked of them. The only limitation to their responses was due to the speculative nature of the conversation and our inability as students to present actual offers for their product. This survey sought to simply gauge interest and capacity for collaboration of producers in hopes that we could present a list to our client of possible collaborators. It was largely successful to this end, though much of the information collected was tentative and the producers expressed that they would prefer to share more information with Greylock WORKS directly. For example, Hilltop Orchards specifically told us to have Greylock WORKS contact them with specific offers before they would be willing to engage further.

The farms that responded positively, indicating interest in collaboration, offered a variety of options for Greylock WORKS ranging from grown apple supply in different varieties and quantity to open acreage available for plantings. Those that responded “maybe” indicated some interest in collaboration but were only interested in speaking with Greylock WORKS or wanted to deliberate until the growing season. The eight non-
responders did not answer or respond to at least three attempted phone-calls or emails from us, a non-conclusive but fairly likely indication that they were uninterested. The “no” responses were from producers unable or unwilling to engage in collaboration.

Our primary takeaway from this process was that surveying is an imperfect science and is largely subject to the possibility of apathy on the part of responders. Some apple farms seem to be skeptical or generally unprepared to engage with possible collaborators, while others were excited by the prospect and quick to indicate interest. Thus it became apparent that a lack of information provided can be a telling result. However, we expect that the survey would have been more effective if conducted during the growing season and with the capacity to offer concrete proposals.

**Evaluation Matrices**

We decided to use a Planning Balance Sheet to compare the costs and benefits of several alternative methods of supplying cider apples to the Greylock WORKS cidery. Plan A involves sourcing all apples from a variety of local growers. This is the plan that would best satisfy the intentions of Greylock WORKS. It would benefit the local apple producers by providing them a new market for their cider apples. It would also allow Greylock WORKS to create a local ecosystem of producers and consumers. Supporting local farmers also bolsters Greylock WORKS’ reputation in the community. However, Plan A may expose Greylock WORKS to risks associated with seasonal fluctuations.

One alternative to buying apples from local farms is purchasing or leasing land and starting an orchard. This model—Plan B—would provide Greylock WORKS greater control over the types of apples they use and how those apples are treated. This vertical integration plan would also avoid issues of buyer competition. The detriment of Plan B is
that overhead costs of starting the orchard would be high. Plan B also does less than Plan A to support local farms, as fewer relationships with producers would be formed.

The third supply option would be to supplement a supply of local apples with cider apples from England. This is the least desirable alternative as it forsakes many of the primary intentions of Greylock WORKS in producing a value-added product derived from local apples and creating mutually beneficial partnerships with local farmers. However, this alternative would allow Greylock WORKS to expedite the supply process and start producing cider as early as next season.

The quantitative elements of the following evaluation matrices assign weight to the costs and benefits of each proposed plan. Each of the different benefits and costs are rated on a scale of 1 (least important and thus least heavily weighted) to 5 (most important and thus most heavily weighted). The overall value (benefits minus costs) to the cidery (“GW”) is evaluated separately from the overall value to local apple producers and customers (“community”), and these two measures are weighted equally. The net good of each plan is calculated by the following formula: 

\[
(Benefit_{GW} - Cost_{GW}) + (Benefit_{community} - Cost_{community}) = \text{Evaluation Score.}
\]

This formula captures the relative efficacy of each plan in serving both Greylock WORKS and the community. Thus the Plan with the highest Evaluation Score will serve as our primary recommendation.
Plan A: Sourcing apples from a variety of local growers

<table>
<thead>
<tr>
<th>Greylock WORKS</th>
<th>Benefit</th>
<th>Cost</th>
<th>Community</th>
<th>Benefit</th>
<th>Cost</th>
</tr>
</thead>
</table>
| Greylock WORKS Cider Lab | -Low Overhead Costs (2)  
-Community “ecosystem” (5)  
-Production by 2016 (1)  
-Segmental/yield risk (3)  
-Limited variety (2) | Local Apple Producers | -Potentially high negotiating power (5)  
-Less susceptibility to fluctuations in the eating apple market (4)  
-Higher market risk if attention shifts to true cider apple varieties (2)  
-Less flexibility with land, especially if entering into Right of First Refusal contracts. (4) | Local Residents | -Local cider variety (2) |

\[ \text{Benefit}_{GW}: 8 \]
\[ - \text{Cost}_{GW}: 5 \]
\[ \text{Overall value to GW}: 3 \]
\[ \text{Benefit}_C: 11 \]
\[ - \text{Cost}_C: 6 \]
\[ \text{Overall value to community}: 5 \]

\[ (3.P) + (5.C) = \text{8 Evaluation Score} \]

Plan B: Purchasing or leasing land to source apples from.

<table>
<thead>
<tr>
<th>GW</th>
<th>Benefit</th>
<th>Cost</th>
<th>Community</th>
<th>Benefit</th>
<th>Cost</th>
</tr>
</thead>
</table>
| Greylock WORKS Cider Lab | -No buyer competition (4)  
-Management control (3)  
-Control over planted apple varieties align (2)  
-Reliability of supply (2)  
-Potential educational and commercial site. (2) | Local Apple Producers | -Other producer of apples in area, shared farming interests. (3)  
-Profit derived from selling or leasing land. (3)  
-Profit from selling plantable trees or grafting supplies. (2) | Local Residents | -Cultivation of currently unused or misused land. (2)  
-Possibility for community engagement with Greylock WORKS property. (2) |
| | | | | | -Increased noise pollution from farming. (1)  
-Increased visitor if site becomes used for commercial or educational purposes. (2) |

\[ \text{Benefit}_{GW}: 13 \]
\[ - \text{Cost}_{GW}: 10 \]
\[ \text{Overall value to GW}: 3 \]
\[ \text{Benefit}_C: 12 \]
\[ - \text{Cost}_C: 10 \]
\[ \text{Overall value to community}: 2 \]

\[ (3) + (2) = \text{5 Evaluation Score} \]
Plan C: Supplementing a supply of local apples with apples from large apple producers in England

