

# NANTUCKET FOOD ASSET MAP

An Interactive Qualifying Project submitted to the Faculty of  
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Sustainable Nantucket, Nantucket Food Pantry, Food Rescue Nantucket

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### ABSTRACT

Nantucket's sustainability movement is partially sparked by the large amount of food imported to feed its fluctuating population, caused by summer tourism. The goal of this project was to develop an interactive food asset map and database for Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket to identify areas to expand food production, improve food distribution to recipients, and reduce food waste on Nantucket. Our approach included interviews with stakeholders and the assessment of databases, in addition to site visits and observations. After developing the map and database, we analyzed the food system; suggesting areas for production expansion, program improvements and future developments for food-focused organizations on island.

### ACKNOWLEDGEMENTS

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Nantucket Shipwreck & Lifesaving Museum

ReMain Nantucket

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## EXECUTIVE SUMMARY

Sustainable agriculture works to meet the food needs of today without compromising the food security of tomorrow. The sustainable movement, sparked largely by the growing fear of global environmental crises and natural disasters, is pushing for self-sustaining practices, locally-produced food, and community food network analysis. However, in the United States there is still an estimated 133 billion pounds of food that ends up in landfills annually (United States Department of Agriculture, n.d.).

Nantucket is an island community that used to be agriculturally focused, but now imports most of its food. Imported food requires added transportation which, according to an Environmental Research Letters journal article, has multiple impacts “such as resource depletion, pollution, climate disturbance, and biodiversity reduction” (Dalin & Rodriguez-Iturbe, 2016). Promoting and increasing locally-produced food helps provide fresh produce to supplement the food supply being imported. Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket are three organizations promoting sustainable food activities on the island. Improving the food system requires understanding and analyzing Nantucket’s current resources.

### ➤ Approach

On Nantucket, we were given the opportunity to work on a Comprehensive Food System Assessment, a long-term plan set forth by the three organizations. The goal of our project was to develop a map that identifies places on Nantucket where people can grow, prepare, share, buy, receive, or learn about food. We conducted interviews with stakeholders on and off-island, administered surveys to restaurants, and reviewed existing database materials in Geographic Information Systems (GIS) and other on-island sources. We gathered data to compile the food asset map and database such as address, contact information, and availability.

### ➤ Food Asset Map and Database

The purpose of this map is to visualize the aspects current food cycle and spark changes to improve the system.

### ➤ Production

Our map of producers on Nantucket includes: apiaries, florists, farmers, oyster farmers, fisherman, and other select producers. Below in Figure a are producers on Nantucket in black diamonds.

## NANTUCKET FOOD ASSET MAP

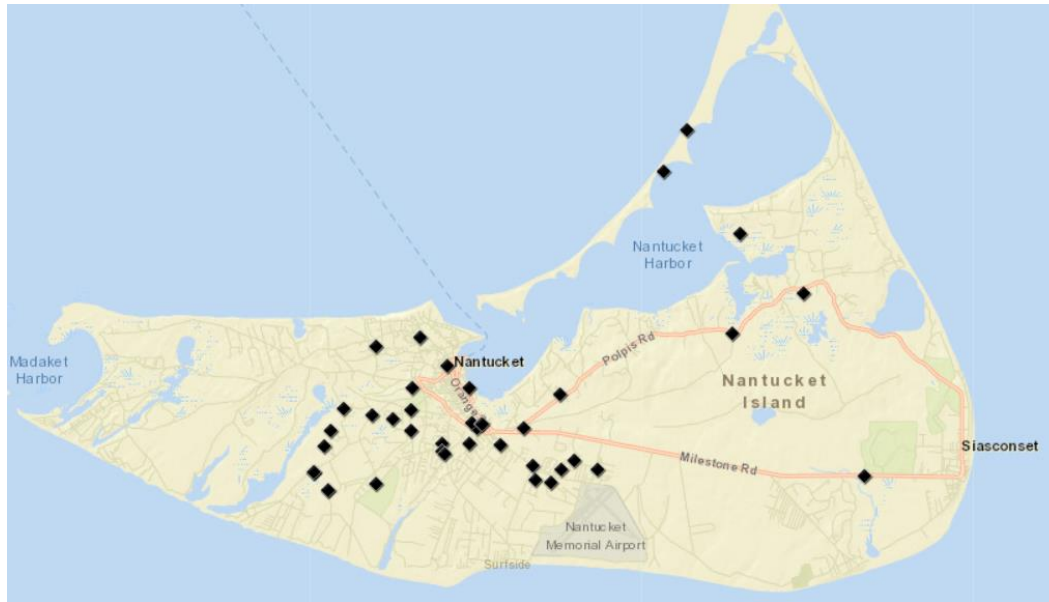


Figure a: Producers on Nantucket

We identified farms in order to understand the island's food production. We noted areas of aquaculture, which occur around the island by private growers and by the town, occupying about 100 acres of land altogether. Currently, there are open plots of aquaculture reserved by the Natural Resources Department available for use in Polpis Harbor.

### ➤ Distribution

Figure b shows distributors involved in the Nantucket food system (orange squares) and also food storage facilities on the island (green circle). Off-island distributors import the vast majority of the food on island which can become a problem when ferries cancel due to high winds. On-island locations with freezers and refrigerators are particularly valuable because organizations are able to store perishable foods.

## NANTUCKET FOOD ASSET MAP

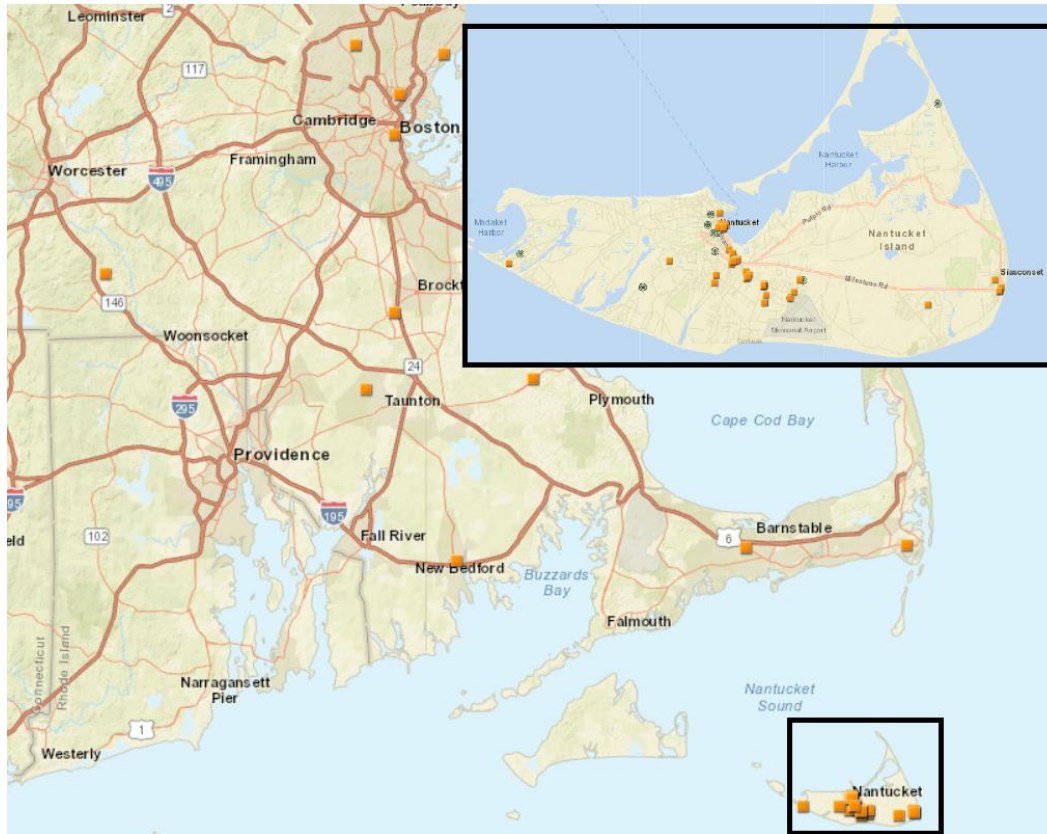


Figure b: Distributors on and off island.

### ➤ Consumption

Many Nantucket restaurants and inns are seasonal, however, there currently is not a program in Nantucket to use commercial kitchens in off-times (either at night or during the end of a season). If the Nantucket Food Pantry had access to these unused spaces, it could pre-package its own food, increasing the kinds of donations it can receive.

### ➤ Recommendations

**Production expansion:** There are open areas for aquaculture and agriculture on the island that can be utilized in the food system cycle.

- ❖ We encourage the use of the open plots of aquaculture reserved by the Natural Resources Department in Polpis Harbor by current growers or by implementing a program to train new growers.
- ❖ We recommend more exploration of agricultural expansion on the island. Criteria that make land suitable is: it has been used for an agricultural purpose in the past 15 years.

**Future developments:** A stronger, more developed food network on Nantucket can lead to a more effective system in the community.

## NANTUCKET FOOD ASSET MAP

- ❖ We encourage the Nantucket Food Pantry to work with the Nantucket Health Department and interested commercial kitchens to arrange licensing to use vacant commercial kitchens.
- ❖ We recommend that Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket work together in establishing a local Food Hub through Sustainable Nantucket's CFI.

Food-focused programs: We recommend the implementation and expansion of several programs to help further the goals of Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket.

- ❖ We encourage the Nantucket Food Pantry and Sustainable Nantucket to better promote their *Share Your Harvest* program and partner with Food Rescue Nantucket to organize gleaning and pick-ups.
- ❖ We recommend Food Rescue Nantucket expand gleaning beyond the current two farms: Moors End Farm and Bartlett's Farm.
- ❖ The number and locations of Food Rescue Nantucket box locations could be expanded to make it convenient for more residents.
- ❖ We recommend that the Nantucket Food Pantry work with the Nantucket Atheneum to implement a *Food for Fines* program, allowing library members to exchange non-perishable food items for a reduction of library fines.

Communication: We recommend enhancing communication between the organizations and others involved in the food network through the use of various applications (i.e. the program *Slack*).

Updating the Map: We suggest that Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket continue to work with the Nantucket High School students to update the map annually. We created a user manual to explain this process and aid in keeping the map current.

Map Promotion: We recommend that Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket promote the food asset map through the use of different forms of media to reach the largest audience.

# NANTUCKET FOOD ASSET MAP

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Section	Primary Author	Primary Editor	Secondary Author	Secondary Editor
<b>Introduction</b>	ALL	KB	ALL	MD
<b>Background</b>				
Sustainable Agriculture	RL	MD	KB	JJ
Food Assets & Networks	RL	MD	KB	JJ
Food Asset Mapping	MD	KB	RL	JJ
Food Insecurity Case Studies	RL	RL	JJ	KB
Nant. Food System Cycle	KB	RL	ALL	ALL
Conclusion	KB	ALL	ALL	ALL
<b>Methodology</b>				
Objective 1	KB	MD	ALL	ALL
Objective 2	MD	MD	KB	RL
Objective 3	JJ	JJ	MD	KB
Objective 4	RL	MD	KB	JJ
Objective 5	RL	MD	KB	JJ
<b>Food System on Nantucket</b>				
Food System Cycle	ALL	KB	ALL	ALL
Map/Database Content, Usage	JJ	KB	MD	RL
<b>Conclusions/Recommendations</b>				
Production Expansion	KB	RL	MD	JJ
Future Developments	MD	RL	KB	JJ
Food-Focused Programs	MD	KB	RL	JJ
Nant. High School Program	MD	KB	RL	JJ
Communication	RL	KB	KB	MD
Map Promotion	RL	MD	KB	JJ
<b>Appendices</b>				
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## INTRODUCTION

Sustainable agriculture works to meet the food demands of today without compromising the food security of tomorrow. The sustainable movement, sparked largely by the growing fear of global environmental crises and natural disasters, is pushing for self-sustaining practices, locally-produced food, and community food network analysis. Communities are increasingly promoting locally-sourced food through farmers markets, providing fresh produce to food pantries and local schools, as well as practices such as gleaning that reduce food waste. However, there still remains an estimated 133 billion pounds of food that is produced annually, never eaten, and ends up in landfills (United States Department of Agriculture, n.d.).

Nantucket is an island community that used to be agriculturally focused, but now imports most of its food. Imported food requires added transportation which, according to an Environmental Research Letters journal article, has multiple impacts “such as resource depletion, pollution, climate disturbance, and biodiversity reduction” (Dalin & Rodriguez-Iturbe, 2016). In addition, imported food raises food prices due to the added effort in transporting and storing the food, and is not as fresh as locally-produced food. Promoting and increasing locally-produced food helps provide fresh produce to supplement the food supply being imported. However, as a developed island community with relatively little room for expansion, Nantucket’s opportunity to grow agricultural resources is limited.

Sustainable Nantucket, Nantucket Food Pantry and Food Rescue Nantucket are three organizations on the island promoting sustainable food activities. Sustainable Nantucket promotes sustainable agriculture to protect the environment while increasing the island’s self-reliance. The Nantucket Food Pantry provides vital support to many food-insecure families and, and Food Rescue Nantucket works to stop food from being wasted.

Community mapping is a practical visualization technique to help identify and promote sustainable food practices. Food asset maps can be used to identify where food is produced, received, distributed, or wasted in the community. This can highlight spaces not being used to their full potential or areas that show possibilities for future production expansion; and thus be beneficial for local food-focused organizations.

The goal of this project was to develop a map that identifies places on Nantucket where people can grow, prepare, share, buy, receive, or learn about food. We identified five objectives to achieve this goal. Accordingly, we:

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1. Identified and evaluated best practices in the development of food asset maps and databases
2. Clarified details of the purpose, content, and format of the food asset map and database with respect to the goals set forward by Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket
3. Built a food asset map and database
4. Used the food asset map to analyze Nantucket's food system (production, distribution, consumption, waste) in order to identify opportunities for improvement
5. Integrated the food asset map with existing programs and developed a strategy to update and maintain the map and database

In order to achieve these objectives, we conducted interviews with stakeholders on and off-island, administered surveys to restaurants, and reviewed existing database materials in GIS and other on-island sources. We gathered information on GIS software practices, food asset maps, production expansion, and gleaning opportunities; synthesizing it into a food asset map. This is the initial step of the long-term plan set forth by Sustainable Nantucket, Nantucket Food Pantry and Food Rescue Nantucket of a Comprehensive Food System Assessment. We hope that the three organizations will be able to use the food asset map as a tool to analyze and enhance the Nantucket food system.

## BACKGROUND

In this chapter, we first discuss the history of farming over the past 100 years in the United States and how changes in technology affected the sustainability of the practices used. We then explain food assets and the workings of food system cycles. We give examples of other food asset maps that improved communities' food system cycles. Then we dive deeper into case studies in New England and how they combat food insecurity. Finally, we end with a discussion of Nantucket's efforts to promote sustainability.

### I. Sustainable Agriculture

Over the past 100 years there has been a dramatic change in farming practices in the United States. After technological advances in the 1940s, farmers were able to more efficiently work their land, subsequently allowing them to increase production while decreasing labor required. As a result, the average size of farms increased and the number of farms declined (as seen in Figure 1).

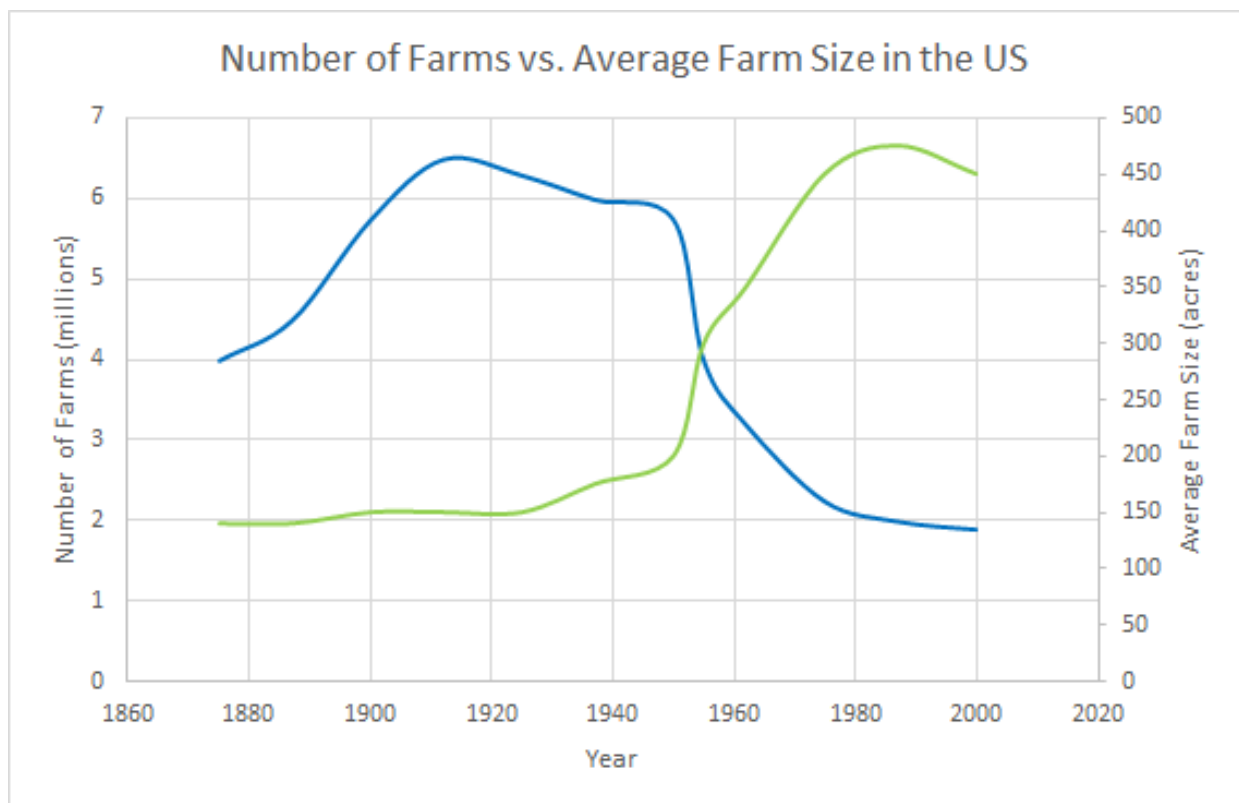


Figure 1: Number of Farms vs. Average Size of Farms in the US (What is sustainable agriculture?, n.d.)

There are many advantages to increased productivity in agriculture; however, there are also many negative impacts. Along with a decrease in the number of small family farms, there was also a decline in the sustainability of the practices used by

the larger farms that replaced them. It is often more profitable for these farms to produce only a few key crops. A lack of crop rotation and diversity leads to the depletion of the soil's natural resources, rendering the land less valuable for future farming efforts. The rise in production cost and overall decline in the number of farms also puts an economic strain on communities that were once mostly agrarian. Additional problems that arise from unsustainable agricultural practices include contamination of groundwater and an increased reliance on nonrenewable environmentally damaging energy in order to operate farms. In the past few decades there has been a movement in the United States of America and across the world to promote more sustainable agricultural practices (What is sustainable agriculture?, n.d.).

Sustainability is a relatively new concern in society. Sustainability became a topic of discussion in the late 1970's and early 1980's, but it did not gain traction and become widely accepted until the 1990's. Caradonna (2016) describes sustainability as a way to combat a "moribund economic system that has drained the world of many of its finite resources" (p.4). In the past 100 years, there has been a push in many societies to expand economic capabilities; however, this is often largely at the expense of the ecosystem (p.3).

Sustainable agriculture works to meet the food needs of today without compromising the food security of future generations. To advance this goal sustainable agriculture focuses on promoting economic prosperity, environmental health, and social and economic fairness (What is sustainable agriculture?, n.d.). The rise of sustainable agriculture is shown through the rise in the amount of organic farming and food.

Organic food sales were an estimated \$28.4 billion in 2012, about 4% of total food sales in the US (Organic Market Overview, 2017). The largest organic food sale category is produce, as shown in Figure 2. However, organic price premiums show no sign of decreasing due to the increased demand for organic products. These prices limit the accessibility of organic food to the general public and can make it a luxury product (Organic Market Overview, 2017).

