SITE ASSESSMENT AND LANDSCAPE PLANNING STRATEGY FOR THE STUDENT GARDEN AT THE COLLEGE OF CHARLESTON, CHARLESTON, SOUTH CAROLINA

A thesis submitted in partial fulfillment of the requirements for the degrees

MASTER OF SCIENCE

in

ENVIRONMENTAL STUDIES

and

MASTER OF PUBLIC ADMINISTRATION

by

CARL TAYLOR
AUGUST 2016

at

THE GRADUATE SCHOOL OF THE UNIVERSITY OF CHARLESTON, SOUTH CAROLINA AT THE COLLEGE OF CHARLESTON

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ABSTRACT

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This thesis project created a landscape design framework for the Student Garden at the College of Charleston that took into account stakeholder needs and landscape constraints, thereby allowing the Garden to better fulfill its mission. Steps for this project were to perform a stakeholder analysis to determine perceptions of mission, vision, and needs for the Garden. This was then paired with a landscape suitability assessment. The assessment was performed in GIS using available soil data from the Soil Survey Geographic Database (SSURGO) to analyze for agricultural suitability.

Based on interview data, stakeholders considered the main mission of the Garden to lie in three areas: education, student research projects, and vegetable production. Landscape suitability analysis determined that the Garden was situated in the least favorable location within its available land area from an ecosystem standpoint. The landscape design incorporated the stakeholder needs of education, research, and production while proposing an expansion in a new, more centralized location that has soil better suited for agriculture along with new infrastructure. It incorporated a centralized building with office, rest area, and shaded work area that has facilities approved for vegetable processing for the CSA. Adjoining the building are beds showcasing sustainable agricultural techniques, greenhouses for seed starting and production, area for a food forest, and open fields for row crops.

ACKNOWLEDGEMENTS

This project would not have happened without the support of many people. First, I would like to thank my thesis committee for all the work and guidance they have provided; Jim Ward, thank you for drawing the concept maps; they really tie everything together. To those interviewed for this project, thank you; the insight you gave me was wonderful. I am grateful to Church Creek Nursery for allowing me to visit, take photos and learn how they organize things. Lastly, thanks to everyone else who has provided support throughout this project.

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INTRODUCTION

The Student Garden at the College of Charleston's Dixie Plantation is a ~2-acre organic, student-facilitated garden used for education, research, and food production (Figure 1). It was established in 2010 with a grant from the Golden Pearl Foundation under the direction of Dr. Tracy Burkett at the College of Charleston. The Garden is housed administratively under the Environmental Studies Graduate Program, which is under both the School of Science and Mathematics and the School of Humanities and Social Sciences (Figure 2), along with the administrative relationship to the College of Charleston and outside organizations. Dixie Planation, the tract of land where the Garden is located, was donated to the College of Charleston Foundation in 1995 by John. H. Dick, who had managed Dixie for waterfowl.

The Garden's vision is "…to educate the College of Charleston community about food systems, their relationship to the environment and the people who depend on them. The Garden will serve as a site for active learning through college and K-12 classes, research, volunteerism, and outreach events" (Student Garden 2015). The garden fulfills this vision through the following:

> *"Workshops and the Farm and Garden Club are two outlets for students to get their hands dirty at the Garden, and both venues provide students the opportunity to learn about everything from marketing strategies to the latest in sustainable agricultural techniques. In addition to the market garden, the Student Garden provides dedicated research space for students to hone their skills in project management and field research. By providing a stake in the life and health of the Garden, rather than mere access, the Garden allows students to grow both mentally and physically, all*

> *while working to get good food to their fellow classmates" (Student Garden 2015).*

The Garden has been using and teaching a variety of organic methods to fulfill these goals and vision through workshops, volunteer groups, and dedicated research space.