<table>
<thead>
<tr>
<th>GW</th>
<th>Benefit</th>
<th>Cost</th>
<th>Community</th>
<th>Benefit</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greylock WORKS Cider Lab</td>
<td>-Reliable apple supply from growers in England (2)</td>
<td>-No &quot;community Ecosystem&quot; (5)</td>
<td>Local Apple Producers</td>
<td>- None</td>
<td>-Less push for revitalization (4)</td>
</tr>
<tr>
<td></td>
<td>- Already established varieties in England (1)</td>
<td>-Shipping costs (2)</td>
<td></td>
<td></td>
<td>-No support for new plantings (1)</td>
</tr>
<tr>
<td></td>
<td>- No lag time for new cultivations (could start next season). (2)</td>
<td>-Non-local apples (4)</td>
<td></td>
<td></td>
<td>-Greylock WORKS is less dependent on them - relationship is less stable in terms of mutual power. (3)</td>
</tr>
<tr>
<td>Local Residents</td>
<td>- None</td>
<td></td>
<td></td>
<td></td>
<td>-Less local revitalization of industry and apple growers (2)</td>
</tr>
</tbody>
</table>

Benefit_{GW}: 5  
Cost_{GW}: 11  
Overall value to GW: -6  

Benefit_{C}: 0  
Cost_{C}: 11  
Overall value to community: -11

(-6) + (-11) = -17 Evaluation Score

Goal Achievement Matrix

To simplify our evaluation matrix for the general public, we created a goal achievement matrix bases on the goals of the Cider Lab and Greylock WORKS as a whole. We selected four goals central to the project and evaluated whether the previously mentioned alternatives met these goals. The goals are as follows:

1. Foster an ecosystem of local producers and consumers
2. Support and revitalize local apple growers
3. Obtain supply of 5,000 bushels
4. Be able to begin test batches next year; reach full production in three years

Plan A, to source all the apples from local growers, meets all the listed goals. Plan B, to purchase or lease land on which to grow the apple supply, meets goal number 1 and number 3. Plan C, to supplement a local apple supply with apples from England, only
meets goals number 3 and number 4. Since Plan A is the only option which fully satisfies all of the goals, we are recommending it as the best course of action.

**Recommendations**

In light of the above goals, the quantitative assessment conducted in the evaluation matrix, and the findings from our research, we advise that *Greylock WORKS* seeks its supply of cider apples, totaling 5,000 bushels, from a variety of different, proximate apple producers. This includes Jaeschke’s Orchard, the closest orchard to *Greylock WORKS*, as a primary supplier of Northern Spy apples. As the quantity supplied by Jaeschke’s will only be around several hundred bushels, this must be supplemented by other local producers. This supply should be accrued from Scott Farm, Yonder Farms, Cortland Hill and Southern Vermont Orchards. *Greylock WORKS* should capitalize on the tremendous diversity of apples (including heirloom varieties) produced by Zeke of Scott Farm by sourcing cider-specific and niche varieties from him. In order to satisfy the quantity demanded, a relationship with Yonder Farms’ large-scale apple operation may be of importance. Cortland Hill and Southern Vermont may also serve as supplemental suppliers of both cider and eating varieties used in the *Greylock WORKS* cider lab. There are numerous other producers who we were unable to survey that should be contacted further as they may still express interest in collaboration.

The secondary plan of acquiring land for new plantings or graftings should serve as a supplemental alternative if the supply demanded by *Greylock WORKS* increases over time. While there are inherent benefits to this option such as custom-curated varieties, consistent supply, and in-house management, the overhead costs and reduced contact with local growers may outweigh these. That said, Cortland Hill
Orchard and Hilltop Orchards have 10 and 15 available acres, respectively, to possibly fulfill this purpose.

The third possible option, borne of our conversation with David Dolginow of Shacksbury Cider, is to supplement Greylock WORKS’ supply with apples grown and mechanically harvested in England. This option avoids supply and time constraints, but forsakes many of the core intentions expressed by the Greylock WORKS cider lab, namely forging relationships with local apple producers. We advise that this option be pursued only in years when local supply is severely impaired by unforeseen factors.

Finally, we recommend that Greylock WORKS be sure to employ systems to recycle byproducts from all of their production endeavors. In the case of the cidery, the main byproduct will be apple pulp from pressing. This pulp, incredibly dry and fibrous, can either be composted or fed to pigs. If Greylock WORKS plans to compost onsite for their proposed rooftop greenhouse, the apple pulp could be a good additive to that compost. Another option would be to return the pulp to local farms for compost. However, the best option for closing the ecological loop in cider production may be to feed the pulp to pigs. Nutritionally similar wheat husk, a byproduct of Bright Ideas Brewery, goes to supplement the feed of local pigs. Additionally, the byproduct from Greylock WORKS’ cheese and yogurt production, whey, could also be fed to pigs. A partnership with a local pig farmer could be an ecologically sound way for Greylock WORKS to recycle its byproducts.

Conclusions
It is our hope that the information collected in this project informs Greylock WORKS in acquiring a supply of apples for its cider lab in the coming years. We believe

41Conversation with Orion Howard (December 2016).
that this revitalization project at Greylock WORKS has the capacity for a tremendously positive impact of the North Adams community and local apple producers. Though our efforts were met with some success, it should be noted that some apple producers were unreachable due to seasonal or other constraints and should be pursued further when possible. We appreciate the opportunity to work with the Greylock WORKS team on this project and wish them all the best in realizing their goals for the Cider Lab.
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