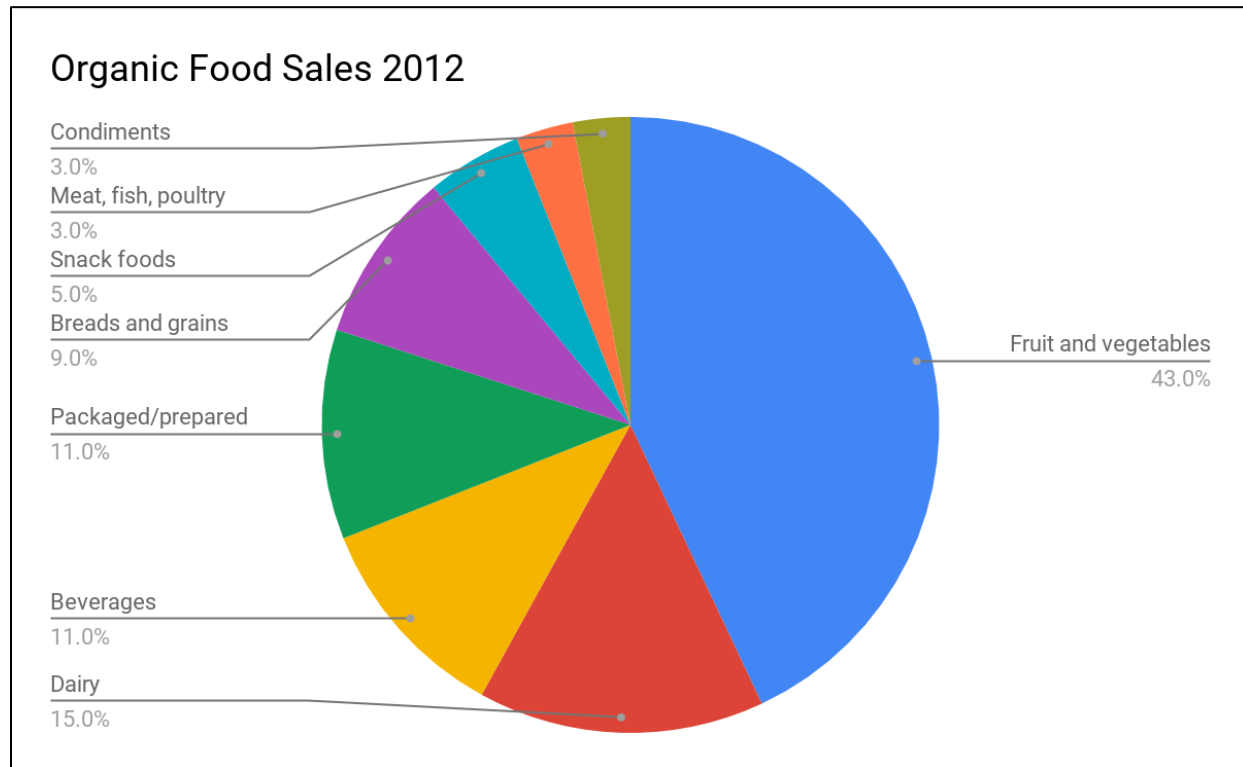


Figure 2: Organic Food Sales 2012 (Organic Market Overview, 2017).

Another indicator of the rise in sustainable agricultural interest is the increase in the number of community supported agriculture (CSA) locations. In 2015, according to the Local Food Marketing Survey by the US Census of Agriculture, CSAs sold \$226 million of food directly to consumers, 7% of direct to consumer food sales in the US. These sales are from just 7,398 CSAs nationwide (USDA/NASS QuickStats, 2015).

The rise in sustainability movements is aiding in decreasing overall food waste. However, there is still a large amount of food wasted in the United States, where an estimated 30-40% of the food produced becomes food waste (United States Department of Agriculture, n.d.). The United States Department of Agriculture estimates that in one year alone, \$47 billion in food from grocery stores never made it to the homes of consumers and was wasted (n.d.). This statistic only takes into account one step in the food system cycle, not even considering the food that never makes it to stores or gets thrown into landfills. Annually, an estimated 133 billion pounds of food produced is never eaten and ends up in landfills (United States Department of Agriculture, n.d.). An analysis of a community's food assets and food network can identify areas where a community is losing food.



## II. Food Assets and Networks

*Food assets* are locations where a community grows, prepares, shares, buys, receives, or learns about food. Each community has its own food network with each point of the network being a food asset or containing assets within it. *Food networks* (Figure 3) start where food is grown, through to distribution and sale in stores and restaurants, and ends with food waste in compost or landfills (What is sustainable agriculture?, n.d.). An ideal food network eliminates inefficiencies to produce the greatest yield for the least amount of energy.



Figure 3: Local Food System Map (Local food system, 2014).

While there is no universally agreed upon definition for a food system cycle, it is generally defined as the steps the food takes from “soil to soil.” This means that it encompasses an entire food system cycle from the time the food is first grown until what remains is discarded. It is important to look at where food loss occurs, and it occurs in every stage of the food cycle.

During the first stage of production there is food left behind during harvest because of poor equipment damaging the food or because the food quality falls below acceptable standards for the harvest. The second stage is the handling and storage of the food. Throughout this stage, there is potential for food to go bad due to pests, diseases, and fungi. Packaging food occurs in the third stage, where food is often spilled, damaged, or deemed “unsuitable for processing.” In the distribution phase, food is often discarded because it is not aesthetically pleasing, or is not sold by the “best by date.” During the consumption phase, a lot of food is purchased but never eaten, whether it goes bad or is simply thrown out (Lipinski et al., 2013, p. 4). In recent years, many people have begun to question the sustainability of local food cycles; largely prompted by environmental and ethical concerns.

Food sustainability is described by Garnett as, “a collaborative network that integrates sustainable food production, processing, distribution, consumption and waste management in order to enhance the environmental, economic and social health” (2013, p.1). Some experts say there are relatively easy, quick, and cost-effective ways to reduce food waste that can be implemented fairly quickly to help promote more sustainable communities. Some of these solutions include (Lipinski et al., 2013, p.2):

- “1. Develop a food loss and waste measurement protocol
2. Set food loss and waste reduction targets
3. Increase investment in reducing postharvest losses in developing countries
4. Create entities devoted to reducing food waste in developed countries
5. Accelerate and support collaborative initiatives to reduce food loss and waste.”

Food security is described by Rosegrant and Cline as “need[ing] policy and investment reforms on multiple fronts, including human resources, agricultural research, rural infrastructure, water resources, and farm- and community-based agricultural and natural resources management” (2003, p.1). Food security is the result of many different elements working together soundly to create a more efficient food system cycle.

Resources that help to combat food waste and increase food security in a community include food banks and food pantries. Driven by concern for community equity, they collect and distribute food to reduce food insecurity. Food that otherwise might be wasted can be donated to these organizations; for example, the food at the end of a restaurant’s season prior to closure or from large retail grocery stores. Food banks and pantries collect food from a mix of purchasing food and donations. Food banks

store up to millions of pounds of food to distribute to multiple communities, while food pantries interact with their clients directly and typically serve one host community. Mobile food pantries are able to connect to more remote areas. Food pantries are typically non-profit organizations assisted by the government and other charitable organizations. Human service charities, such as Feeding America, help distribute supplies to food pantries and food banks (Feeding America, 2017a).

According to Feeding America (2017b), “41 million people struggle with hunger in the United States, including 13 million children. In 2015, 5.4 million seniors struggled to afford enough to eat.” However, only 59% of these households participated in at least one of the major federal food assistance programs: the Supplemental Nutrition Assistance Program (SNAP, formerly Food Stamps); the National School Lunch Program; and the Special Supplemental Nutrition Program for Women, Infants and Children (WIC). This illustrates the problem that a large portion of food insecure families fail to access programs that could be beneficial to them. Food pantries work with users and nonusers of these federally funded programs, and are often the only help some food-insecure families receive.

### III. Food Asset Mapping

Communities use food asset maps as a way to evaluate and improve their food network. With recent technological advances, mapping has become more accessible for organizations to utilize. Mapping food systems can be beneficial in reducing food waste, promoting an increase in food production, as well as identifying improvements in food distribution.

Two common mapping platforms are: Geographic Information Systems (GIS) and Google Maps. As Lefer (2008) details, “[t]he development and availability of geographic information systems (GIS) has greatly expanded the sophistication and analytic power of mapping,” adding that it assists to “serve to involve, inform, and educate students and community members” (p.475). GIS maps have an extensive collection of data indicators and can support a diverse information database behind their display. These data layers can be combined or viewed separately. GIS maps can be created, moved online, and viewed publicly through ArcGIS Online and the software ArcMap. Through these mediums, GIS maps can be customized by icon and information displayed.

In 2010, a project developed by the Johns Hopkins Center for a Livable Future involved creating a GIS food asset map for the state of Maryland. The map started with 30 data indicators in the GIS software, which in just the past five years have grown to over 175 (Fisher, Burns, & Harding, 2017). This is a large-scale food asset

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map and allows for the visualization of larger trends and analysis of patterns. For example, Figure 4 shows the commercial value of oyster landings by area in 2012. The dark blue represents the higher commercial value of oyster operations, and the green and white areas are of lesser commercial value.

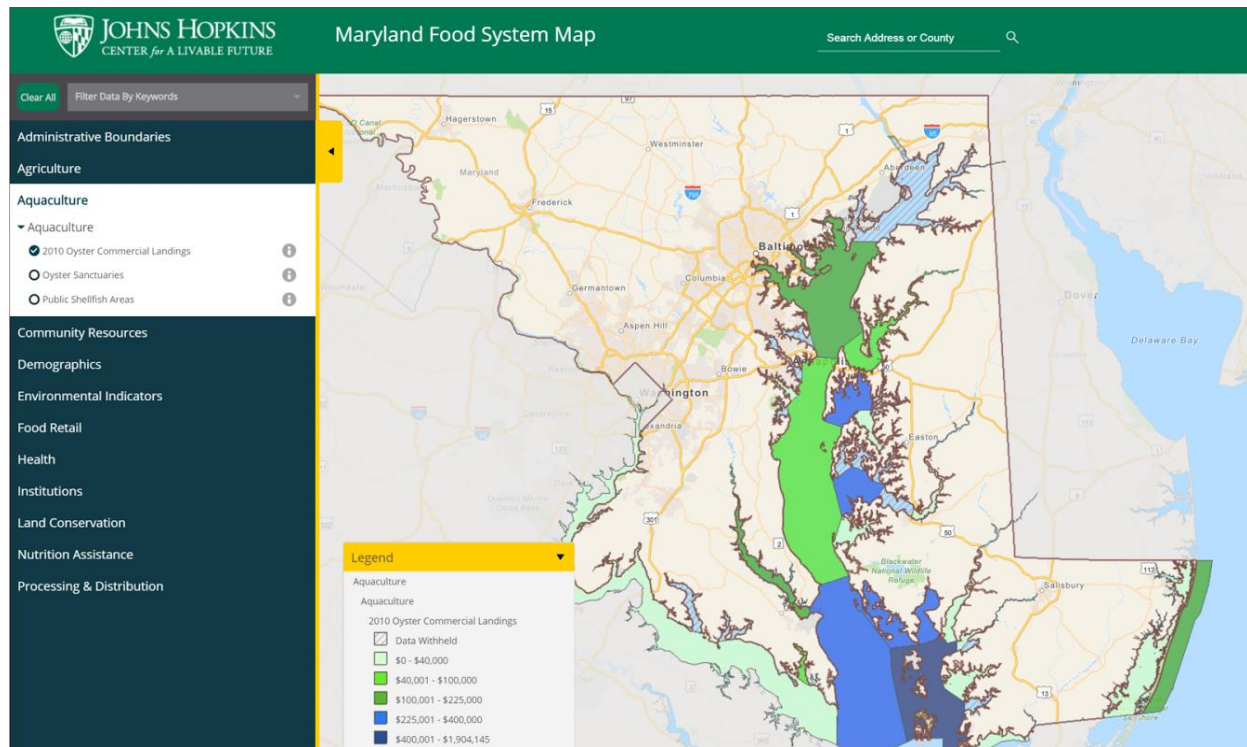


Figure 4: Maryland Food System Map showing 2010 Oyster Commercial Landings (Fisher, Burns & Harding, 2017a).

In contrast with the block mapping of areas of interest in Figure 4, point mapping can be effective in showing the distribution of discrete locations. For example, the Maryland Food Systems Map (Figure 5) shows point locations of farms selling locally in 2015.

## NANTUCKET FOOD ASSET MAP

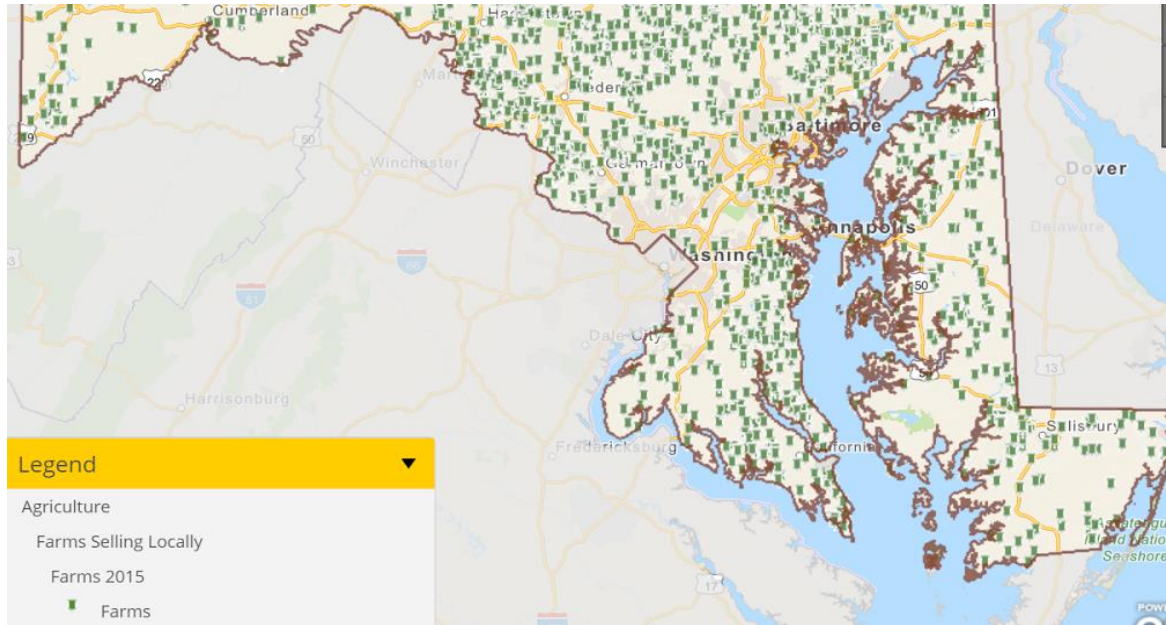


Figure 5: Maryland Food System Map showing Farms Selling Locally in 2015 (Fisher, Burns & Harding, 2017b).

The Maryland Food System Map database includes a variety of other mapped data, such as: census data of cattle, dairy, grain, hog, farms, government payments, net cash farm income, plant hardiness by temperature, and pantry and free meal sites.

Another application of food asset mapping is to identify food deserts. The Johns Hopkins Center for a Livable Future defines a food desert as “an area where the distance to a supermarket or supermarket alternative is more than 1/4 mile, the median household income is at or below 185% of the Federal Poverty Level, over 30% of households have no vehicle available, and the average Healthy Food Availability Index (HFAI) score for all food stores is low” (Buczynski, Buzogany, and Freishtat, 2015). In 2015, the Johns Hopkins Center for a Livable Future evaluated food deserts in Baltimore City, MD. Using mapped data, the study concluded that (Buczynski, Buzogany, & Freishtat, 2015):

1. “[o]ne in four of Baltimore City residents live in areas identified as food deserts;
2. children are affected disproportionately, with 30 percent living in food deserts;
3. African Americans have disproportionately low access to healthy food and are the most likely of any racial or ethnic group to live in a food desert neighborhood.”

Since food deserts are mostly problems in large populated cities affecting more people, they are viewed as a more pressing issue and more research has been done



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on them as opposed to a food sustainability and asset mapping in small urban, suburban, or rural areas.

The organization FarmFresh, based in Rhode Island, uses a food asset map on its webpage to identify different farms and other agricultural locations in Southern New England. This organization uses Google Maps as a base for its design. The map is easily accessed from the FarmFresh homepage and allows zooming features. Below the map is more information about the agricultural locations in the specific area code with links to learn more about them. The point locations of the farms are shown with an icon of the abbreviation for what kind of food resource it falls under. Figure 6 shows the Federal Hill area in Providence with six agricultural locations. It highlights five CSA areas and a farmer's market (mkt) in gold stars. However, when clicking on these locations, not much information is available and requires leaving the map to access more information.

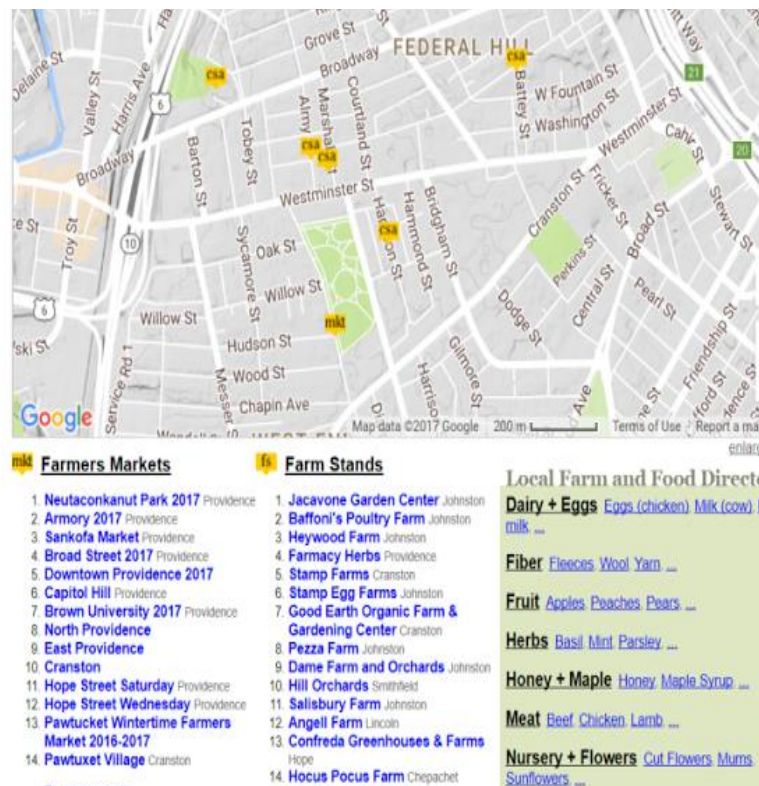


Figure 6: Farm Fresh Food Asset Map (Providence, 2017).

The FarmFresh website illustrates some of the difficulties in developing a food asset map. For example, the website is cluttered and some of the information is outdated or limited.

Food asset mapping is becoming a useful visualization tool to analyze what resources a community contains for the purposes of increasing sustainability and

food security. Many New England communities have begun implementing sustainability programs and could benefit from food asset mapping.

### IV. Food Insecurity Case Studies from New England

Food insecurity is an issue that affects many areas across Massachusetts. Locations with low income residents and immigrant populations are particularly vulnerable to food insecurity. According to Massachusetts Food Trust Program (2017), “2.8 million people living in low income areas in Massachusetts lack access to grocery stores, including more than 700,000 children and 523,000 seniors.” Access to grocery stores is further diminished due to supermarket owners preferring not to be located in such areas. Massachusetts has established programs such as the Massachusetts Food Trust Program, to combat the food insecurity. The Food Trust Program works closely with local organizations, farmers markets, and food trucks by providing them with grants, loans, and technical assistance. Lawrence and Springfield are among the top ten cities in Massachusetts where residents are faced with food insecurity (Massachusetts Food Trust Program, 2017).

Lawrence is located in Essex County, MA with a population of approximately 70,000 people (The City of Lawrence, n.d.). The city has a large number of immigrants and some people refer to it as the “Immigrant City” (The City of Lawrence, n.d.). Many working-class residents of Lawrence have financial difficulties that make it challenging to provide basic necessities for themselves such as food. Groundwork Lawrence is an organization that has been working to address this issue and create a more sustainable environment for the people of Lawrence. The objective of the organization is to “bring about the sustained regeneration, improvement and management of the physical environment by developing community-based partnerships which empower people, businesses and organizations to promote environmental, economic and social well-being” (Groundwork Lawrence, n.d.). To accomplish its mission, Groundwork Lawrence works with local farmers, schools and other organizations. Through community engagement, it has established food programs such as Groundwork Farmers Market and Schoolyard Garden. The focus of its programs is on “increasing access to high-quality fresh produce in Lawrence, enabling residents to make healthy food choices for themselves and their families” (Groundwork Lawrence, n.d.). Massachusetts has many similar communities working towards becoming more sustainable and increasing the food security of its residents.