The purpose of this project is to create an integrated design for the Student Garden that maximizes stakeholder needs within the physiographic constraints of the site. The rationale behind this project lies in a few areas: increased student interest for learning about local food systems, lack of access and knowledge in growing foods, fragility of the current food system, and better use the Garden to meet the needs of stakeholders. The framework of the project is to pair what stakeholders expect of the Garden with what the landscape can support to create a balanced landscape design plan. This thesis builds off prior work completed for the Master of Public Administration (MPA) Capstone project, which examined the administrative context of Dixie Plantation and the Student Garden. Administrators with oversight of Dixie and the Garden were interviewed to determine how they viewed the mission of the two within the broader context of the College of Charleston in order to determine methods to increase integration (Taylor 2015b, Appendix F: MPA Capstone Project).

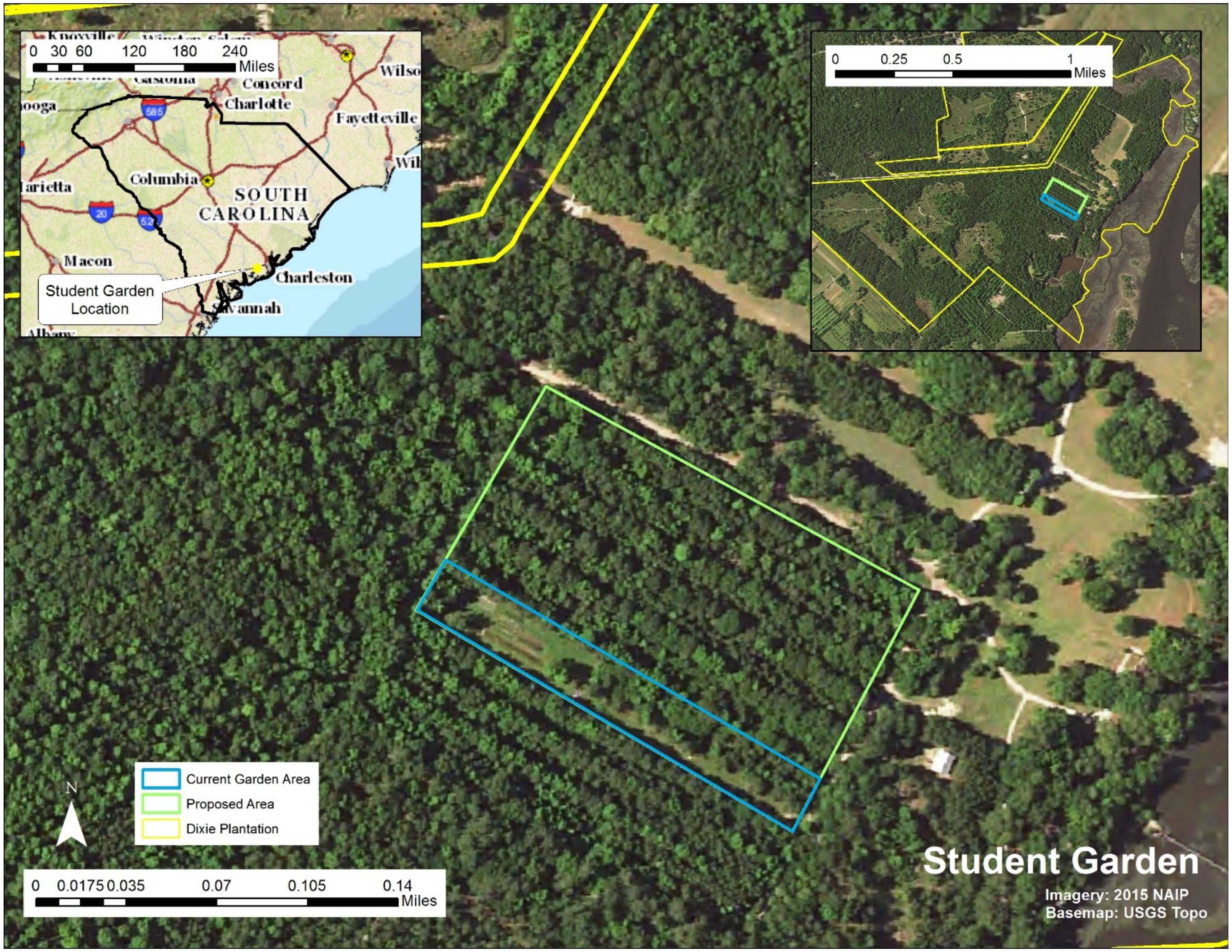


Figure 1. Aerial image of Student Garden.