Livewell Springfield is a collection of over 30 organizations in Springfield, MA focused on promoting healthy living. Two of its most impactful organizations are Fresh Mobile Farmer’s Market (FMFM) and Just Food (JF). FMFM is an initiative

that brings fresh food from Springfield farms to the people of Springfield. It visits several locations in Springfield and run on a schedule from July to October. FMFM is currently working on a new system that would allow them to take Supplemental Nutrition Assistance Program (SNAP) as a form of payment. The FMFM SNAP payment program is helping people make healthier choices by producing locally grown affordable products. In addition, JF has programs that seek to “create an equitable food system that would allow access to affordable, quality food for all in Mason Square [in Springfield]” (Livewell Springfield, n.d.). One of the most important objectives of this program is educating the residents about locally grown, healthy food choices. JF relies on community engagement in order to promote a sustainable environment. Different communities face unique challenges when promoting sustainability.

Martha’s Vineyard is a tourist destination with a distinctive food system because it is on an island and imports food to support its population. Island Grown Initiative was founded in 2005 to “help create a resilient and equitable food system on Martha's Vineyard” (Island Grown Initiative, 2017). Island Grown Initiative achieves its goals through community engagement. It educates people about eating and producing locally grown food and reducing food waste by redistributing it to those in need or for compost (Island Grown Initiative, 2017). Island Grown Initiative has worked on several projects to advance its agenda. The organization has started the “Reasons to Buy Local Food” campaign in order to engage the community in creating a more sustainable food economy. It is composed of three different stakeholders: Community Food Education, Food Equity and Recovery, and Farm Hub. The Community Food Education program works to involve the community in their local food system through training, workshops, and education. Food Equity and Recovery has a mission to reduce, recover, and recycle in order to diminish food waste and hunger in the community. In addition, Farm Hub works hand-in-hand with local farmers to educate and provide them with necessary equipment to grow as farmers. The program has harvested over 20,000 pounds of lettuce and 15,000 pounds of vegetables such as tomatoes, cucumber, herbs, and peppers (Island Grown Initiative, 2017).

Another organization concerned about food use on Martha’s Vineyard is the Island Food Pantry, which has been active for 35 years and has grown from one volunteer to more than 80. The number of families it supports varies based on the season. The pantry encourages clients to come in once every two weeks and is open for two hours three days a week. In 2016 the Island Food Pantry assisted 450 families, or about 1,000 people including an estimated 140 children (Hanjian, 2016).



Vermont Farm to Plate is dedicated to increasing the efficiency of the food system cycle throughout the state, and ensuring that no food is wasted and excess food is distributed to those in need. Vermont Farm to Plate accomplishes its mission by “source reduction, food rescue, composting, animal feed utilization and energy production” (Vermont Farm to Plate, n.d. a). The organization focuses on keeping food and other organic materials out of landfills, promoting food security, job creation, reduction of fossil fuels and greenhouse gas emissions, protecting natural resources such as water and soil, and building stronger communities centered around sustainable food system cycles (Vermont Farm to Plate, n.d. a).

To achieve its mission of strengthening Vermont’s food system Vermont Farm to Plate has created many initiatives, including creating an entire training procedure for retail associates so it can better promote and sell local food (Vermont Farm to Plate, n.d. c). It has sponsored many case studies to see how to improve the current systems already in place. One such study was on the inefficiencies between meat producing and meat processing. It was widely believed by many organizations in the state that Vermont needed to expand the number of meat processing locations. Analysis revealed that the real issue was an inefficiency at the processing facilities caused by a particularly high demand during fall (Vermont Farm to Plate, n.d. b). Due to its size, Vermont Farm to Plate has the distinct advantage of being able to conduct research such as this to determine the best way to increase efficiency in local food system cycles.

Organizations like Vermont Farm to Plate help to promote food production, while aiming to decrease waste through a variety of methods. It helps to involve local communities to foster support and keep these programs going far past its initial creation. It is initiatives like these that look at food systems from multiple perspectives, trying to encourage the public to make an impact in their local communities.

During the 2008 recession, many small-town communities and food pantries began to feel the strain from the economic downturn. One such town was Rutland, VT. It began to find that it did not have enough food in its food pantry and therefore struggled to support its community during difficult times. However, by implementing more sustainable practices such as gleaning, the local food pantry was able to relieve some of the pressure felt by the community (Vt. Embraces Gleaning as Way to Reduce Hunger, 2014). *Gleaning* refers to the agricultural practice of going through fields after the initial harvest and picking up any food that remains or may have fallen to the ground that would otherwise end up being wasted. This practice not only benefits the community by providing more food, but it

also helps the farmers because most farmers do not want excess food creating unnecessary biomass in their fields (Vt. Embraces Gleaning as Way to Reduce Hunger, 2014). Vermont farms such as the Duchess Farm are allowing volunteers to glean its fields after the initial harvest to bring the food to local food pantries and low-income families. Just from this one small town's efforts, it is estimated that 15,000 pounds of food were recovered through gleaning alone (Vt. Embraces Gleaning as Way to Reduce Hunger, 2014). This shows that even small changes can have large effects in a community.

A common theme observed among these organizations is an effort to engage the community with new initiatives and to promote mindful living. Organizations focused on sustainability help transform communities to become food-minded and raise the overall food security through food pantries. There are many commonalities between sustainable communities; most notable, perhaps, is community involvement to improve access to locally-produced and sustainable food, as well as the implementation of policies that help to promote this (Garnett, 2013, p.1). Food loss is a key aspect of food sustainability, and can spark community organizations' focus. Looking at other organizations and comparing their situations to Nantucket's provides an idea of what type of data to look for in building a food asset map.

### V. Nantucket Food System Cycle

In the following section, we focus on the food system in Nantucket. We first describe farming, then aquaculture, and finish by discussing the sustainable practices and organizations on the island.

#### ➤ Farming on Nantucket

Nantucket is an island off of Cape Cod, MA with a unique food system. The island is a summer tourist destination, with seasonal residents. To feed the fluctuating population on Nantucket, food is imported onto the island and also locally grown. About half the island is now in conservation (Nantucket Land Bank, 2017); the remainder of Nantucket, according to Nantucket realtors J Pepper Frazier (2017), is “closely monitored by a group of boards” with historic preservation and public enjoyment in mind, leaving relatively little room for agriculture. Only about 1% of Nantucket's land is used for agriculture: about 630 out of 67,360 acres. A GIS map of land use in Nantucket is shown in Figure 7. The light green area is land being used for agriculture; this does not include cranberry bogs (bordered in orange).

## NANTUCKET FOOD ASSET MAP

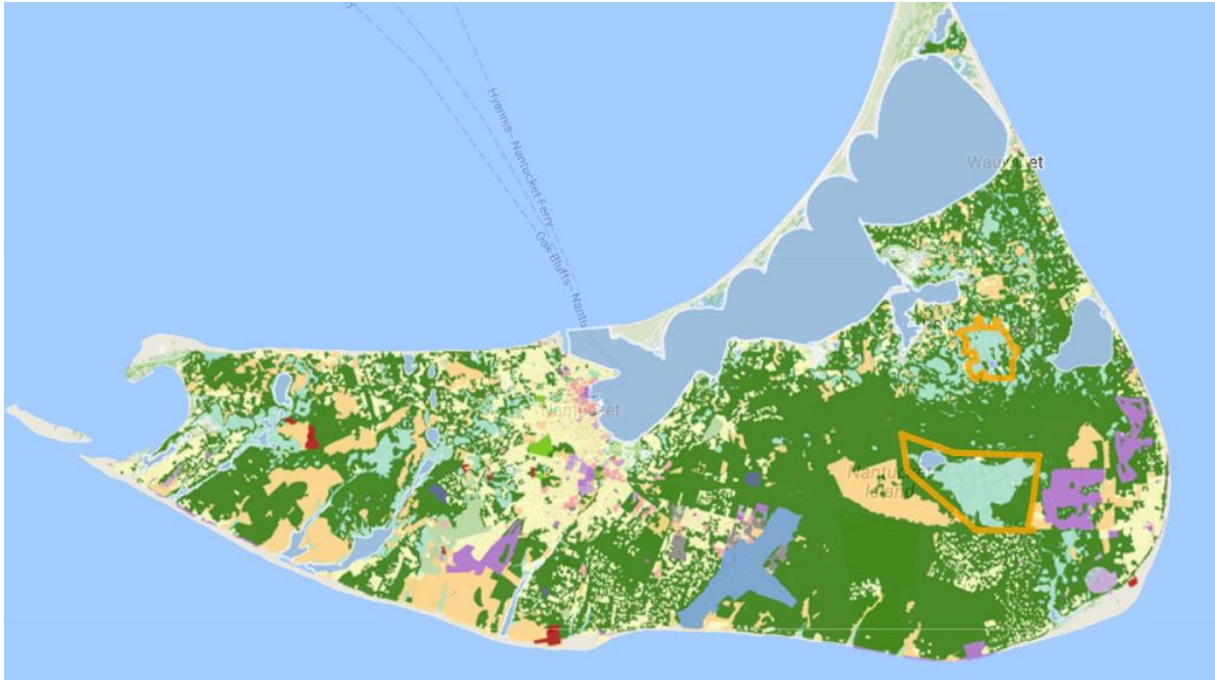


Figure 7: Nantucket Town GIS Screenshot of Land Use Areas (MapGeo, 2017).

In 1850, there were more than 100 farms on Nantucket (Nantucket Land Bank, 2016). However, farming began to decline when the whaling industry collapsed and the population on Nantucket decreased sharply from about 10,000 in 1850 to 4,000 in 1870 (Oldham, n.d.). Today, there are only 14 farms on the island.

Bartlett's Farm is the largest farm on the island and a proponent of sustainable agriculture. Bartlett's Farm has a long history on the island, beginning in the early 1800s. It is now on its sixth generation in the Bartlett family (Bartlett's Farm, 2017). They own 125 acres of land, most of which is highlighted by a yellow box in Figure 8. Vegetables from the farm are served in many Nantucket restaurants, and their flowers occupy gardens and window-boxes throughout the island (Bartlett's Farm, 2017). Other sizable farms on the island include Moors End Farm and Pumpkin Pond Farm. For more details on Nantucket's farms, see Appendix A.

## NANTUCKET FOOD ASSET MAP

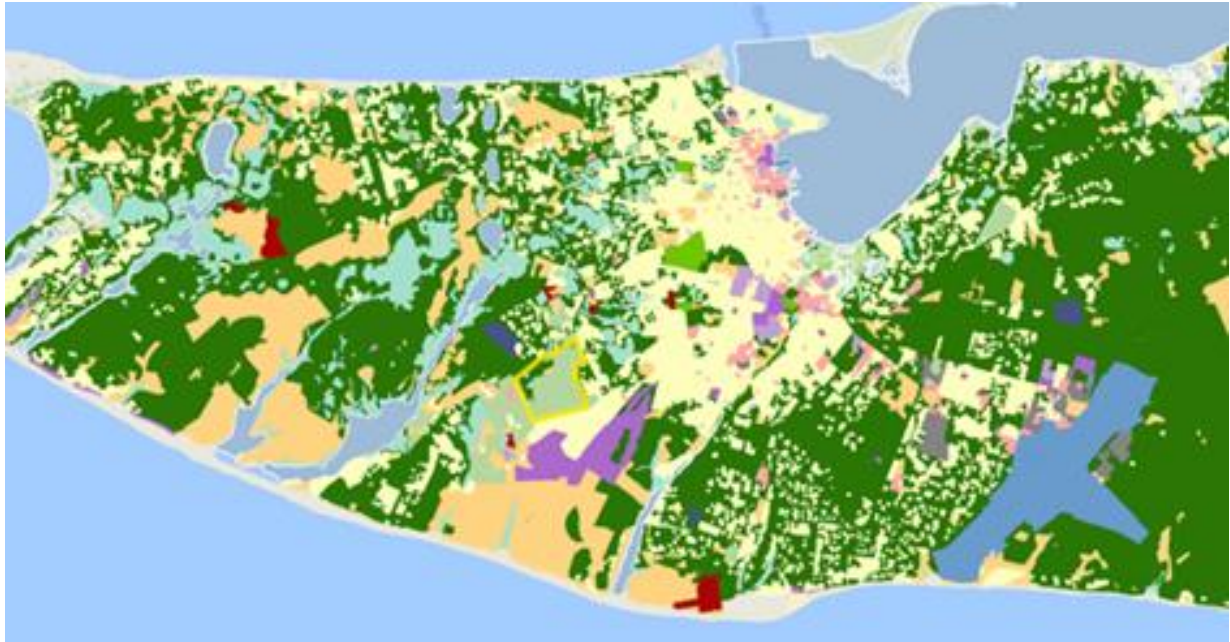


Figure 8: West Side of Nantucket Island Highlighting Bartlett's Farm (MapGeo, 2017).

Milestone Cranberry Bog and Windswept Cranberry Bog are the two cranberry bogs on Nantucket owned by the Nantucket Conservation Foundation. According to the Nantucket Conservation Foundation (n.d. a), Milestone Bog now only cultivates 50 of their 195 acres. Windswept Cranberry Bog operates on 37 acres of land bringing the total area of cranberry bogs on Nantucket to about 87 acres, which was previously 230 before Milestone Bog began organic farming methods. The green circle in Figure 9 highlights the Windswept Cranberry Bog and the blue circle highlights the Milestone Cranberry Bog.



Figure 9: Windswept and Milestone Cranberry Bogs on the Nantucket Conservation Foundation map (Nantucket Conservation Foundation, n.d. b).



When Milestone Cranberry Bog was larger it had the potential to produce up to 2 million pounds of berries per year (Nantucket Conservation Foundation, n.d. a). This has been greatly reduced since the bog is now only operating on 50 acres in an effort to compete with organic cranberries from Canada (Stanton, 2017). Only a small amount of the cranberry harvest is sold locally; the majority of these berries are exported and sold to large fruit companies such as Ocean Spray, Decas, and The Power of Fruit (Cocuzzo, 2015).

Cranberry sales fund the Nantucket Conservation Foundation projects and initiatives. To keep up with Canadian cranberry competition in hopes “that the fiscal savings associated with not farming those 140 acres, coupled with inroads into the health-food market with organic berries, will allow the bogs to at least break even”, both Milestone and Windswept Cranberry Bogs began using organic farming methods (Stanton, 2017). The Nantucket Conservation Foundation hosts the cranberry festival annually to educate the community and promote cranberry produce (Cranberry Festival, n.d.). For more information on Nantucket’s cranberry bogs, see Appendix B.

### ➤ Aquaculture on Nantucket

Aquaculture also plays a role in the Nantucket economy, although much less today than in the past. There is an active aquaculture area of 30 acres in the Nantucket Sound for blue mussels, and also an oyster farm at the entrance to Polpis Harbor which has been active since 1980. For details on oyster farms and their locations, see Appendix C. Another proponent of aquaculture is the Brant Point Shellfish Hatchery. This facility raises bay scallops to support the scallop population in the Nantucket and Madaket Harbors (Brant Point Shellfish Hatchery, 2015).

Bay scallop fisheries are significant not only in Nantucket, but nationally. Scallops used to range the coast from North Carolina to Maine, but today their populations are severely depleted (Nantucket Shellfish Management Plan Committee, 2012). Nantucket’s bay scallop fishery is still functioning today, but is less productive than it once was. According to the Nantucket Shellfish Management Plan Committee (2012), there is a lack of public “concern for the future of the resources and the habitats supporting them.” Thus, the Shellfish Management Plan was created in 2012 to be implemented in the Nantucket and Madaket Harbors. Its goals are to maintain or improve the habitats with a healthy shellfish fishery, and maintain or enhance the shellfish populations in the Nantucket waters (Nantucket Shellfish Management Plan Committee, 2012). One way proposed to manage growing areas is requiring licenses for aquaculture.

Shellfish aquaculture licenses allow people to plant/raise shellfish, use protective devices on tidal flats (like boxes, trays, nets), harvest/take legal shellfish, plant cultch to catch shellfish seed, and grow shellfish using racks, rafts or floats (Nantucket Shellfish Management Plan Committee, 2012). The Shellfish Management Plan recommends the encouragement and support of aquaculture by increasing available space and use of space in the waters and continuing to identify potential aquaculture locations. Recently, shellfish aquaculture has been growing in acres farmed, especially in the northeast of the island, at a rate of about 10% per year (Nantucket Shellfish Management Plan Committee, 2012). This is one source of locally grown food that can be and is very successful within the Nantucket food system.

### ➤ Promoting Sustainable Agriculture on Nantucket

Several organizations have been advocating for more sustainable agriculture and food production on the island, including Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket. Sustainable Nantucket is focused on promoting sustainable agricultural production on the island. Its mission is “to preserve the community character of Nantucket while sustaining its economic and environmental vitality” (Sustainable Nantucket, 2017a). Sustainable Nantucket aims to expand agricultural demand and production, to educate the community about sustainability, and to increase access for the community to local food through farmers markets, restaurants, and schools.

Four major programs Sustainable Nantucket leads are the Farmers & Artisans Market, Farm to School, Community Farm Institute, and NantucketGrown™.

- ❖ *Farmers & Artisans Market:* In 2007, this event was started to raise awareness of local growers and keep downtown Nantucket connected to the community. Everything sold at the market is grown/produced on the island.
- ❖ *Farm to School:* This program bridges the gap between schools and local farms. It is partnered with the Nantucket Public Schools Food Services Department and Food Rescue Nantucket with the aim to serve healthy meals in school cafeterias by “building a school garden for education and supplementing school food supply” and supporting local and regional farmers (Sustainable Nantucket, 2017b).
- ❖ *Community Farm Institute (CFI):* The Walter F. Ballinger Educational Community Farm, also known as CFI, is a community farm that teaches new farmers sustainable farming practices. Growers start with an eighth of an acre and as they learn more, they can graduate to larger plots of land. It was founded in 2000 and through the Land Use Partnership Initiative and

## NANTUCKET FOOD ASSET MAP

Agricultural Apprenticeships, Sustainable Nantucket works to provide classes, workshops, and resources for education (Sustainable Nantucket, 2017c).

- ❖ *NantucketGrown™*: To expand the market and access to local food, the Nantucket Grown Campaign began. This campaign works to promote the NantucketGrown™ brand to provide farmers, restaurants, and food producers with an “instantly recognizable branding campaign” to show consumers that their food came from Nantucket (Sustainable Nantucket, 2017d).

In spite of being a resort community, Nantucket has many individuals on the island who cannot make ends meet and need assistance in feeding themselves and their families. The Nantucket Food Pantry and Food Rescue Nantucket work hand-in-hand to promote a more equitable and sustainable food system. The Food Pantry on the island regularly supplies food to about 200 families in the summer and 100-125 families in the winter, and has a mission to “provide food on temporary basis to persons with no income or inadequate income to feed themselves and their families” (Nantucket Food Pantry, 2011). In addition, the Food Pantry has goals to strengthen the availability of healthy foods, to work with local initiatives to maximize local food assets and end hunger on Nantucket, and to share tools such as local food asset maps with the community (Nantucket Food Pantry, 2011). In 1995, it started a program that has evolved in association with Sustainable Nantucket to become *Share Your Harvest* that involves individuals, families, and group gardeners to supply fresh produce (Nantucket Food Pantry, 2011). The idea is to make sure local fruits and vegetables are available for Food Pantry clients, which also helps to reduce fresh food waste and spoilage. Since the start of the program, “over 20 million pounds of produce providing over 80 million meals have been donated” (Nantucket Food Pantry, 2011).