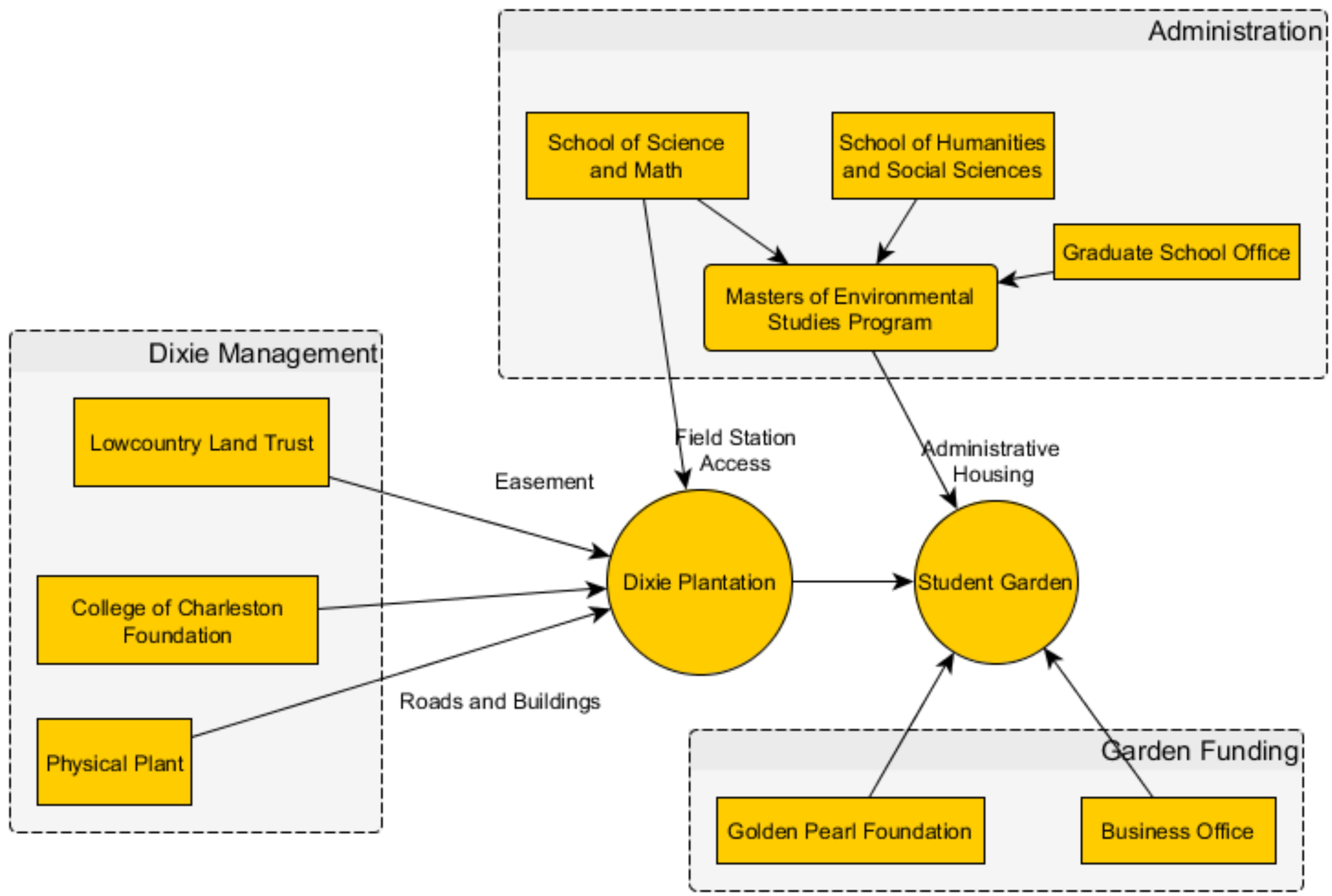


Figure 2. Organizational Map for Dixie Plantation and the Student Garden.