Food Rescue Nantucket is “a Nantucket Unitarian Meeting House congregational initiative in partnership with the Food Pantry of Nantucket” with the goal of no food being wasted (Food Rescue Nantucket, 2017). It collects fresh foods and then redistribute them using the Nantucket Food Pantry network in order to reduce food waste. The amount of food going to waste on Nantucket is unknown. We do know, however, that every year in the United States 30-40% of food produced ends up as waste in landfills (United States Department of Agriculture, n.d.). To combat Nantucket’s food waste, Food Rescue Nantucket has collected and distributed more than 10 tons of food over 2 years (Gary Langley, personal communication, September 22, 2017). About 80% of the food comes from Bartlett’s Farm, and other

regular pickups include: The Bean, Something's Natural, Moors End Farm, Fast Forward, and more (Gary Langley, personal communication, September 22, 2017). The food is distributed to various locations, mostly to the Food Pantry.

Collaborating with the Food Pantry, Food Rescue Nantucket also picks up food from restaurants on the island when they close for the season. Food Rescue Nantucket and the Food Pantry work together towards the efficient use of food on the island.

### VI. Conclusion

The rise of sustainable agriculture, prompted by environmental and ethical concerns, is shining a light on food issues in communities. Food security is a growing problem for many people on Nantucket and organizations such as Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket are exploring a variety of ways to address this issue. Mapping food assets would allow Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket to evaluate the aspects of the food system cycle, identify areas to expand their food network, and help educate and engage the community so that a more sustainable food system can be developed on the island.



### METHODOLOGY

The goal of this project was to develop an interactive food asset map and database for Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket to identify areas to expand food production, improve food distribution to recipients, and reduce food waste on Nantucket. This was done by following five objectives:

1. Identify and evaluate best practices in the development of food asset maps and databases
2. Clarify details of the purpose, content, and format of the food asset map and database with respect to the goals set forward by Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket
3. Build a food asset map and database
4. Use the food asset map to analyze Nantucket's food system (production, distribution, consumption, waste) in order to identify opportunities for improvement
5. Integrate the food asset map with existing programs and develop a strategy to update and maintain the map and database

These objectives involved a variety of tasks including interviews with stakeholders and the assessment of ArcGIS and other databases, in addition to site visits and observations, as illustrated in Figure 10. We describe these tasks in more detail below.



Figure 10: Flowchart for Objectives and Tasks.

## Objective 1: Identify and evaluate best practices

Before beginning the project, we needed to learn: What information is gathered and how is it displayed in food asset maps and databases, what platforms are typically used, how these maps and databases are used to analyze and improve food systems. To approach these questions, we reviewed pertinent literature and supplemented this background research with a set of interviews with experts on food asset mapping and Nantucket land use (see Figure 11).

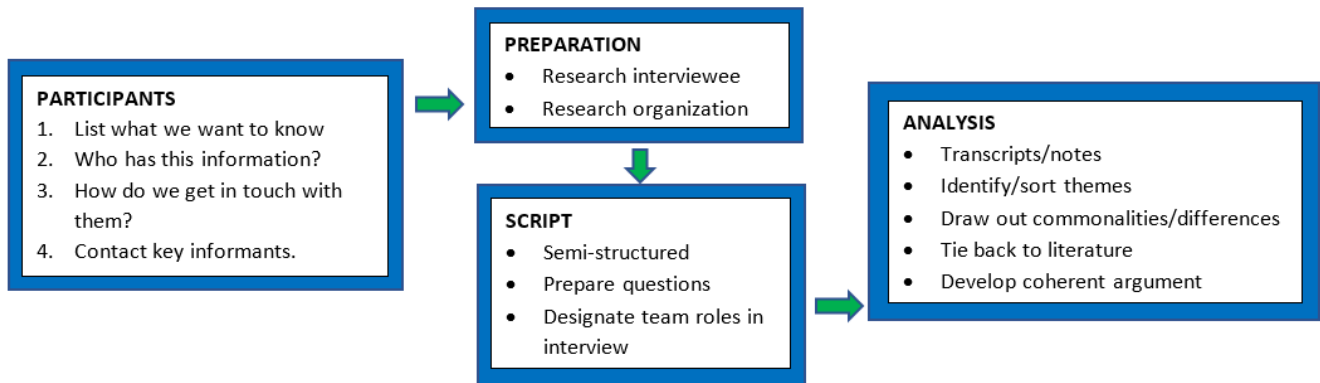


Figure 11: Flowchart of Interview Process.

We conducted semi-structured, qualitative interviews by phone and in person, with one team member taking notes. We did not need verbatim transcripts so key themes were noted with selective quotations. We developed the interview questions based on our background research and feedback from our advisors and representatives from Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket. A preamble was emailed to the interviewee in advance and repeated at the beginning of the conversation (see Appendix D).

Since there are relatively few food asset maps, we found one extensive large-scale example of Maryland. We interviewed a creator, GIS Specialist Jamie Harding from Johns Hopkins Center for a Livable Future, about this map to gain useful information about mapping platforms.

We conducted an interview with the assistant director of the Nantucket Islands Land Bank, Jesse Bell, who gave us information about the Nantucket Islands Land Bank mission towards agriculture, open space programs, and land that is open with the potential of being transformed into an agricultural use. To gather more information about practices on Nantucket, we interviewed Jeff Carlson from the Nantucket Natural Resources Department to learn about the Shellfish Management Plan, and also active and open sites of aquaculture on the island.

These three interviews were useful in the compiling of data to assemble the database of the food asset map, and also for learning about the most suitable GIS map format and platform to display our data.

### Objective 2: Clarify ideas for food asset map

Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket have minor differences in their needs and expectations for Nantucket's food system, but their overall missions are similar. This is the first project on which these organizations are working together so we scheduled regular meetings to understand their individual ideas and build consensus around their common goals. We discussed their expectations in terms of the content, features, and format of the map and associated databases. Using the research proposal as a point of departure, we met with them to discuss details such as:

- ❖ What types of food assets should/should not be included in the database and associated maps?
- ❖ Where the map should be hosted?
- ❖ How would the map and database be used in the future?

Our initial discussion involved what types of food assets should go onto the map. We started with our given list and presented a base map with that information. After viewing this map and talking with them more, we added data layers specific to each organization's individual interests.

In regards to where the map should be hosted, the organizations agreed that the best-known organizations, Sustainable Nantucket and Food Rescue Nantucket, would include the map on their websites. This would provide the greatest reach to the community and those involved in the food network.

To judge how the map and database would be used in the future, we talked individually with each organization to gain an understanding of what their long-term and everyday objectives were. After gaining this understanding, we began the creation of our food asset map and database.

### Objective 3: Build a food asset map and database

To begin the process of building a food asset map, a listing of food assets on Nantucket was created:

- ❖ Producers (farms, apiaries, & florists)
- ❖ Farms (smaller section of producers; just agricultural farms)
- ❖ Areas of Aquaculture
- ❖ Distributors (grocery stores, distribution facilities, & convenience/liquor stores)

## NANTUCKET FOOD ASSET MAP

- ❖ Storage (dry, freezer, & refrigeration facilities)
- ❖ Restaurants
- ❖ Lodging (Inns & Hotels)
- ❖ Caterers
- ❖ Commercial kitchens (hospital, schools, churches, & human service agencies)
- ❖ Waste facilities

We identified information fields of interest for each asset, including:

- ❖ Name
- ❖ Owner
- ❖ Locations
- ❖ Type of asset
- ❖ Contact information

The asset data was compiled on Google sheets from sources such as:

- ❖ Online searches
- ❖ Nantucket phone book
- ❖ Nantucket restaurant guides
- ❖ Sustainable Nantucket's NantucketGrown™ list
- ❖ Sustainable Nantucket
- ❖ Nantucket Health Department commercial kitchen information
- ❖ Nantucket Chamber of Commerce website
- ❖ Food Rescue Nantucket

To gather information such as: dates/seasons of operation, distributors they use, interest in composting, and willingness to participate in donating extra food to the Nantucket Food Pantry, we conducted a restaurant survey. We sent the survey to approximately 85 local restaurants; we obtained 14 responses (see Appendix E for survey preamble and questions). Although we did not get enough responses to warrant survey results, we followed up on some interesting trends by interviewing restaurant owners and managers.

After gathering all the data on Google Sheets, we utilized an add-on called Awesome Table in order to convert all the addresses to longitude and latitude to plot the locations. The spreadsheet was downloaded to a computer desktop as a CSV file and uploaded on ArcGIS online to generate the food asset map. This process is illustrated in Figure 12 below.

## NANTUCKET FOOD ASSET MAP



Figure 12: Database Transfer and Map Creation Flowchart.

### ➤ Map Evaluation

After the database was assembled, through discussions and research we evaluated different platforms to be used for the map. The first option was using Google Maps for the display of our data. There are benefits to using Google Maps; such as user-friendliness of the platform's interface. Google Maps provides a quick and easily accessible way of displaying point data. Point data is a single point that can be located on a map using a longitude and latitude coordinate system. With all the features of Google Maps, there are also some limitation with the platform. Options for displaying non-point data on Google Maps are not as comprehensive as for other platforms.

The other platforms investigated were ArcMap and ArcGIS Online. ArcMap is an expansive desktop mapping platform that provides its users with many options on creating, publishing, and displaying data on a map. In contrast to Google Maps, ArcMap allows a user to plot more than just point data. The complexity of the ArcMap platform presents the main challenge for this platform. Navigating through this platform is difficult and requires considerable training. The features on this platform include plotting point data and parcel data, highlighting certain areas and displaying information. ArcGIS Online is a derivative and more user-friendly version of ArcMap.

ArcGIS Online is simpler, but it supports features that are an integral part of the project, such as the ability to create an online map, import data layers onto it, and make the map accessible to the community. The publishing features are versatile, including the option of creating a web application from the map. Navigating through ArcMap requires some experience working with complex software, whereas ArcGIS Online does not require a high technical skill to use. ArcGIS Online can be learned more quickly while ArcMap takes more self-training and tutorials to accomplish the same basic tasks. This makes it suitable for updating in the future because the skill-level required is not as high.

### Objective 4: Use the food asset map to analyze Nantucket's food system (production, distribution, consumption, waste) in order to identify opportunities for improvement

To approach this objective, we created a few questions to answer:

- ❖ How did each organization wish to use the map?
- ❖ What additional information did they request?
- ❖ Should all of the information in the database be publicly accessible? If not, how would that be handled?
- ❖ How can the map be used to promote the objectives of each organization?

Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket had specific goals in mind for the project, so we addressed all of their interests. We worked to identify additional opportunities for the food network on the island with the resources we gathered and through visualization with the food asset map.

To provide the organizations with the resources necessary to identify inefficiencies and food waste in the food system cycle on the island in order to help eliminate them, we aimed to identify key attributes that could be beneficial for this goal, as listed in Objective 3. With all of this data clearly mapped out we began to analyze the food system and draw conclusions. In addition to the preliminary food asset layers, we expanded the map to include data layers such as:

- ❖ Areas of Aquaculture
- ❖ Food-focused organizations

These layers map out places that could be further enhanced to promote each of the three organizations' goals. They also help to create a more complete database of food-related information.

### Objective 5: Develop a strategy to update and maintain the food asset map and database

We developed a strategy to update the map and database regularly to ensure it does not become outdated and obsolete. Due to the fact that Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket are relatively small nonprofits, the time and resources they have are limited. This coupled with the fact that they do not have employees familiar with GIS software makes it unlikely they will want to assume the task of updating and maintaining the map. However, we wanted to keep the updating of the map local and we researched alternatives. We learned of the existence of student groups at Nantucket High School interested in sustainability and in information technology. After talking with the teachers/advisors of these student groups, we decided to start a program at the

## NANTUCKET FOOD ASSET MAP

Nantucket High School to get students involved in updating the database. We worked with the High School to teach interested students how to use the software and how to update the online map and database. This was an opportunity not to just to update the map but to better promote education in sustainability and establish a better relationship between Sustainable Nantucket, Nantucket Food Pantry, Food Rescue Nantucket and a younger generation of environmentally concerned people. We additionally created a user manual to help future high school or WPI students learn how to update and maintain the map in an effort to keep the map current. To view the manual, see Appendix F.



### THE FOOD SYSTEM ON NANTUCKET

In the following chapter, we present the Nantucket food asset map and its associated database created for Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket. This map is the first step in a Comprehensive Food System Assessment that will take a few years to complete. The purpose of this map is to create a database that will consolidate all the information on the current food system cycle and spark changes to improve the system. We subsequently analyze the map in regards to Nantucket's food system and list our observations. Then introducing the map and database, we explain the format of the map and the update plan to keep the map current.

#### Food System Cycle

The Nantucket food asset map contains a comprehensive list of food assets including production, distribution, consumption, and waste. After discussion with Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket we determined what information would and would not be publicly available. This includes Food Rescue Recipients, information obtained through the restaurant survey, and producers who do not wish for their information to be publicly available. These data layers with confidential information will be created as private data layers and only Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket will have access to these. Thus, we have chosen to omit those layers from our final report. What follows is the data layers that will be publicly accessible from the host website, Sustainable Nantucket.

##### ➤ Production

We found the most accurate representation of producers on Nantucket to include: apiaries, florists, farmers, oyster farmers, fisherman, and other select producers. A few small producers only source to restaurants and elected to keep their addresses hidden. Figure 13 shows all public producers on Nantucket in black diamonds.

## NANTUCKET FOOD ASSET MAP

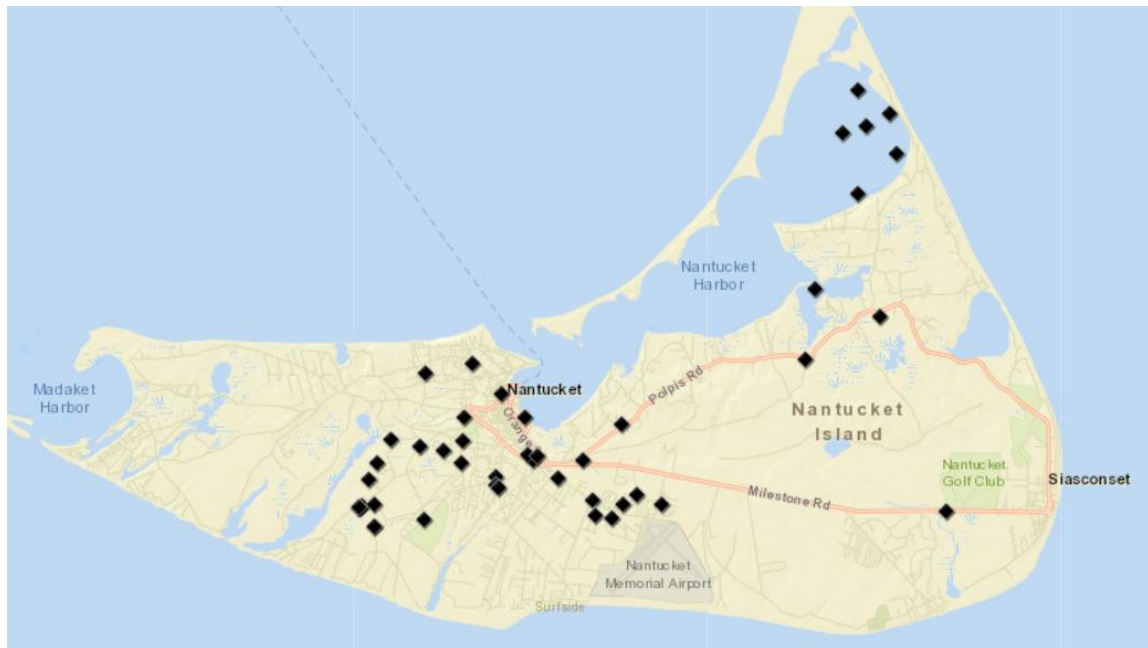


Figure 13: Producers on Nantucket.

There are 47 producers mapped with the majority being concentrated in the center of Nantucket. There are 16 agricultural farms shown in Figure 14 in green rectangular points. Farms are on both Madaket and Siasconset sides of the island, with the primary number of farms located on the Madaket side of the island. More information about Nantucket's farms can be found in Appendix A.

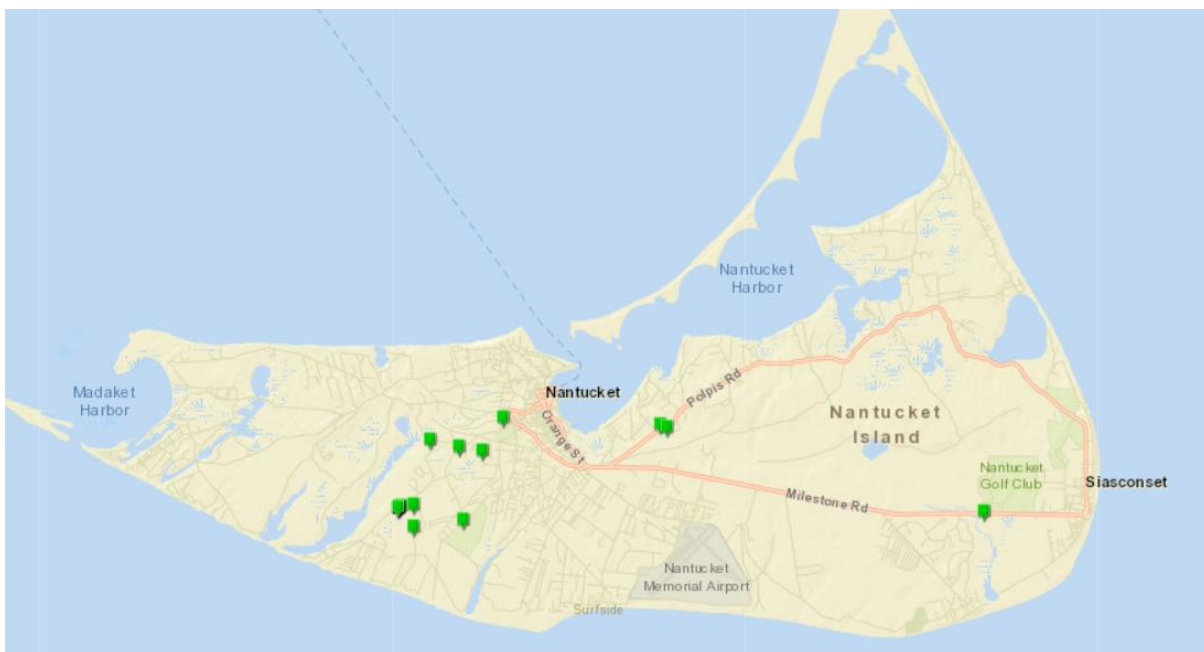


Figure 14: Farms on Nantucket.

## NANTUCKET FOOD ASSET MAP

These farms are located away from the downtown area, where most food consumption occurs. This requires farms to deliver food to the restaurants, adding extra transportation efforts from the producers.

Food Rescue Nantucket transports excess food from select farms, restaurants, and groceries to many locations including the Nantucket Food Pantry. Since Food Rescue Nantucket does not pick up from every location on the island with excess food, there is opportunity for Food Rescue Nantucket to reach out to more food locations. The map can help Food Rescue Nantucket identify these producers to enhance their waste reduction efforts and promote gleaning programs.

Although gleaning is already practiced through individual and organizational efforts, not all farms and producing locations are practicing it. Food Rescue Nantucket has a current gleaning initiative with the Sustainable Nantucket Farm to School program that donates gleaned food from Moors End Farm and Bartlett's Farm to the Nantucket schools. Excess food from this program gets donated to the Food Pantry. The gleaning season runs from August to early December. More promotion can be done to reach out to farmers to make them aware of the volunteers willing to glean their fields.

The *Share Your Harvest* program only involves small backyard food producers on the island. This could be expanded to reduce future food waste from a greater number backyard gardens with increased promotion and outreach. Since Food Rescue Nantucket is interested in reducing food waste, it can work with the Food Pantry on its *Share Your Harvest* program to transport food from the backyard gardens. This could encourage participation in the program and connect Food Rescue Nantucket to owners of large backyard gardens for potential gleaning opportunities in the future.

### **Potential area for production expansion**

One major restriction in Nantucket's food production is the lack of land available for agricultural use. There are a couple of contributing factors to this issue, one of which is the high price of land on the island. In addition, 50% of the land on the island is in conservation, while less than 1% of the land is currently being used for agriculture. The expansion of agriculture could lead to significantly more food being produced on the island and this would supplement the food being imported on to the island to increase Nantucket's sustainability. We discussed the criteria for land expansion with Sustainable Nantucket to gain a clear understanding of what makes the land suitable; potential land must have been used for an agricultural purpose in the past 15 years. This is because it is less likely that there are endangered plants

on the land if it has been used agriculturally in the past 15 years; this includes: mowing, sheep grazing, and other agricultural processes. There are other factors including wetlands protection and open space restrictions that would need to be evaluated before final purchase.