BACKGROUND

MODERN, CONVENTIONAL AGRICULTURE

Mainstream agricultural practices provide a copious amount of food cheaply with minimal labor by externalizing many of the costs and impacts (Gliessman 2014). For example, the Green Revolution modernized agricultural practices in the developing world by shifting practices towards the use of fertilizers, pesticides, and high yield hybrids. This was vital since millions of people were starving. The “Father of the Green Revolution,” Norman Borlaug, won the Nobel Peace Prize in 1970 for saving hundreds of millions of lives (Kilman and Thurow 2009).

Borlaug's accomplishment was indeed laudable; however, its gains came at significant, externalized, ecological costs (Gliessman 2014). These costs may include desertification, salinization, water overuse, erosion of topsoil, and runoff of pesticides, herbicides and fertilizers. This has earned farming the dubious distinction as “... the single largest threat to biodiversity and ecosystem functions of any single human activity on the planet" (Clay 2004, vi). Ultimately, farming practices have implications beyond the fence line. The remainder of this section explores the sustainability implications of conventional agriculture in regards to water usage, soil management, fertilizer runoff, genetic diversity, energy usage, and labor sources.

Water

Modern agricultural practices are highly dependent on irrigated water, and account for 70% of fresh water usage worldwide (Gliessman 2014). Having clean, high quality aquifers is vital for healthy food; however, aquifers are under stress from numerous sources. Stormwater runoff from cities, soil and fertilizer runoffs from farms, acid mine drainage, runoff from construction sites, and leaching from landfills are among a few of the threats.

More than half of water used in agriculture evaporates or drains away instead of being absorbed by crops (Van Tuijl 1993). This presents extensive implications for livability in the form of three trends. The first two trends impact the bread basket regions of the United States: excessive withdrawals for irrigation water supply and competition for water rights. The third trend has been affecting populated coastal areas: salt water intrusion.

Many of our Midwestern farms are irrigated from the High Plains aquifer system (USGS 2013), a large-scale set of unconfined aquifers where withdrawals have been outpacing natural recharge for decades (Scanlon *et al.* 2012). The aquifer spans eight states, from Texas to South Dakota, and is what enabled agriculture since the region has little rainfall (Opie 2000). If no water conservation measures are taken, agricultural productivity is projected to peak around 2040 (Steward *et al.* 2013; Scanlon *et al.* 2012).

The second trend is increasing competition for water rights and usage around the world and within the US, especially in the Midwestern and Western regions. In Colorado, 85% of water goes towards agriculture. Now, farms are being forced to become more efficient or outright compete with expanding cities to ensure their continued access to water (Brown 2009; Finley 2015). Similar stories play out in California as well (Brown 2009; Lamb 2009) and the 2014 drought is likely to increase this competition between agriculture and cities for water.

Both the Midwest and West are significant food production centers of the US, so these trends in water shortages do not bode well for those dependent on these areas, which may lead to a shift towards local sourcing of food. The Lowcountry does not face similar widespread impending water shortages; however, coastal regions are facing another threat to water security.

Coastal aquifers are very sensitive to inappropriate water management that could lead to salt water intrusion into fresh water drinking sources (Cheng *et al.* 2000). Salt water incursion wedges develop when the fresh water aquifer is pumped beyond its replenishment rate, which allows saline ground water moves in to fill the void. This has already happened in the Charleston, South Carolina region, when declining water levels and production in the 1920s necessitated the switch to surface water sources to provide adequate water to the city's population (Campbell 2008).

Soil

Topsoil has the highest concentration of organic matter and microorganisms of all earth materials and is where most of the earth's biological activity occurs (Clay 2004; Gliessman 2014). Within it, humus holds water and mineral nutrients and provide habitat for microbes, on which plants rely (Nardi 2007). Due to this, it is where rooting occurs for most plants in order for them to extract nutrients.