During an interview with Jesse Bell, Assistant Director of the Nantucket Islands Land Bank, she mentioned that expanding agriculture on the island is a part of the Nantucket Islands Land Bank's mission. She felt that their agricultural goal was an area of its mission that the Land Bank could improve upon henceforth. The Land Bank has previously worked positively with Sustainable Nantucket on implementing their Community Farm Institute, and look forward to continuing their partnership with Sustainable Nantucket in the future.

We have also found aquaculture to be another source of production on the island to look at expanding. In conversation with Jeff Carlson of the Nantucket Natural Resources Department, we found that the areas surrounding Nantucket, along with the harbors, are used for commercial scalloping from November 1 through March 30. The Brant Point Shellfish Hatchery is on island, where adult bay scallops are harvested from the harbor, brought to the hatchery, and bred. The larvae are then released into the wild to rejoin the native population, which keeps the scallop population steady in the region. The only prohibitions for scalloping are the reserved aquaculture areas, where there is a lack of scallops and other shellfish are present.

Aquaculture occurs around the island by private growers and by the town, occupying about 100 acres of land altogether. The town allows a maximum of 10 acres of land to each grower by lease. All growers are required by the town to renew their lease/license every three years to ensure all active spaces are in fact being used. Regions of aquaculture around the island include: Coskata Pond, Polpis Harbor, Head of the Harbor, and Pocomo Meadow Area. These are featured in Figure 15. Information about these areas is managed by the Natural Resources Department, which noted there are unoccupied leases on Polpis Harbor that the town has reserved as extra space for potential expansion (circled in blue on the figure).

## NANTUCKET FOOD ASSET MAP

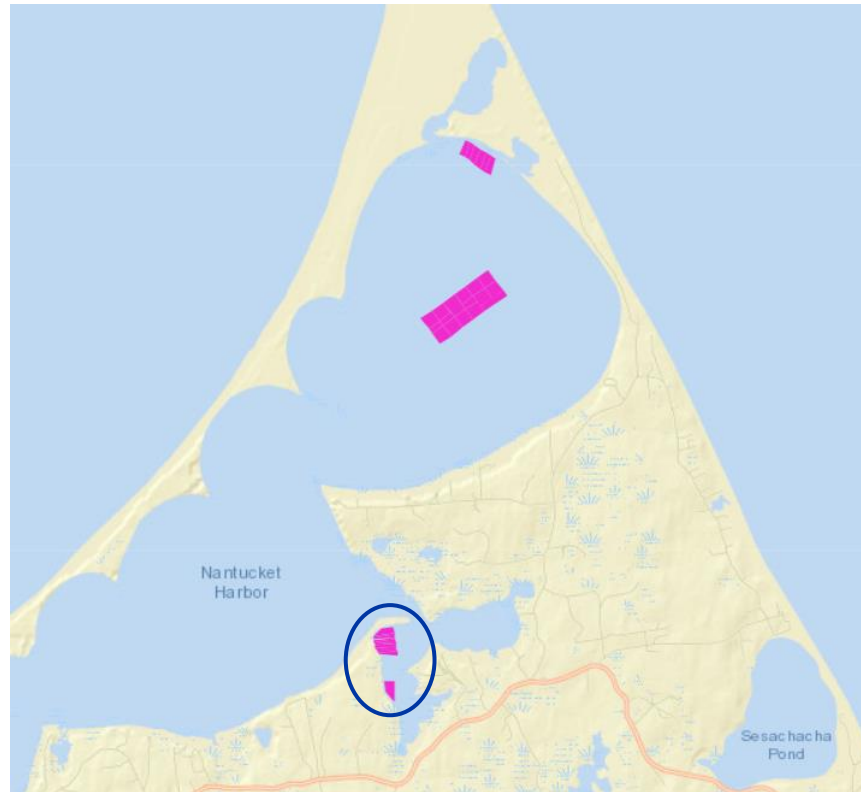


Figure 15: Aquaculture Locations around Nantucket.

### ➤ Distribution & Storage

There are 43 on-island distributors and 13 off-island distributors. Figure 16 shows the distributors on Nantucket while Figure 17 shows the distributors on and off island in orange squares. Distributors are scattered throughout the island with a concentration in the downtown area and are primarily small grocery and convenience stores. Distributors off island are primarily large food distribution facilities that range from New Jersey to New Hampshire, with the majority being located in Massachusetts. Off island producers import the vast majority of the food on island, mainly through the use of the Steamship Authority ferry. This can present challenges when there are high winds or storms and the ferries are cancelled for several days, interrupting the island's main food supply.



## NANTUCKET FOOD ASSET MAP

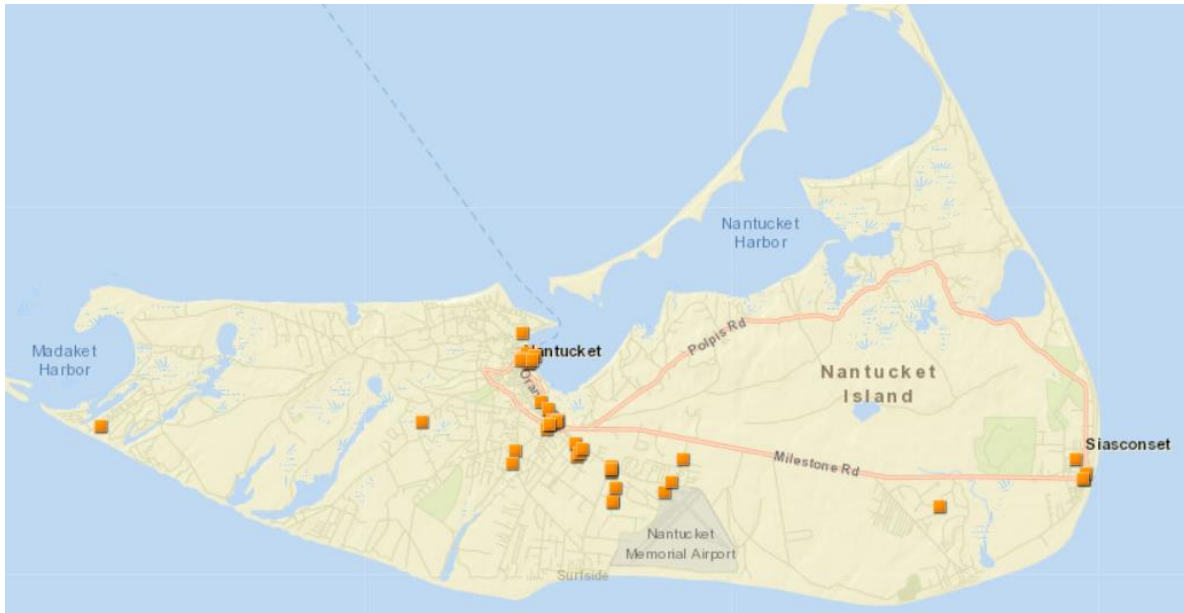


Figure 16: Distributors on Nantucket.

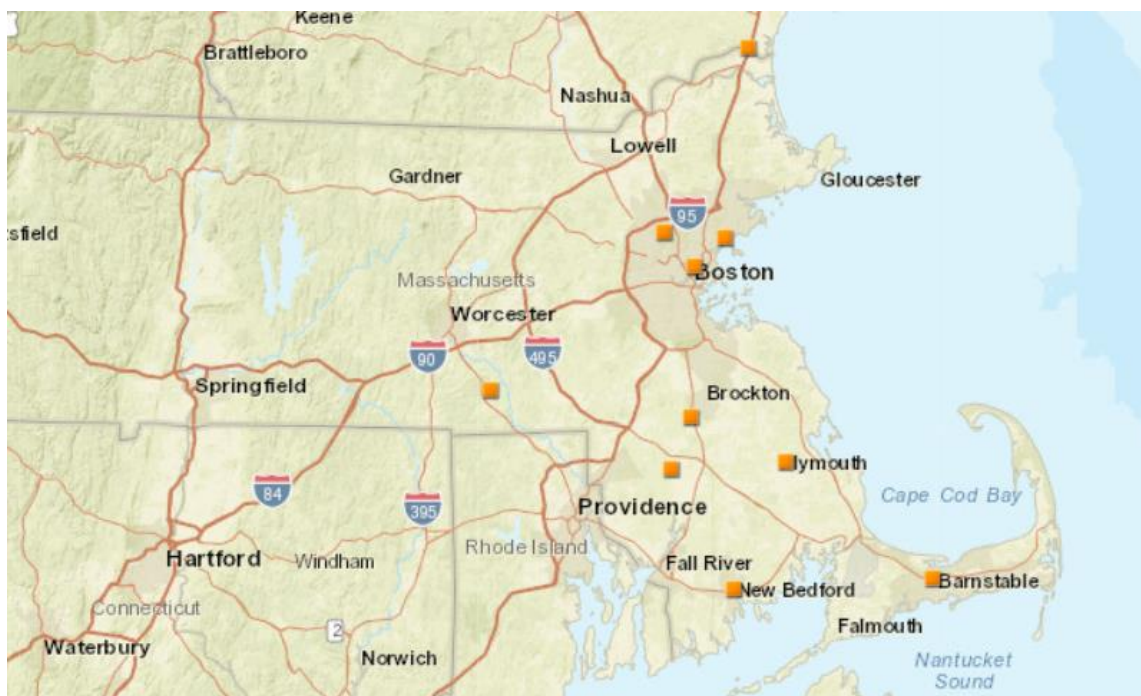


Figure 17: Distributors off Nantucket.

Figure 18 shows the storage facilities for food on the island. There are 16 in total including freezers, refrigerators, Food Pantry storage locations and Food Pantry and Food Rescue Nantucket drop off locations. Locations with freezers and refrigerators include the Food Pantry and Sustainable Nantucket. These locations are extremely valuable because they allow these organizations to store perishable foods; however, there are very few locations with available refrigeration and freezer



## NANTUCKET FOOD ASSET MAP

capabilities. Expansion on this could greatly improve the amount of perishable foods that could be stored. Some of these drop off locations for the Food Pantry include Stop and Shop, Living Faith Church, Nantucket Cottage Hospital, St. Mary, our Lady of the Isle Catholic Church, Unitarian Universalist Church, St. Paul's Episcopal Church, Summer Street Church, Nantucket United Methodist Church, and First Congregational Church. The Food Pantry is still faced with a unique challenge of trying to import enough food from the Greater Boston Food Bank with the added challenge of having to transport food over the ferries. So while they have many drop off locations and food donations from on island, they are always looking to expand any opportunities for this.

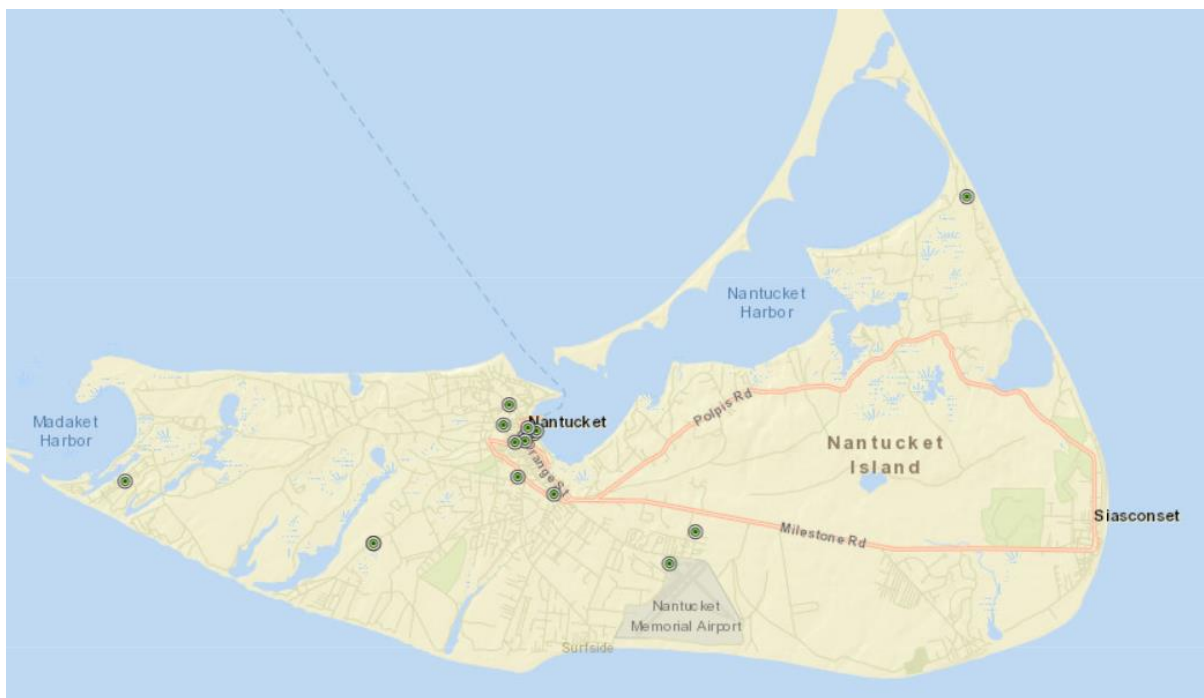


Figure 18: Storage on Nantucket.

Nantucket's situation for food storage is unusual due to the fact that it is an island with limited space. Transportation is more expensive, less reliable, and takes more time than in areas on the mainland. This stresses the importance of having more locations on the island that store and preserve food.

The Greater Boston Food Bank is the main source of food used by the Nantucket Food Pantry, about 85%. However, the Food Bank only delivers to Harwich, thus requiring an extra step in transportation to get the food onto the island via ferry. The Food Pantry transports perishable items with the use of a refrigerated truck, and they are partnered with Cape Cod Express in order to transport the

## NANTUCKET FOOD ASSET MAP

nonperishable items to Nantucket. The ability to provide more food is hindered by the lack of space and extra steps of importing food onto the island.

One popular program between libraries and food distribution organizations is called *Food for Fines*. This program involves exchanging non-perishable foods for a reduction in library fines. *Food for Fines* is a particularly popular method of payment at Worcester Polytechnic Institute. A student who has an overdue fine at the WPI Gordon Library can give non-perishable food items in exchange for a \$5 fine reduction per food item. The donation cannot be expired or in a glass container to be accepted. This program began in 2014, and Table 1 shows, for the following years, how much food was collected, the value of the food, and the number of donations. The food gets donated to food banks throughout the Worcester area and the Gordon Library partners with WPI affiliated organizations throughout the year. (Amy Lawton, personal communication, December 6, 2017).

Year	Cans Collected	Food Worth	Number of Donations
2014	171	\$650.20	41
2015	607	\$2,358.69	136
2016	909	\$3,413.10	227
2017 (up to May)	333	\$1,112.75	111

Table 1: Gordon Library, Food for Fines (Amy Lawton, personal communication, December 6, 2017).

### ➤ Consumption

Nantucket food consumption has areas for improvements in the reduction of its food waste. Many commercial and private locations of Nantucket already implement sustainable food practices with some restaurants producing little to no waste. However, there are numerous Nantucket restaurants, inns, hotels, caterers, and commercial kitchens where food waste can be reduced, food can be donated, and kitchens can be utilized or rented during off-times. Figure 19 shows the restaurants on Nantucket in purple dots, and lodging in black dots. There are 159 total Nantucket restaurants pictured, along with 30 locations of lodging. Most of these establishments are located in the downtown area with a few scattered restaurants on the far sides of the island. Figure 20 shows the drop-down information available

## NANTUCKET FOOD ASSET MAP

when selecting a restaurant location, using the Boarding House as an example. Information such as their NantucketGrown™ certification is displayed as well as contact information. This can be used in the future to contact restaurants about their food waste to help implement sustainable programs.

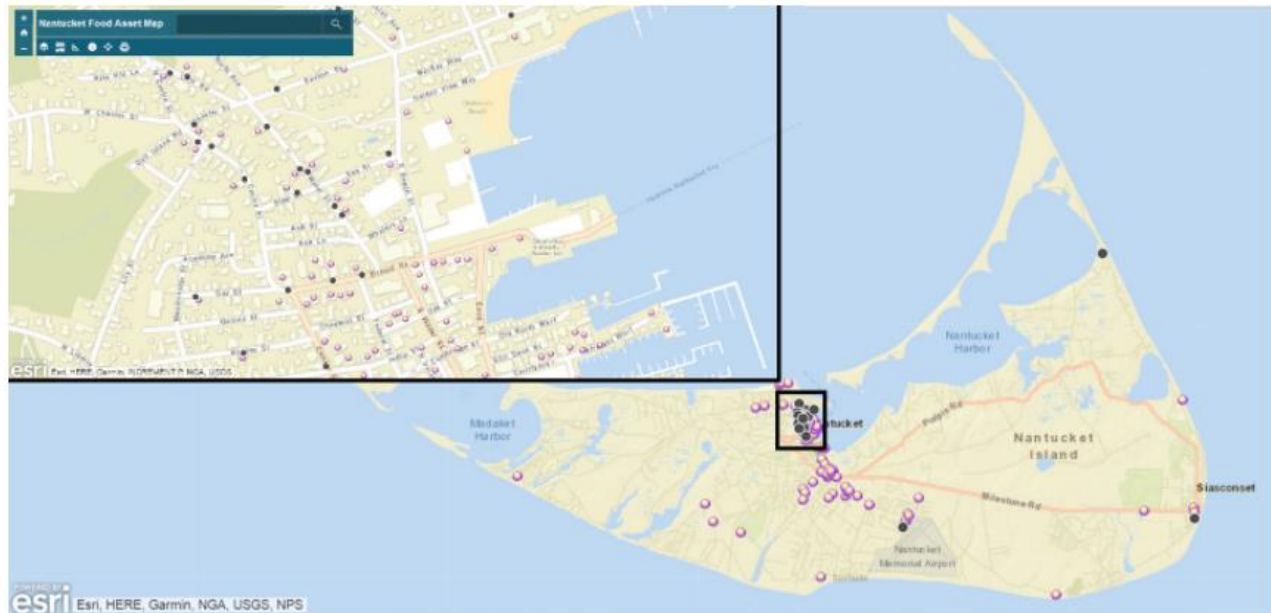


Figure 19: Restaurants and Lodging on Nantucket.

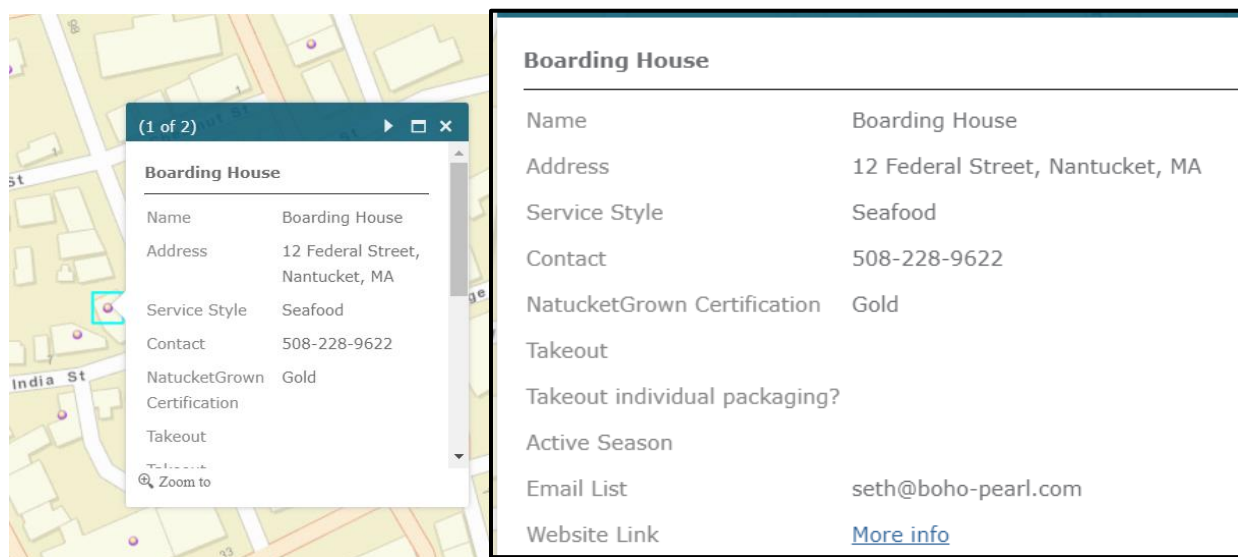


Figure 20: Pop-up Dialogue Box for the Boarding House.

Nantucket has a strong connection to consuming and marketing locally produced food, with NativMade and Sustainable Nantucket's NantucketGrown™ brand being notable examples. However, only 30 out of 159 restaurants are recognized for sourcing locally. In Table 2, the NantucketGrown™ certification level and the

## NANTUCKET FOOD ASSET MAP

number of restaurants associated with that level is shown. Gold level restaurants source about 30+% of their food locally, silver sources about 16-29%, and bronze sources about 5-15%.

	NantucketGrown™ Certification Levels			
	Gold	Silver	Bronze	None
Number of Restaurants	14	10	6	129

Table 2: NantucketGrown™ Certification Levels.

In an interview with Chef Bruce Sacino of the Westmoor Club, a gold level certified NantucketGrown™ restaurant, he expressed that he believes customers appreciate knowing their food was grown locally. However, there are some barriers to sourcing locally because some foods are not produced on Nantucket and need to be imported to meet customer demands. Local sourcing helps reduce food waste by eliminating long-distance distribution.

Another opportunity to eliminate food waste is to contact caterers about their food usage. The food asset map has contact information for caterers around the island. Figure 21 shows the locations of caterers on Nantucket in yellow flags. There are 27 caterers included. The caterers follow the same location trend as restaurants with the largest proportion being located in the downtown area.



Figure 21: Caterers on Nantucket.

## NANTUCKET FOOD ASSET MAP

We found that the Nantucket Food Pantry's capabilities are confined in terms of the kinds of assistance it can give to its clients due to its limited space. It can only accept pre-packaged items with ingredients labeled, since it does not have a location that could be used for repackaging other donated foods. Because of the high cost of land, it is not feasible to expand to a separate building to repackage donated food. In an interview with Roberto Santamaria, director of the Nantucket Health Department, we found that it is possible for multiple organizations to obtain licensing for the use of the same vacant commercial kitchen. Commercial kitchens can be defined as kitchens in public places such as hospitals, schools, churches, and other social organizations. For the purpose of this project, we expanded the definition to include restaurants and inns during their off seasons. Commercial kitchens are shown in Figure 22 in red tacks, the majority of which are located in the downtown Nantucket area with a few scattered in the Surfside and Madaket areas. We chose to separate the rest of the commercial kitchens from restaurants and inns to help distinguish between locations. There currently is not a program in Nantucket to use commercial kitchens in off-times (either at night or during the end of a season). From survey results, restaurants are mostly not interested in having the Nantucket Food Pantry use their kitchens during the off seasons.

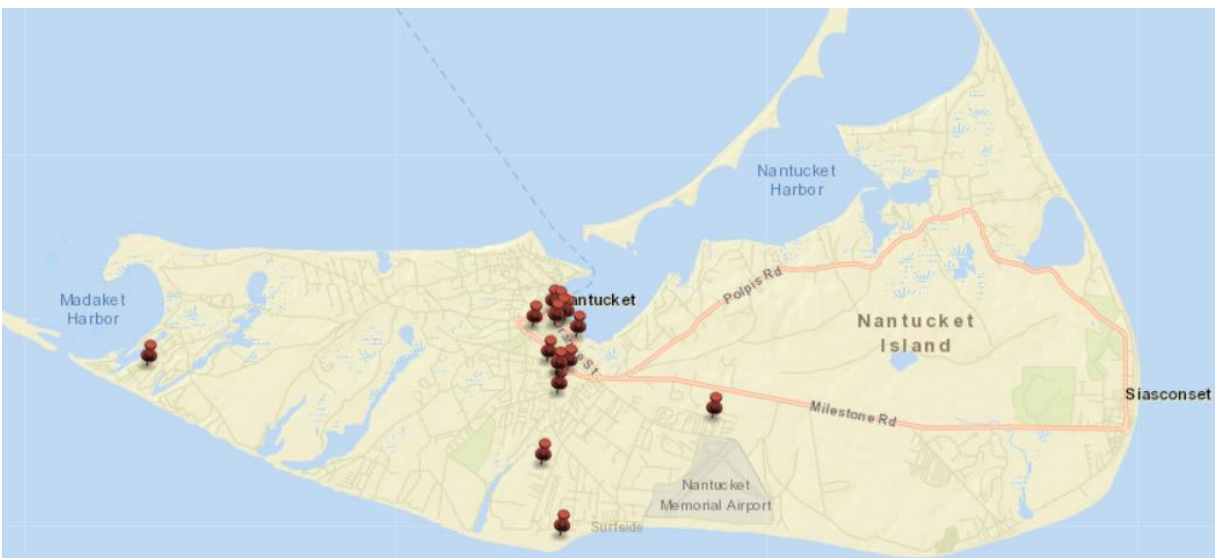


Figure 22: Commercial Kitchens on Nantucket.

### ➤ Waste

Waste on Nantucket all currently goes to one location. The Nantucket Department of Public Works operates a landfill on the Madaket side of the island. Figure 23 depicts this location. This is also a registered composting location for the state of Massachusetts. There is currently a program with Sustainable Nantucket to increase the presence of composting in schools, restaurants, and other food locations



## NANTUCKET FOOD ASSET MAP

on the island. The restaurant survey we conducted suggests that there is interest in composting, with some restaurants already currently composting. Many restaurants cited reasons such as smell or lack of space as main deterrents from composting on their own. Don Kolp, the manager at the Brotherhood of Thieves restaurant on island, was interviewed about composting. He stated that their main concern is they do not want the smell to bother their customers. However, Mr. Kolp would be interested if there was a more convenient way to compost off site. He was intrigued at the idea of Sustainable Nantucket and Food Rescue Nantucket working with the high school to set up a composting program to collect from restaurants.

On the other hand, we interviewed Peter McEachern from the Nantucket Yacht Club about how they compost food waste. He described their composting process as: all of the waste goes into a grinder, except for oyster shells and bones; once the waste has been ground up to oatmeal consistency, the Somat machine is used; paddles extract water, dehydrating the waste. That water can then be used to water the grass, and the remaining mass is sent to the landfill where it can now easily dissolve into the soil and help breakdown other landfill materials.

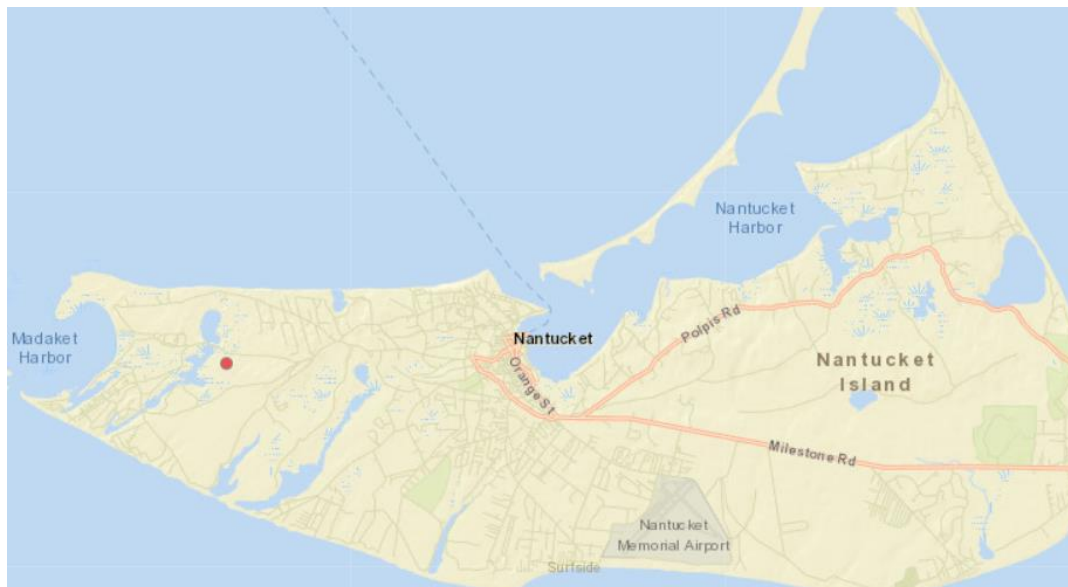


Figure 23: Waste Facilities on Nantucket.

### ➤ Education

A vital part of Nantucket's food network is food education. Being an island, the community is uniquely aware of its environmental impact. Figure 24 shows food-focused organizations on the island: Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket.



## NANTUCKET FOOD ASSET MAP

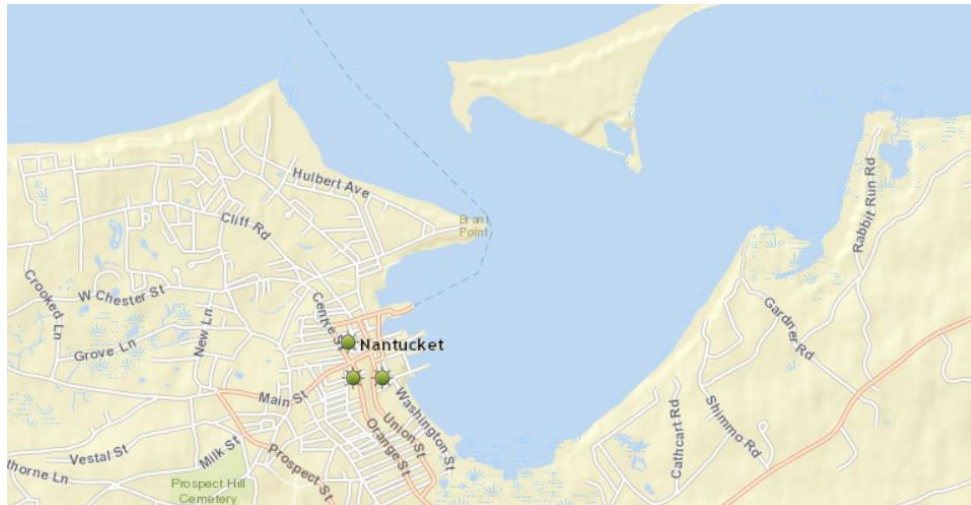


Figure 24: Food-Focused Organizations on Nantucket.

There are opportunities to enhance these organizations' programs. There are several programs that are currently in place to help promote sustainable practices such as *Share Your Harvest*, a program that encourages local farmers and gardeners to share their uneaten food they produced, and the Sustainable Nantucket's Community Farm Institute (CFI), a pilot program that teaches community members who are new to farming how to grow and maintain a farm or garden by using sustainable practices. In fact, only 8 of the 41 producers that we have mapped out attend Sustainable Nantucket's Farmers and Artisans Market (Figure 25).

### Producer Attendance at Sustainable Nantucket's Farmers and Artisans Market

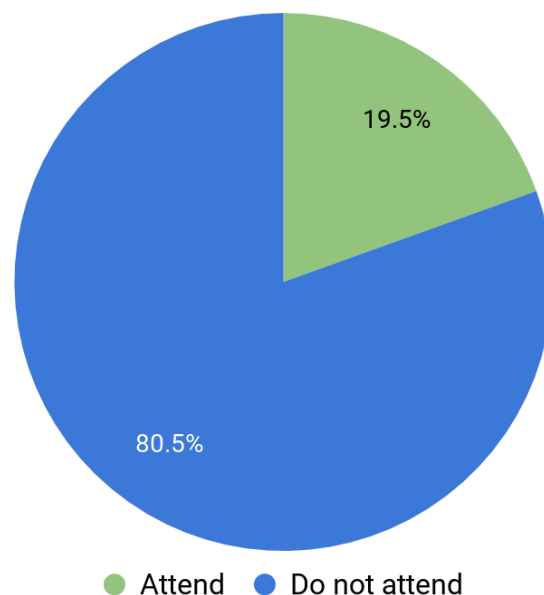


Figure 25: Producer Attendance at Sustainable Nantucket's Farmers and Artisans Market.

## Map and Database Content and Usage

A food asset map can be expanded past the primary purpose of identifying areas where food loss occurs, in order to include future endeavors to expand and improve the food system cycle. To create a more comprehensive database of information, we include the following data layers on the food asset map:

- ❖ Producers (farms, apiaries, & florists)
- ❖ Farms
- ❖ Aquaculture
- ❖ Distributors
- ❖ Storage (dry, freezer, & refrigeration facilities)
- ❖ Restaurants
- ❖ Lodging (Inns & Hotels)
- ❖ Caterers
- ❖ Commercial Kitchens
- ❖ Waste facilities
- ❖ Food-focused organizations

These are the individual data layers because they are the key elements of the Nantucket food network of interest to the stakeholders. Different sets of data were collected on each category, depending on what would be most useful for those using the map. For example, information available when clicking on a producer is shown below in Figure 26:

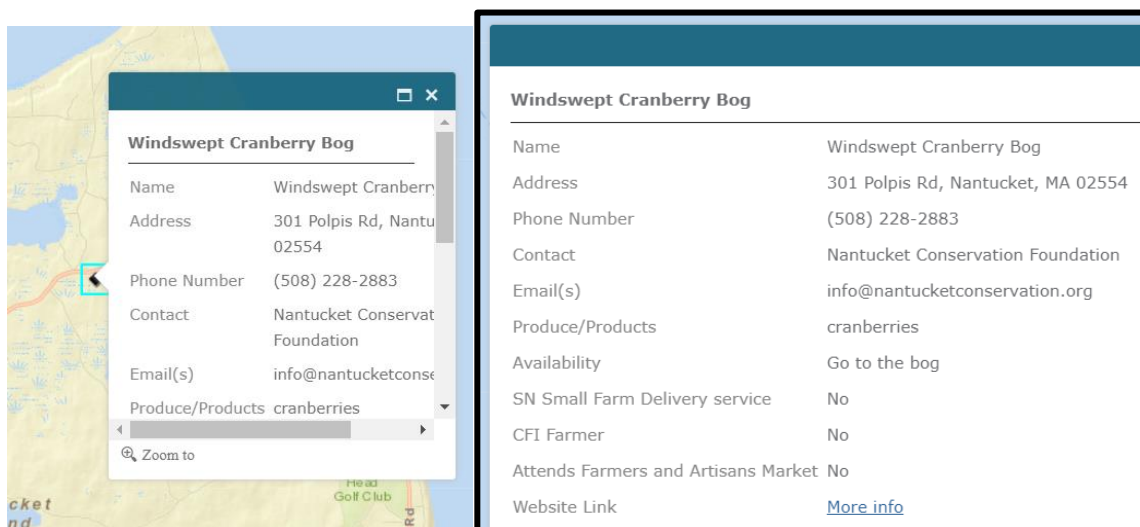


Figure 26: Pop-up Dialogue Box of Producer Information.

To view more material obtained by clicking on a location for the rest of the data layers, see Appendix G.

## NANTUCKET FOOD ASSET MAP

For the format of our map, we chose ArcGIS Online because we determined it to be the best platform for the map. After evaluating both ArcGIS Online and ArcMap we determined that ArcGIS Online was superior because of its:

- ❖ Flexibility and attractive interface
- ❖ Ability to integrate with Town GIS data
- ❖ Inexpensive licensing for the Nantucket High School
- ❖ User friendliness making it easy for high schoolers to continue updating

On the map, the information obtained by clicking on a certain location varies based on the type of location. The update process involves changing our Google Sheets database directly. After updating the information on Google Sheets, that file will need to be converted to a CSV, and then uploaded into ArcGIS Online.

Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket can use the map to promote community discussions about Nantucket's resources. The data included in the map will allow them to analyze Nantucket's food network to find areas for production expansion, along with educating organizations about the assets on the island. Contact information provided to the Nantucket Food Pantry and Food Rescue Nantucket will allow them to form more connections with restaurants and other potential food donors. The map was placed on Sustainable Nantucket's and Nantucket Food Pantry's websites to act as an information hosts, so it can be initially updated in one central location.

### CONCLUSIONS & RECOMMENDATIONS

In this chapter we detail conclusions and recommendations for Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket based on the food asset map and database as well as interviews with stakeholders and restaurant survey. These conclusions and recommendations are intended to aid in the next steps of the Nantucket Food System Assessment, which will further assess the food production, consumption, waste and recovery, food education, food storage, food technology, and food security assets and needs of Nantucket. The food asset map created for this project is the first database that synthesized this information about the Nantucket food system. It provides the community with a resource intended to spark conversation and change to improve the food network on the island.

The following sections present recommendations about production expansion, future developments, improving food-focused programs, communication, and map promotion.

#### Production Expansion

There are open areas for aquaculture and agriculture on the island that can be utilized in the food system cycle. Below are recommendations on repurposing ocean plots and open lands for productive use.

##### ➤ Aquaculture

We encourage the use of the open plots of aquaculture reserved by the Natural Resources Department available for use in Polpis Harbor. Jeff Carlson, Coordinator of the Nantucket Natural Resources Department, explained that this area is ready for use in the future. There are different approaches available for using this land. First, it could be advertised by Sustainable Nantucket and the Natural Resources Department to other growers with leases elsewhere in Nantucket, to inform them of new places they could expand their work. This would allow these areas that are already reserved for aquaculture to be put to good use. On the other hand, these plots could be used for educational purposes. A program could be set up by the Natural Resources Department to educate new growers who are interested in learning about aquaculture and would like to practice it. Similar to Sustainable Nantucket's Community Farm Institute (CFI) where each new farmer has a designated area of farmland, the open plots in Polpis Harbor could be sectioned off for each new grower. Either options for the use of these open plots would help with the expansion of aquaculture in Nantucket, thus increasing the amount of food produced on island.

### ➤ Agriculture

To expand the agricultural land on Nantucket, we recommend further research be done to cover all areas of the island. If experts could explore these options, the land could be turned into farmland, orchards, grazing areas, and more, based on their historical usage. This is a long-term idea, potentially something that Sustainable Nantucket could look into in a few years when they would like to take on a new endeavor.

### Future Developments

A stronger, more developed food network on Nantucket can lead to a more effective system in the community. The Nantucket Food Pantry lacks resources to benefit and reach a wide client-base. Additionally, the food asset community could benefit from having a larger and better defined local Food Hub. In this section, we present recommendations for the Nantucket Food Pantry to partner with a commercial kitchen and for the Sustainable Nantucket's Community Farm Institute to establish a more defined local Food Hub for the Nantucket local food community.

### ➤ Food Pantry

The Nantucket Food Pantry can work with the Nantucket Health Department and interested commercial kitchens in the future to arrange licensing to use vacant local commercial kitchens. Obtaining a commercial kitchen license would greatly expand the Nantucket Food Pantry capabilities by allowing them a space to repackage foods that are donated to them for redistribution to their clients. This would expand their current donation capabilities and they would be able to receive more food from organizations; such as restaurants closing down for the season who may be willing to donate excess food.

In order to gain a better understanding of potential commercial kitchens' availabilities, we recommend a schedule be created of their opened/closed dates. This would allow the Food Pantry to analyze their options, and coordinate with any interested commercial kitchens.

Another component to the food cycle are the consumers that buy food online and have it shipped to their houses. To reach this portion of the public, online food purchasers could be made aware of donating capabilities. Tagged along to a consumer resident survey about how they use their food, residents could be invited when purchasing their online food to make a donation. The donation could then be shipped directly to the Food Pantry, providing an easy way to send food without the residents having to drop it off themselves.

## NANTUCKET FOOD ASSET MAP

### ➤ Local Food Hub

We recommend that Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket work together in establishing a local Food Hub. A Food Hub is a place where distribution, production, and exchange of food can happen. The first step is to get the three organizations together for a discussion. The various entities can then explore what a Food Hub in Nantucket would be like. Sustainable Nantucket had a local Food Hub the past few years which gathered small producers on the island together for restaurants to pick up produce. This provides a starting point to expand upon. A Food Hub would help alleviate food storage issues as well as institute a location for increased face-to-face communication for producers, consumers, and chefs. A place for this local Food Hub could be developed in the next 3-5 years with Sustainable Nantucket's CFI. Representatives from Sustainable Nantucket envision the CFI becoming a larger, more market-focused asset in the food community. Below in Figure 27, is a flow diagram of how Nantucket's food system currently operates. Following that is Figure 28, which adds a local Food Hub to simplify and centralize the system, bringing the community together.