Soil is naturally generated at a rate of about one inch per 500 to 1000 years (Nardi 2007). Many conventional agricultural practices cause erosion at a rate of 10 to 44 times the generation rate (Gomiero *et. al.* 2008). This unsustainable soil management practice is estimated to cost $44 billion in losses of public and environmental health (Pimentel *et al.* 1995).

Contributing to erosion is intensive tillage from short crop rotations. This leads to soil compaction, which reduces the pore space of the soil. Ideal soils are composed of about 50% soil mineral and organic matter and 50% void space filled with a combination of water and air (Gliessman 2014; DuPont 2012). Soil compaction drives out the air and water, reducing the ability of plants to grow. This leaves the soil bare and prone to transportation by wind, which leads to a phenomenon known as desertification (Gliessman 2014).

Deserts in much of the world are expanding due to excess grazing, plowing, and deforestation (Brown 2009; Gliessman 2014). This results in the abandonment of villages and the shrinkage of productive regions. The American Dust Bowl of the 1930s is one example of desertification, which displaced 3 million people along with causing great environmental impact

(Brown 2009; Opie 2000). Practices leading to soil erosion and desertification also allow for the leaching of nutrients like nitrate and phosphorous in the form of runoff in the near term which reduces the land's fertility.

Runoff

Expanding populations have triggered a corresponding expansion and intensification of agriculture, which has in turn led to increased runoff from livestock and application of fertilizer. Both types of runoff contain high levels of nutrients such as nitrate and phosphate, which are top ranked threats to water quality (Arnold and Gibbons 1996). The threat is due to eutrophication that occurs when phytoplankton "bloom," or rapidly populate in an aquatic system due to the influx of nutrients. Aerobic bacteria consume the dead phytoplankton and metabolize the oxygen in the water thereby depleting dissolved oxygen and creating an anoxic zone, commonly called a dead zone (Nybakken and Bertness 2005; Roberts 2012). One of the largest and well known anoxic zones lies at the mouth of the Mississippi River. It has spread across nearly 5,800 square miles in the Gulf of Mexico (NASA 2015), though the area varies with the season; at its peak it covers 8,000 square miles (Roberts 2012). The dead zone was observed after the soaring application rates of artificial fertilizers in the Mississippi River's watershed in the 1950s (Roberts 2012). As a note, the Mississippi catches runoff from 40% of the lower 48 states, which equates to a discharge of 140 cubic miles of water each year into the Gulf of Mexico (Roberts 2012).

In addition to causing massive ecological damage, fertilizer runoff has implications for the ability to farm in the future through the loss of key nutrients that are a limiting factor in plant growth. Phosphorous is one such nutrient usually available in limited quantities and thus serves as a limiting factor within the ecosystem (Neset and Cordell 2012). To exceed this limitation, phosphorous has been mined and exported to farm regions for application. Extraction is expected to peak during, or by the end of, this century, with estimates ranging from 2033 to 2100 (Neset and Cordell 2012). Thus, we will need to institute practices that preserve phosphorous on site rather than relying on importing it in the future.

Genetics

The global food supply has trended towards a narrowing of choices. We now depend on just three species for 60% of the global food supply: rice, corn, and wheat (Kotschi 2010). Among these has been a trend towards genetic uniformity as well (Teklu and Hammer 2005).

This narrowing of species is also called a monoculture, and is especially prevalent in corn and wheat in the United States, which tend to be hybrids or genetically modified (USDA ERS 2015). Both of these use vertical resistance methodologies to provide pathogen resistance. Vertical resistance is provided by a single gene and the process causes the organism to lose genes providing partial resistance to a broader range of pathogens. The issue with vertical resistance is that diseases and pests adapt and evolve, and thus "resistance to the resistance" develops (Gliessman 2014, 186). In this case, diseases can sweep through genetically similar (or identical) crops, such as in the 1846 Irish Potato Blight, which destroyed half of Ireland's crop due to reliance on two genotypes susceptible to disease (Gliessman 2014). Global trade can promote the spread of pathogens (Strange and Gullino 2010; Anderson *et al.* 2004), a real concern in today's highly interconnected world.