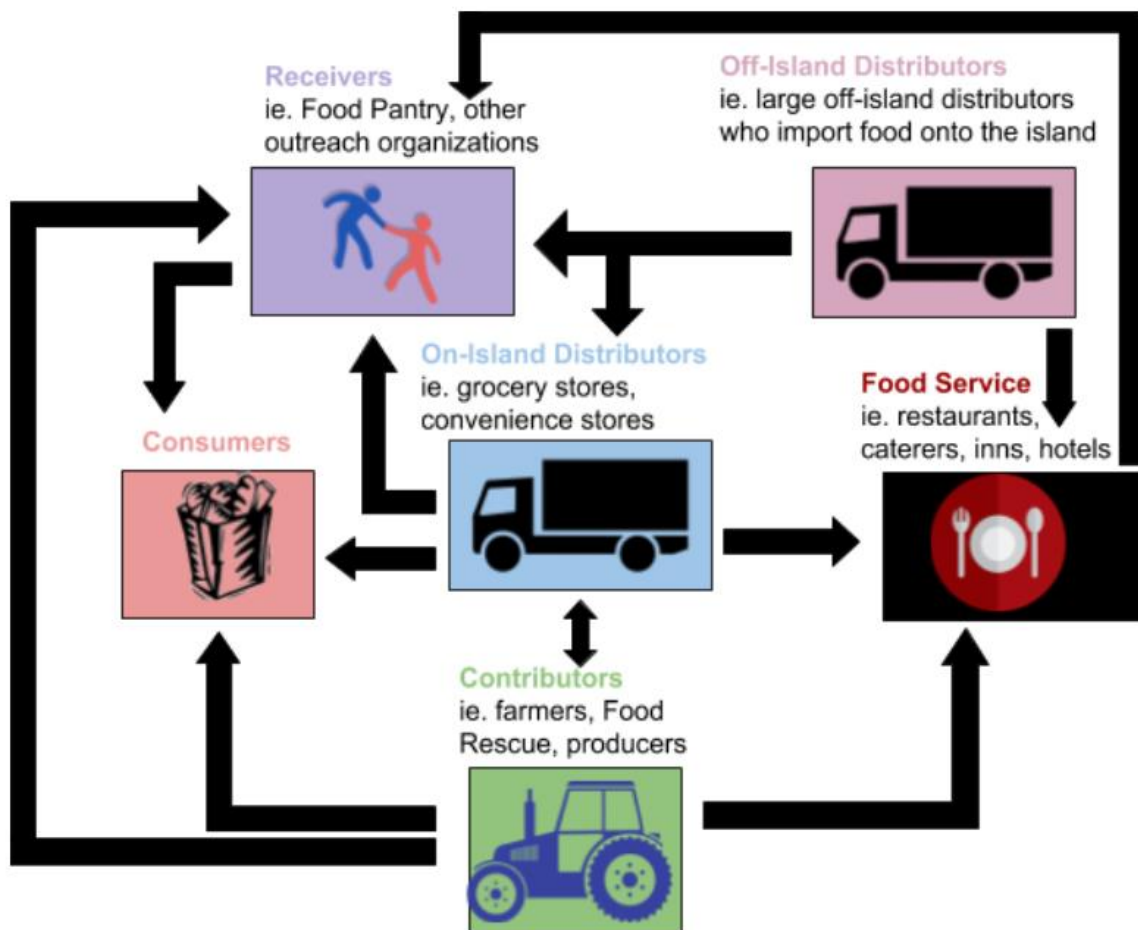


Figure 27: Nantucket's Current Food System Diagram.



## NANTUCKET FOOD ASSET MAP

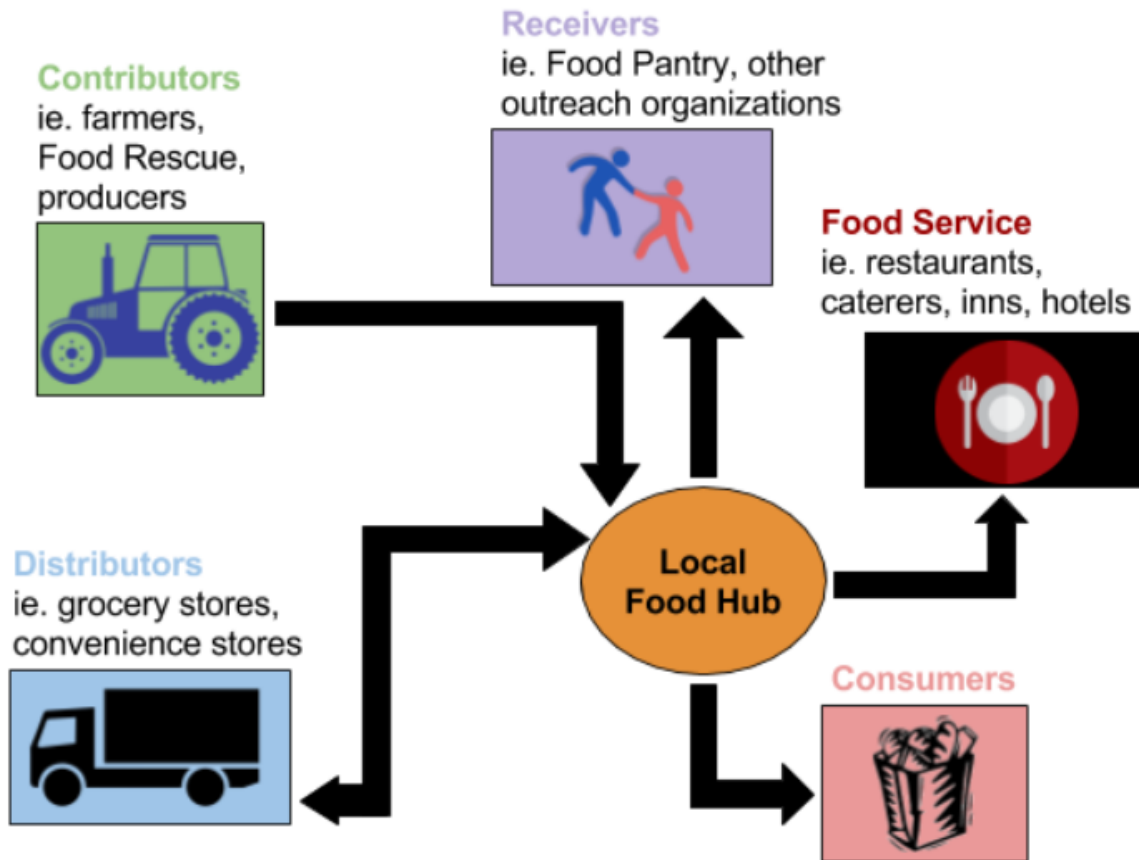


Figure 28: Local Food Hub Flow Diagram.

### Expanding Food-Focused Programs

Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket foster important relationships with the community. Programming is a valuable way to strengthen these relationships. It can educate the community on the organizations and promote future communication.

Using the list of producers from the map and database can allow organizations that aim to collect food in the community to expand their collection programs. The current food collection programs are limited due to lack of knowledge of some food producers on the island. Below are our recommendations related to improving the popularity and effectiveness of a few of these organizations' programs.

#### ➤ Nantucket Food Pantry - *Share Your Harvest*

The Nantucket Food Pantry can better promote the *Share Your Harvest* program to attract new donors and inspire individuals to create additional backyard gardens. It can also work with Food Rescue Nantucket to organize pick-ups and gleaning from residences to the Food Pantry. The *Share Your Harvest* program currently relies on

people to donate excess food and does not include a gleaning initiative. Because gleaning is a particular area of focus for Food Rescue Nantucket it could be beneficial for the two to partner together to increase donations to the food pantry.

### ➤ Food Rescue Nantucket – Gleaning

Food Rescue Nantucket only gleans at two farms, Moors End Farm and Bartlett's Farm, since it is a new organization. Although contact has been made with other farms on island, we would recommend reaching out to them again at the beginning of next season. The map could act as a database of potential new areas to glean. With examples to give of the services provided at the two farms in the prior year, other farms may be more open to the idea of working with Food Rescue Nantucket in future years.

### ➤ Food Rescue Nantucket - Drop-off Boxes

There are currently three drop-off box locations to collect donations of unopened, non-perishable food items in residential areas that often include rental properties. These box locations could be expanded to make it more convenient to more residents (in a closer proximity to them). This would make it easier for residents to contribute, which may increase the amount of donations Food Rescue Nantucket receives for its recipients.

### ➤ Nantucket Food Pantry - Creation of *Food for Fines* Program

In order to better enhance the presence of the Food Pantry on island and increase the amount of food the Food Pantry obtains, we recommend the implementation of a *Food for Fines* program at the Nantucket Atheneum. This program would allow library members to drop off cans of food in exchange for a reduction of any overdue fines. In turn, the Nantucket Atheneum does not have any withstanding fines with members, and the Food Pantry is increasing their food donations they receive. Many libraries including the WPI library already implement programs such as these. They have a positive impact on the community as they increase awareness and involvement in local food pantries.

## Nantucket High School Program

In order to ensure the food asset map is most effective, we recommend Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket continue working with the Nantucket High School to update and add missing information to the food asset map. This will involve working with the Nantucket High School IT department to get the free K-12 ESRI ARC package. Once the software is installed, more map features can also be added and experimented with to improve the user-

friendliness of the program, since the base food asset map was not created with a full ArcGIS Online account. The Nantucket High School students can update the map annually using the Google Sheets database, access to the online mapping tool, and the user manual. Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket can continue working with the Nantucket High School to update the existing data, fill in missing information (i.e. all distributors used by all restaurants on the island), and add any desired improvements to the map.

### Communication

After multiple meetings with Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket, individually with each organization and all together, we concluded that better communication between the organizations and others involved in the food network on island would be especially useful. It became evident from these meetings that the three organizations are not always aware of all aspects of each other's programs due to the lack of platforms connecting them. With an increase in communication, as well as the database from the map acting as a central location for their data, they would all experience more promotion of their organizations and programs. In that way, involvement between the organizations could also increase.

The development and usage of the food asset map can help to bring Sustainable Nantucket, the Nantucket Food Pantry, and Food Rescue Nantucket closer together. It holds pertinent information for each organization, and gives them common ground to build from. Using the map and adjacent data, they may be able to discuss programs, strategies, and collaborations.

To further improve cross-promotion of each organization and increase involvement in each other's programs and events, we also recommend that Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket look into different communication platforms (e.g., the program Slack). The three organizations, while all having individual areas of interest, have many overlapping goals such as reducing food waste and promoting more sustainable practices that can help to improve food security on the island. A platform that could facilitate more communication between organizations would allow them all to stay organized and involved.

### Map Promotion

Additionally, we recommend that Sustainable Nantucket, Nantucket Food Pantry, and Food Rescue Nantucket promote the food asset map and ideas about the food system on the island to better engage the community. We encourage this be done

## NANTUCKET FOOD ASSET MAP

through the use of different forms of media in order to reach a larger audience. A few guidelines to best promote the food asset map, programs, events and other sustainable topics by the three organizations may include:

- ❖ Dedicate a page on the Sustainable Nantucket's website to the food asset map to explain the organizations involved and the map's role in the Comprehensive Food System Assessment.
- ❖ Place the food asset map and information on multiple platforms such as in local newspapers, on Facebook, Instagram, and Twitter, to reach as many people as possible.
- ❖ Post about events on media before they happen, rather than after, in order to improve attendance of these events.
- ❖ Post fun, engaging, and eye-catching photos with some details in the description to be informative and grab the audience's attention.
- ❖ Engage with others on social media. If someone tags your organization in a post like it and potentially comment on it when appropriate. Also, depending on the post and how applicable it is, you could repost the picture as long as you indicate it is a repost.

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## APPENDICES

### Appendix A: Farming on Nantucket

In addition to Bartlett’s Farm, other farms on the island include: Moors End Farm, Far Away Farms, Boatyard Farm, Pumpkin Pond Farm, Cisco Sanctuary, Nantucket Blooms, Nantucket Organics, Berry Patch Farm, and Sustainable Nantucket’s Community Farm Institute Growers (Lazy Man Gardens, ACK Sweetwater Farm, Fields of Ambrosia, and Washashore Farm). The sizes of some of these farms can be seen in Table 3.

Farm	Size (acres)
Bartlett’s Farm	197, 97 in production
Moors End Farm	18, 13 in production
Pumpkin Pond Farm	10, 1.25 in production
Sustainable Nantucket’s Community Farm Institute Growers	8.5, 1.375 in production
Boatyard Farm	1.25
Berry Patch Farm	0.3

Table 3: Nantucket Farms by Size.

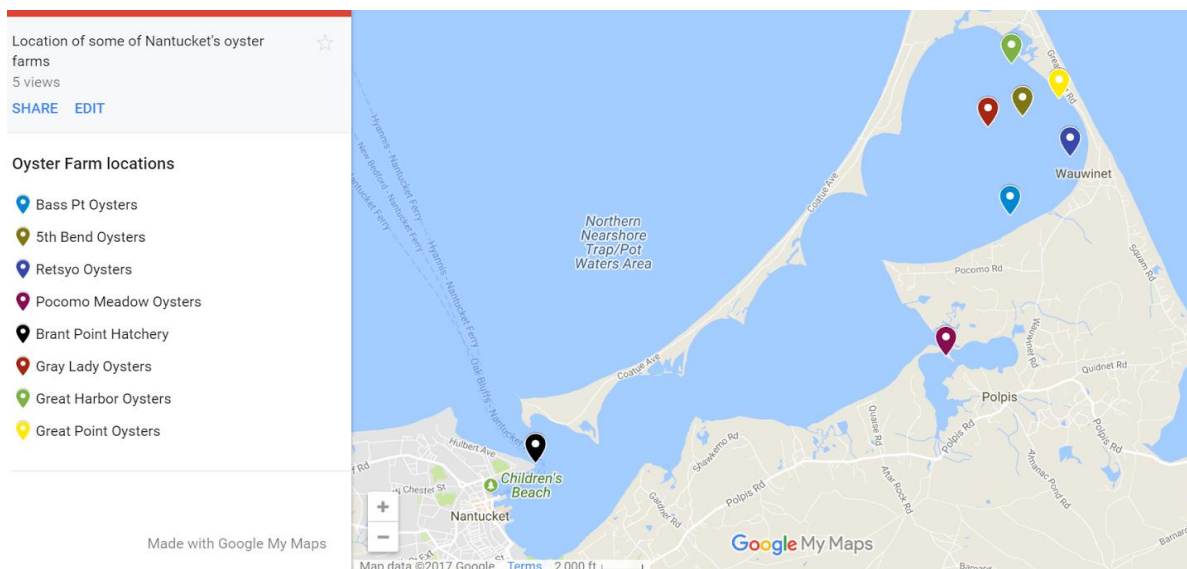
There are also other small-scale, specialist growers on the island. Sustainable Nantucket started an initiative in 2011 with the Pilot Grazing Project. They partnered with the Nantucket Islands Land Bank and Faraway Farms to use low-impact rotational grazing, and aim to “eventually create a network of grazed and cultivated land all over the island” (Sustainable Nantucket, 2011).

### Appendix B: Cranberry Bogs on Nantucket

Cranberries have been an important asset on Nantucket since the days of the natives and early settlers, and the Nantucket Cranberry Company was founded in 1916 (Jenness, 2015). With the expansion of the whaling industry, cranberries became a vital resource. By 1683 settlers were making juice from cranberries, by 1820 they were making shipments to Europe, and by 1850 they were being used by whalers to prevent scurvy at sea (Our BERRIES, 2003-2016). As the whaling industry collapsed cranberry farming became one of Nantucket's surviving industries. After a downturn in the cranberry market in 1999, the early 2000s saw a resurgence of the cranberry production on the island.

## Appendix C: Aquaculture on Nantucket

Oyster farmers use long rack systems with rebar frames to support plastic bags, which hold millions of oysters in different developmental stages (Burch, 1994). There are 8 oyster farms in Nantucket, with seven still being the most active. These include: 5th Bend Oysters, Bass Point Oysters, Great Harbor Oysters, Great Point Oysters, Grey Lady Oysters, Pocomo Meadow Oysters, and Retsyo Oysters. While it is a productive food resource, oysters are also beneficial for the environment. Locations for some of the oyster farms and the Brant Point Hatchery are pictured below in Figure 29. Oysters filter about 15 gallons of water per day, so these aquaculture areas provide “ecosystem services that aid in moderating impacts such as nutrient eutrophication in our coastal waters” (Nantucket Shellfish Management Plan Committee, 2012).



**Figure 29: Locations of Oyster Farms and Brant Point Hatchery.**

### Appendix D: Interview Preamble

We are a group of students from Worcester Polytechnic Institute (WPI), working with Sustainable Nantucket, the Nantucket Food Pantry, and Food Rescue Nantucket. Our goal is to learn about food asset mapping and analysis, which will assist us in efforts to evaluate the food systems cycle in Nantucket. This conversation should only take about half an hour. Can we quote you in our final report, or would you prefer your comments to remain anonymous? We will give you an opportunity to review any quotations that we will use prior to final publication. If you have any concerns about the research, contact us at [ack17sn@wpi.edu](mailto:ack17sn@wpi.edu). You may also contact our WPI project advisors, Professors Dominic Golding ([golding@wpi.edu](mailto:golding@wpi.edu)) and Richard Vaz ([vaz@wpi.edu](mailto:vaz@wpi.edu)).



## Appendix E: Surveys

We are a group of students from Worcester Polytechnic Institute (WPI) working with Sustainable Nantucket, the Nantucket Food Pantry, and Food Rescue Nantucket to create a food asset map of Nantucket. This map will serve as a resource to understand and create connections between producers, distributors, and purveyors of food on the island.

The purpose of this survey is to add more information to the map and associated databases regarding Nantucket restaurants. The information you provide will be shared with Sustainable Nantucket, the Nantucket Food Pantry, and Food Rescue Nantucket. We will give you the opportunity to review the map and databases before they are published online so you can determine what if any information you may wish to remain confidential.

If you have any questions about this research project, you may contact us at [ack17sn@wpi.edu](mailto:ack17sn@wpi.edu). Thank you for your participation.

### Restaurant Survey Questions:

- What is the name of your restaurant?
  - Fill in the Blank
- When is your restaurant open?
  - Year round
  - Seasonally, open during which months and include other additional times (examples: Thanksgiving, Stroll, etc.): fill in blank
- Seasonal: Would you be willing to have your kitchen or freezer/refrigerator be used after you are closed for the season? This would be used by the Nantucket Food Pantry.
  - Yes
  - No
  - Maybe, under these circumstances: (fill in blank)
- Do you source any of your food from on-island producers?
  - Yes
  - No
- If yes: from which of these local producers do you regularly source foodstuffs (Click all that apply)
 

<ul style="list-style-type: none"> <li>◦ Ace Sushi</li> <li>◦ ACK Sweet Water Farm</li> <li>◦ Ambrosia Chocolates &amp; Spices</li> <li>◦ Bartlett's Farm</li> <li>◦ Bass Point Oysters</li> </ul>	<ul style="list-style-type: none"> <li>◦ Bee Happy Honey Co.</li> <li>◦ Berry Patch Farm</li> <li>◦ Boatyard Farm</li> <li>◦ Captain Bill Blount and the Ruthie B. Community Supported Fishery</li> </ul>
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## NANTUCKET FOOD ASSET MAP

- Cisco Brewery
  - Fields of Ambrosia
  - The Flower Farm
  - Gliddens Island Seafood
  - Grey Lady Oysters
  - Island Bee Girls
  - Island Lumber
  - Lazy Man Gardens
  - Moors End Farm
  - Nantucket Bake Shop
  - Nantucket Bottled Water
  - Nantucket Coffee Roasters
  - Nantucket Fresh Catch
  - Nantucket Jams
  - Nantucket Organic
- Nantucket Seafoods
  - Nantucket Toffee
  - Nantucket Wildflower Farm
  - Nantucket Blooms
  - Pocomo Meadow Oysters
  - Retsyo Oysters
  - Salty Balls Seafood
  - Sayles Seafood
  - Something Natural
  - Sunny's Honey
  - Washashore Farm
  - Wicked Island Bakery
  - 5th Bend Oysters
  - Other (fill in blank)
- If yes: Which of the following items do you get on-island (check all that apply)?
  - Vegetables
  - Shellfish
  - Fish
  - Fruit
  - Dairy
  - Beverages
  - Meat

Which of the following major off-island food sources do you use regularly?

- D'Artagnan Foods
  - Dole & Bailey
  - Sysco
  - Seacrest Foods
  - Shapiro Produce
  - Sid Wainer & Son
  - Sun Island Delivery
  - US Foods
  - Other (fill in blank)
- Would you be willing to donate excess food to the Nantucket Food Pantry? Volunteers from Food Rescue Nantucket could come and pick up the food from your restaurant.
  - Very unwilling
  - Unwilling
  - Neutral
  - Willing
  - Very willing

## NANTUCKET FOOD ASSET MAP

- I already donate some of my excess food to the Nantucket Food Pantry.
- Do you sell takeout foods at your restaurant?
  - Yes
  - No
- If yes, is the food prepackaged with ingredients labeled? The Nantucket Food Pantry can only use excess takeout food if it is individually wrapped and labeled.
  - Yes
  - No
- Does your restaurant offer catering services?
  - Yes
  - No
  - Comments (fill in blank)
- Does your restaurant participate in any composting programs?
  - Yes
  - No
  - Not currently, but interested.
  - Comments (fill in blank)

### Inn Survey Questions

- What is the name of your inn?
  - Fill in the Blank
- When is your inn open?
  - Year round
  - Seasonally, open during which months and include other additional times (examples: Thanksgiving, Stroll, etc): fill in blank
- Seasonal: Would you be willing to have your kitchen or freezer/refrigerator be used after you are closed for the season? This would be used by the Nantucket Food Pantry.
  - Yes
  - No
  - Maybe, under these circumstances: (fill in blank)
- Do you source any of your food from on-island producers?
  - Yes
  - No
- If yes: from which of these local producers do you regularly source foodstuffs (Click all that apply)
  - Ace Sushi
  - ACK Sweet Water Farm
  - Ambrosia Chocolates & Spices
  - Bartlett's Farm

## NANTUCKET FOOD ASSET MAP

- Bass Point Oysters
  - Bee Happy Honey Co.
  - Berry Patch Farm
  - Boatyard Farm
  - Captain Bill Blount and the Ruthie B. Community Supported Fishery
  - Cisco Brewery
  - Fields of Ambrosia
  - The Flower Farm
  - Gliddens Island Seafood
  - Grey Lady Oysters
  - Island Bee Girls
  - Island Lumber
  - Lazy Man Gardens
  - Moors End Farm
  - Nantucket Bake Shop
  - Nantucket Bottled Water
  - Nantucket Coffee Roasters
  - Nantucket Fresh Catch
  - Nantucket Jams
  - Nantucket Organic
  - Nantucket Seafoods
  - Nantucket Toffee
  - Nantucket Wildflower Farm
  - Nantucket Blooms
  - Pocomo Meadow Oysters
  - Retsyo Oysters
  - Salty Balls Seafood
  - Sayles Seafood
  - Something Natural
  - Sunny's Honey
  - Washashore Farm
  - Wicked Island Bakery
  - 5th Bend Oysters
  - Other (fill in blank)
- If yes: Which of the following items do you get on-island (check all that apply)?
    - Vegetables
    - Shellfish
    - Fish
    - Fruit
    - Dairy
    - Beverages
    - Meat
  - Which of the following major off-island food sources do you use regularly?
    - D'Artagnan Foods
    - Dole & Bailey
    - Sysco
    - Seacrest Foods
    - Shapiro Produce
    - Sid Wainer & Son
    - Sun Island Delivery
    - US Foods

- Other (fill in blank)
- Would you be willing to donate excess food to the Nantucket Food Pantry? Volunteers from Food Rescue Nantucket could come and pick up the food from your inn.
  - Very unwilling
  - Unwilling
  - Neutral
  - Willing
  - Very willing
  - I already donate some of my excess food to the Nantucket Food Pantry.
- Does your inn offer catering services?
  - Yes
  - No
  - Comments (fill in blank)
- Does your inn participate in any composting programs?
  - Yes
  - No
  - Not currently, but interested.
  - Comments (fill in blank)

## Appendix F: User Manual

### 1. Overview

Sustainable agriculture works to meet the food needs of today without compromising the food security of tomorrow. Communities are now promoting more locally sourced food through farmers markets, supplying fresh produce to food pantries and local schools, as well as a growing resurgence of practices such as gleanings that reduce food waste.

Sustainable Nantucket, the Nantucket Food Pantry and Food Rescue Nantucket are three organizations promoting sustainable food activities on the island. Sustainable Nantucket promotes sustainable agriculture to protect the environment while increasing the island's self-reliance. The Nantucket Food Pantry provides vital support to many families and individuals struggling to make ends meet, and Food Rescue Nantucket works to stop food from ending up in landfills. As a developed island community, Nantucket's opportunity to grow agricultural resources is limited. Even so, this local food system is not being used to its full potential.

To construct a more sustainable community, food asset mapping is a useful visualization technique. This method marks out local areas that contribute to the community food cycle and helps gain an understanding of what resources a community has. The existing food network on Nantucket can be analyzed and enhanced. The creation of a food asset map is part of the larger endeavor of a comprehensive food assessment. This can help to highlight spaces not being used to their full potential or areas that show possibilities for future agricultural expansion; being beneficial for local sustainably focused organizations.

Taking ownership of this map will allow the map to be maintained and updated. This is imperative in order to continue the collaboration between the sustainable organizations on Nantucket and to enhance the local food system.

#### 1.1 Platform Overview

ArcGIS Online is an online GIS system that allows one to create, share, and analyze geographical data. ArcGIS Online supports features such as: the ability to create an online map, import data layers onto it, and make the map accessible to the community. The publishing features are versatile, including the option of creating a web application from the map.

#### 1.2 Important Terminology

GIS	Geographic Information Systems
Food Asset	Location where a community grows, prepares, shares, buys, receives, or learns about food
Point Data	Depicts discrete locations (longitude, latitude)
Parcel Data	Depicts a collection of pieces of land
Data Layer	Set of related locations



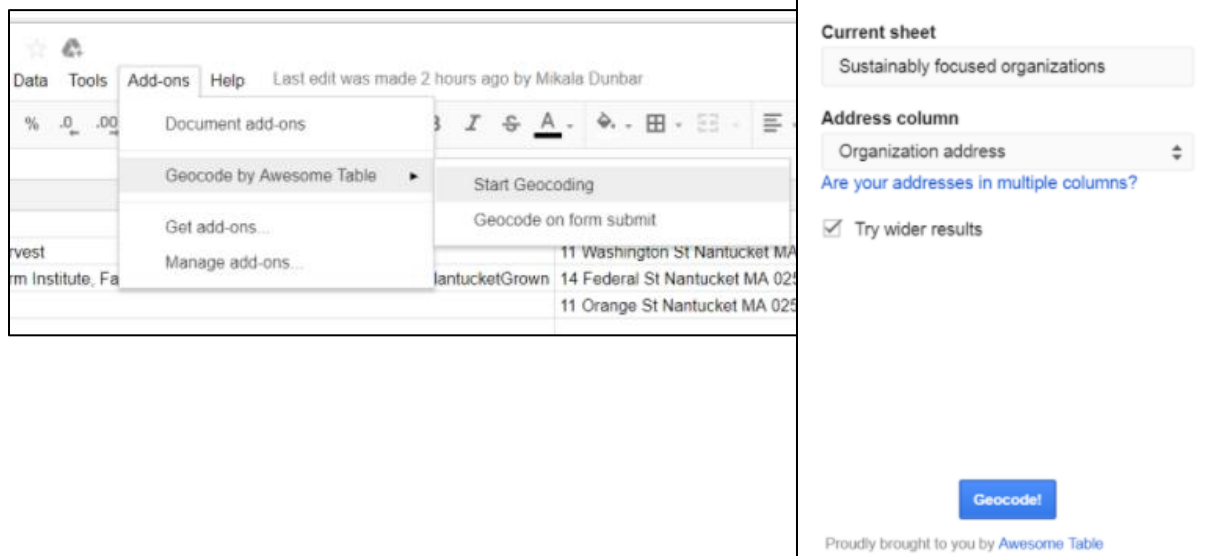
### 1.3 Items to Update on the Food Asset Map

- Google Sheets
- Parcel Data
- ArcGIS Online Certification

## 2. Updating Google Sheets Data

1. Access the Google Sheets spreadsheet titled “Food Asset Map Database” on Google Drive.
2. The Food Asset Map Database is organized in different sheets, based on data layer of the map. Each data layer contains different assets. Within each sheet, you can update by adding new assets and deleting those that are no longer active.
3. Click “Add-ons” on the top help bar.
4. Under “Add-ons” click “Geocode by Awesome Table” => “Start Geocoding”.

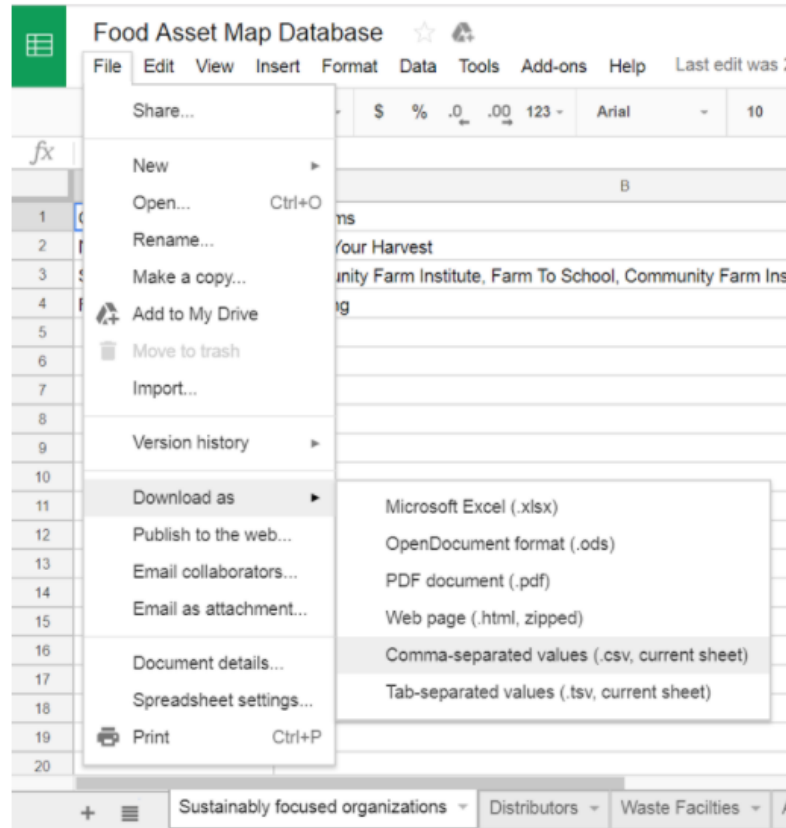
When the pop up appears on the right, ensure that Address column is the column with the addresses, then hit Geocode. This runs the add-on to convert new addresses to latitude and longitude. See images below for further detail.



### 2.1 Preparing Google Sheets to upload to ArcGIS Online

1. Download each sheet directly from Google Sheets as a CSV file by clicking “File” then “Download as” and “Comma-separated value (.csv, current sheet).”

The step is illustrated in the image below.



2. Follow directions below at Section 4 Updating ArcGIS Online

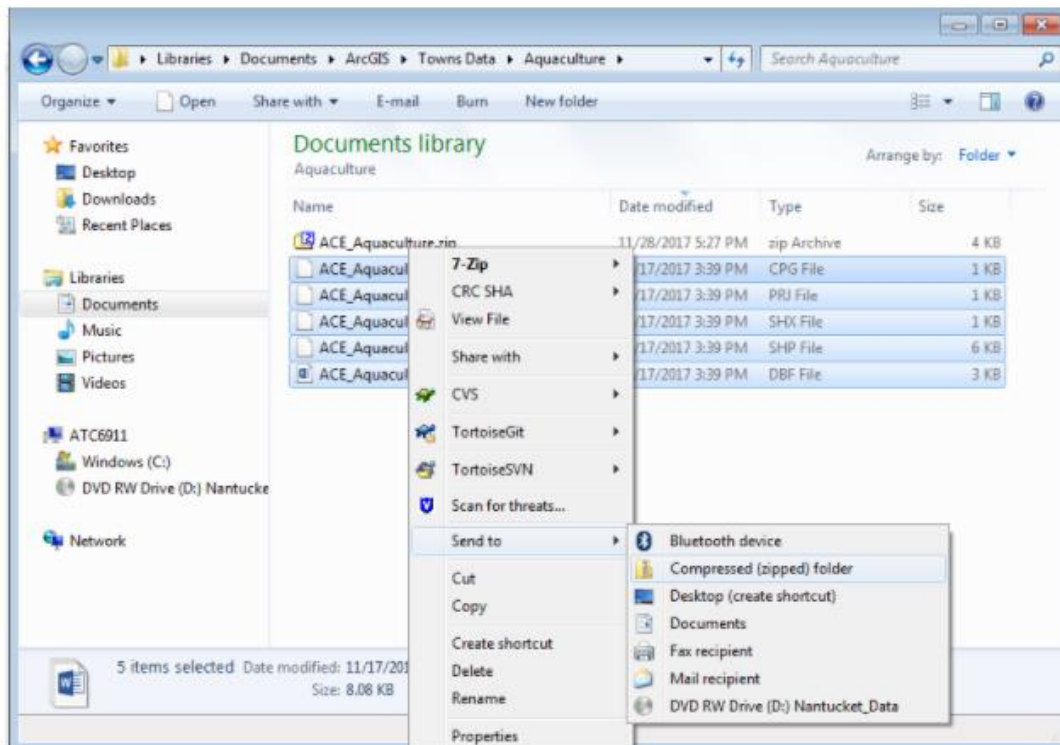
### 3. Preparing the Parcel Data to Upload to ArcGIS Online

Some files of parcel data can be accessed through the Nantucket Town gIS and then uploaded to the online food asset map.

#### 3.1 How to upload parcel data to ArcGIS Online

1. Contact the current Nantucket Town GIS coordinator to get the most updated versions of files such as Aquaculture or land usage.
2. After acquiring the data, highlight the files needed, right click and click “Send to” then “Compressed (zipped) folder.”

It is important to note: there are limitations to how much data can upload at once. Shape files or CSV files can only upload 1000 features or 250 addresses at a time.



3. Once the data is converted to a zip file, it can be uploaded to ArcGIS Online following the instructions below in Section 4 Updating ArcGIS Online.

#### 4. Updating ArcGIS Online

1. Navigate to the ArcGIS Online sign in through your web browser and enter the proper credentials.

2. To access the already existing map, go to Content and “Nantucket Food Asset Map”
3. Click “Open the map with map viewer”

#### 4.1 Add a layer

1. Click “+Add”
2. Click “Add Layer from File”
3. Choose the CSV file that was downloaded from Google Sheets, or the zip file created from the parcel data.

#### 4.2 Delete a layer

1. Find the data layer you wish to delete in the Details tab, under Contents. This is a list of the data layers.
2. Click on the data layer, then on the three dots for more options.
3. In More Options, select “Remove”

#### 4.3 Save your work

1. Click “Save” at the top of the window.  
This saves your changes on the account and updates the link to the map.

### 5. Special Cases

#### 5.1 Oyster Farms

- Most oyster farms are depicted in relative areas of the harbor. They do not have exact locations to enter in the database. **Using Google Maps, approximate latitudes and longitudes were found and inputted into the Oyster Farms Google Sheets tab.**
- On Google Sheets, there is both a tab for Oyster Farms and Producers. The Oyster Farms are included in the Producers tab. The Oyster Farms tab is used as a working space, not to be uploaded, while the Producers tab does get uploaded to the map.
- To upload the Oyster Farms in their correct locations on the Producers data layer, follow these steps starting in the Producers data tab:
  - a) Geocode the data (described starting in Section 2, step 3). This adds latitudes and longitudes for all data points here, putting in random latitudes and longitudes for the oyster farms.
  - b) Go to the Oyster Farms tab, and manually copy these latitudes and longitudes to the Producers tab in the corresponding rows.
  - c) This data layer can now be downloaded as a CSV file (Section 2.1) and uploaded to the map (Section 4).

#### 5.2 Private Producers

- Information in this data layer is not publicly available. Therefore, it must be kept private. This also means that we do not have specific addresses for

these locations, if anything we were given areas of Nantucket or just a road name.

- To upload more points on this layer, you must manually input each point by following these steps:
  - a) Click “+Add”
  - b) Click “Add Map Notes”
  - c) Click “Create” and then select the shape of the point you wish
  - d) Click on the point when it appears on map, and input all necessary data
  - e) Click on the point on the map and drag it to move its location
  - f) Click “Close” when satisfied with the point’s location
  - g) Click “Save” at the top of the window

## 6. ArcGIS Online Certification

To learn about and obtain this free subscription, follow these steps:

1. Visit [esri.com](http://esri.com)
2. Click the “Industries” tab at the top of the page.
3. Click “Education”
4. Go to the “Schools” tab
5. Click “Schools Software Bundle”
6. Fill out the form on the page to request a Free ArcGIS for Schools Bundle.

## Appendix G: Information given within each layer

- **\*Producers:** name, address, latitude, longitude, phone number, contact name, email address, website link, produce, availability, and more sponsor tailored information like: whether or not they are involved with SN Small Farm Delivery service, Community Farm Institute, or if they attend SN's Farmers and Artisans Market
- **Farms:** name, address, latitude, longitude, phone number, contact name, email address, website link, produce, availability, and more sponsor tailored information like: whether or not they are involved with SN Small Farm Delivery service, Community Farm Institute, or if they attend SN's Farmers and Artisans Market
- **Areas of aquaculture:** Owner, size (acres), address, latitude, longitude
- **Distributors:** Name of business, address, latitude, longitude, phone number, email, website, distribution or grocery.
- **Storage:** Organization, address, latitude, longitude, freezer (y/n), refrigeration (y/n), description.
- **\*Restaurants:** Restaurant name, address, latitude, longitude, service style, phone number or email, NantucketGrown™ certification level, Takeout (Y/N), individual packaged takeout (Y/N), active season, website.
- **Lodging:** Inn/Hotel name, address, latitude, longitude, service style, phone number, season, website.
- **Caterers:** Caterer name, address, latitude, longitude, phone number, website, email.
- **Commercial kitchens:** Organization, address, latitude, longitude, phone number, website, email.
- **\*\*Food Rescue recipients:** Organization, address, latitude, longitude, phone number, website link.
- **Waste Facilities:** Name, address, latitude, longitude, type, phone, email.
- **Food-focused organizations:** Organization name, programs, organization address, latitude, longitude, organization description, phone number, email contact.

\* Some information is private (not on our public map)

\*\* Entire data layer is private



## Appendix H: Link to the Food Asset Map

<https://arcg.is/18CyWy>

## Appendix I: Summative Team Assessment

Our team worked effectively and respectfully together. We created an agenda for every day, meeting, and interview. These agendas were filled with minutes, important deadlines, and plans. We also tracked work contributed throughout the day by each individual in order to ensure equal workloads. We set deadlines for ourselves before mandatory deadlines throughout the seven weeks, allowing for us to accomplish all goals and tasks timely. Open communication allowed for discussion of feelings and other concerns throughout our time. We delegated work equally to members based on everyone's strengths. We also allowed for individuals to work on weaknesses to better improve teamwork and individuals' skillsets.

We have communicated effectively amongst ourselves, advisors, and sponsors. After each meeting, minutes and notes were emailed out to everyone who participated to ensure we were all on the same page. A unique challenge to our project was having three sponsor organizations. This became challenging at times to balance everyone's interests and needs relative to our work. We were able to ensure that all three organizations were continuously content with our work through constant check-ins with them and frequent updates. We also met with them individually and in groups. We kept our advisors up-to-date with any developments or challenges within the project or with our sponsors. For example, cover letters were sent to advisors to update them of relevant topics and project changes when sending them reports. In addition, when we had a change in representatives from one of our sponsor organizations due to an absence, we notified advisors and kept them updated for when the sponsor was able to return.

In future projects, we will remember the challenges and successes that we had. An area that we will look to improve upon in the future is communication within the team to solve conflict as it arises. For example, if someone does not agree with another's opinion they should discuss it in the moment to avoid building unnecessary tensions. We will take into account strategies that worked well too, i.e. vigorous note-taking, organization of files, and open lines of communication with important project stakeholders.

Overall this project was a beneficial experience for learning and building teamwork and technical skills.