Another issue in genetics is ownership: life can be patented in certain circumstances. For example, Monsanto brought legal action against Percy Schmeiser in 1998 for allegedly infringing on their patents. Schmeiser had planted seeds he had saved from the prior year's harvest, which had cross pollinated with plants containing Monsanto's proprietary genetics. This suit showed that farmers were now potentially culpable for something as natural as pollination and germination. This intellectual property rights framework is being exported to the rest of the world as control of seed stocks tightens (Pechlaner 2012).

Genetic control of crops has concentrated significantly with Monsanto, DuPont, and Syngenta, the top three seed companies, controlling 47% of the global proprietary seed market. Including the next seven brings that to an estimated 67% (Pechlaner 2012). This control of seed stock coupled with genetically modified (GM) crop trends show a move towards vertical integration of seeds and their corresponding chemicals. Vertical integration means that a company controls production, distribution, and other aspects of a product under sole ownership to maximize profit (Merriam-Webster.com 2016). In this case, the GM crops are developed in house (production), distributed, and reliant on a single chemical also under the same corporate ownership as the seeds.

In 2010, the US had 45% of the world's GM crop land – 66.8 million hectares. GM crops tend to come in three categories of modification: US acreage breaks down into 61% herbicide tolerant, 17% insect resistant, and 22% stacked (multiple modifications) (Pechlaner 2012). The shift to GM has been rapid. First introduced in the mid-1990s, GM commodity crops (e.g. corn, soy, and cotton) now comprise more than 89% of total acreage for each crop (USDA ERS 2015).

When local varieties are abandoned for these GM, or even hybrid, varieties, that seed has an entire system that must be bought into as well: specific inputs, practices, and machinery (Gliessman 2014). For example, Monsanto's Roundup Ready seeds are part of a system reliant on the herbicide Roundup. The overall result of these shifts is food system fragility due to a narrowing of providers and implications of genetic modification. These methodologies also tend to require high levels of energy input due to the required support infrastructure.

Energy

Issues associated with energy supply, transport, and use reach beyond just environmental impacts and impact the entire economy. Modern agriculture is built upon the use of cheap energy for nearly everything: petrochemicals (pesticides, herbicides, and fertilizers), transportation, and refrigeration (Neff *et al.* 2011). As Heinberg puts it in his book *Peak Everything,* "Modern industrial agriculture has been described as a method of using soil to turn petroleum and gas into food" (Heinberg 2007, 48).

The rapid shift to modern practices was due to the energy density of petroleum and its refined products: gasoline is 10,000,000 times more energy dense than human labor (Layton 2008, 441). This density enabled fewer people to accomplish more; however, this will not continue as oil supplies are finite.

Peak oil is defined as "the point at which national and world oil supplies will peak, then decline in coming decades, with extraction growing increasingly costly per unit retrieved" (Neff *et al.* 2011, 1587). Projections of when peak oil will happen range from already happened, to "soon" (Owen, Inderwildi, and King 2010), to 2020 (Miller and Sorrell 2014). This does not mean that oil is gone, just that it will become increasingly scarce; more difficult to find and cost more to extract. This provides a window of opportunity in the short term to alter the way food is produced, since we will still be able to use cheap energy to set up sustainable systems. This is already happening through the use of sustainable agricultural methods which avoid petrochemicals and minimize external inputs (Gliessman 2014; Holmgren 2002).

It is through cheap energy, specifically fossil fuels, that we have realized such massive productivity gains with so few farmers. The average farmer can feed 155 people presently, while in 1940 this number was 19 (USDA n.d.), all due to mechanization and fossil fuel use. With energy declines, our current productivity rates per farmer are likely unsustainable, thereby requiring more farmers.

Labor

Farming faces a looming labor crisis; farmers are among the oldest workers in the United States (Kurtzleben 2014) with the average age trending up over the past 30 years. Data from 2014 shows a mean age of 58 (USDA 2014) with a median of 56 (Kurtzleben 2014). Eventually these farmers will retire and new farmers will have to take their place; however, there has been a drop of 20% in new farmers (defined as <10 years' experience) to fill their places (USDA 2014). Since there are so few farmers and a drop in new farmers, knowledge of how to farm is in danger of disappearing (Heinberg 2007).

This labor and knowledge deficit is a major issue since declining energy intensity will likely require smaller scale farms (Heinberg 2007). In 1900, farmers comprised 40% of the United States population; based on this, an estimated 40-50 million new farmers will be needed over the next 20 – 30 years as available supplies of energy-dense fuels decline (Heinberg 2007). Compounding this is the projected 70% increase in food demand by 2050 due to population increase (Naam 2013).

SOLUTIONS

Almost half of Earth's habitable land is dedicated to agriculture, and from the exploration of issues in the previous section it is evident that "agriculturalists are the principal managers of global usable lands and will shape, perhaps irreversibly, the surface of the earth in the coming decades" (Tilman *et al.* 2002, 671). Thus, solutions to managing agriculture must be holistic and encompass these diverse issues. Two such methodologies for sustainable agriculture are explored in the following sections: Permaculture and Agroecology. These methodologies were picked over others based on their whole systems approach and popularity in academic research.

Permaculture

Permaculture emerged from Australia in the mid-1970s as a result of the collaboration between David Holmgren and Bill Mollison. It is a grassroots and populist form of sustainable agriculture which is modeled off ecological principles, indigenous agricultural practices, and systems ecology (Ferguson and Lovell 2014; Holmgren 2002). The name originally came from the joining of permanent and agriculture. Since then, permaculture's focus has expanded beyond just agriculture. The goal now is to create a genuinely sustainable culture.

Holmgren defines permaculture as “Consciously designed landscapes which mimic the patterns and relationships found in nature, while yielding an abundance of food, fibre and energy for provision of local needs” (Holmgren 2002, xix). Holmgren notes the definition is so broad that its usefulness is limited; rather he sees the practice as an "organizing framework" to implement that definition (Holmgren 2002, xix).

Since permaculture is widely considered a populist movement, there are no specific directives associated with it; however, Holmgren’s book *Permaculture: Principles and Pathways Beyond Sustainability*, serves as one of the main guides to the movement. In it, he outlines 12 guiding principles (Holmgren 2002):

1. Observe and interact
2. Catch and store energy
3. Obtain a yield
4. Apply self-regulation and accept feedback
5. Use and value renewable resources and services
6. Produce no waste
7. Design from patterns to details
8. Integrate rather than segregate
9. Use small and slow solutions
10. Use and value diversity
11. Use edges and value the marginal
12. Creatively use and respond to change

Each of these principles is a core skill that permaculturists need to create a successful agroecosystem modeled off the natural world.

Even though permaculture originated within academia, there has not been much attention or research into it until recently (Ferguson and Lovell 2014). The field of agroecology has been where academic research for sustainable agriculture has been developing.

Agroecology

Agroecology is the academic focus of sustainable agriculture. It meshes the principles of agriculture and ecology into the term agroecology. Agroecology models agroecosystems using ecological principles and preindustrial agriculture with the idea that agroecosystems should function more in line with a natural ecosystem than conventional agricultural systems. Agroecosystems are modified for human needs and (Gliessman 2014; Lovell *et al.* 2010).

Given all these goals, the field is heavily design focused, both in landscape and ecosystem arrangement:

> *"…farm design should promote synergies and integration so that different parts of the agroecosystem support each other, while promoting biodiversity, conservation, food production, and other income-generating activities… Such agroecosystems not only provide products for consumption or sale, but they also support cultural functions and conserve ecosystem services" (Lovell et al. 2010, 328–29).*

Many of the goals mentioned above also touch on socio-political aspects of the farm, which is relevant because farms do not exist in a vacuum: the social and economic structures they are enmeshed in dictate, in part, how the farm is designed (Lovell *et al.* 2010; López-Ridaura, Masera, and Astier 2002). Thus, by examining how the farm is situated within the system as a whole, a well-designed agroecosystem that fulfills multiple needs can be designed.

Limitations of agroecology are scale related, as the focus tends to be at the farm or field level, especially for research. Additionally, agroecology studies tend to take place in tropic or coastal areas (Lovell *et al.* 2010). This makes applications at other scales and in other geographic regions difficult since the main focus of agroecology is to mimic the natural, local ecosystem, and these ecosystems vary extensively based on location.

Many sustainable agricultural approaches are now blending the permaculture and agroecology methodologies together and integrating them with other disciplines (Ferguson and Lovell 2014). Both permaculture and agroecology use the natural world and traditional practices as inspiration. The end goal is the same, the difference is the approach: permaculture is very populist with little penetration into academia, while agroecology is the opposite, remaining largely in the academic realm.

Both of these frameworks require analysis of the landscapes' current status. This next section details a few methodologies for evaluating the sustainability of agricultural practices.

EVALUATION METHODS

Considering issues of peak oil and massive environmental impacts of current agricultural practices outlined earlier, creating a methodology that can quantify the sustainability of a farm is highly relevant. For this to work, we must be able to predict and model the future of the agroecosystem, which allows us to see if the agroecosystem is degrading, maintaining, or bolstering the ecosystem metrics (Gliessman 2014, 289). This clearly requires measurements to characterize baseline conditions and then monitor change. Ultimately, the sustainable agroecosystem will show no degradation of ecological base and may instead be improving it.

Measuring this is easier said than done since the notion of achieving sustainability can only be determined in the future. The difficulty is in capturing a holistic system and breaking it down since ecosystems are so complex; however, establishing baseline metrics for key environmental indicators is absolutely necessary to move forward. There are a number of different methods to approach this, each with benefits and drawbacks.

Landscape Multifunctionality

Landscape Multifunctionality (LMF) is an approach that "considers the functions of the larger landscape… [and] suggests that agriculture can provide numerous commodity and non-commodity outputs..." (Lovell *et al.* 2010, 329). LMF aims to improve the performance of an agricultural landscape by stacking multiple services into each aspect of the landscape rather than attempting to maximize a single service such as production. LMF often aims to stack ecological, production, and cultural functions into a single landscape, while also providing targets for improving those functions (Lovell *et al.* 2010).

Lovell *et al.* (2010) performed a LMF analysis of two dairy farms in Vermont by spatially analyzing land use within the farm, conducting interviews of the farmers to determine the history, usage, and benefits of each land-use type, and then assigned scores for each identified function within the three broad categories of ecological services, production, and cultural functions. These scores were then grouped by land use type and displayed via bar graph with the height as the total score and the width as the percent land-use of the total farm area. Thereby giving a sense of the impact each land use type and function had.

There are a few drawbacks associated with this methodology. Firstly, there are tradeoffs between each functional stack: if one is maximized, then the others are necessarily neglected; if all are balanced then production is generally lower than a farm maximizing that function. This gets into the issue of ecosystem services valuation and how to count non-commodity services in a society that heavily leans towards profits as a metric. That said, the overall function of the land, when including non-commodity services, is higher than a landscape specializing in a single function.

MESMIS

MESMIS[1] is an evaluation framework that identifies key variables for sustainability, determines corresponding indicators, and derives measurement methods. These values are compared to identified, optimum values on a radar plot, and suggestions for improvements are given.

Sustainability within MESMIS is defined by seven natural resource management system attributes: (1) productivity; (2) stability; (3) reliability; (4) resilience; (5) adaptability; (6) equity; and (7) self-reliance/empowerment. Given these attributes, the evaluation is site specific, and is a participatory process including local farmers, community representatives, and external evaluators. Results are then compared to other systems either through a cross sectional or longitudinal analysis (López-Ridaura, Masera, and Astier 2002). MESMIS incorporates a cyclical six step evaluation process (Figure 3).

[1] Spanish acronym for Framework for Assessing the Sustainability of Natural Resource Management Systems

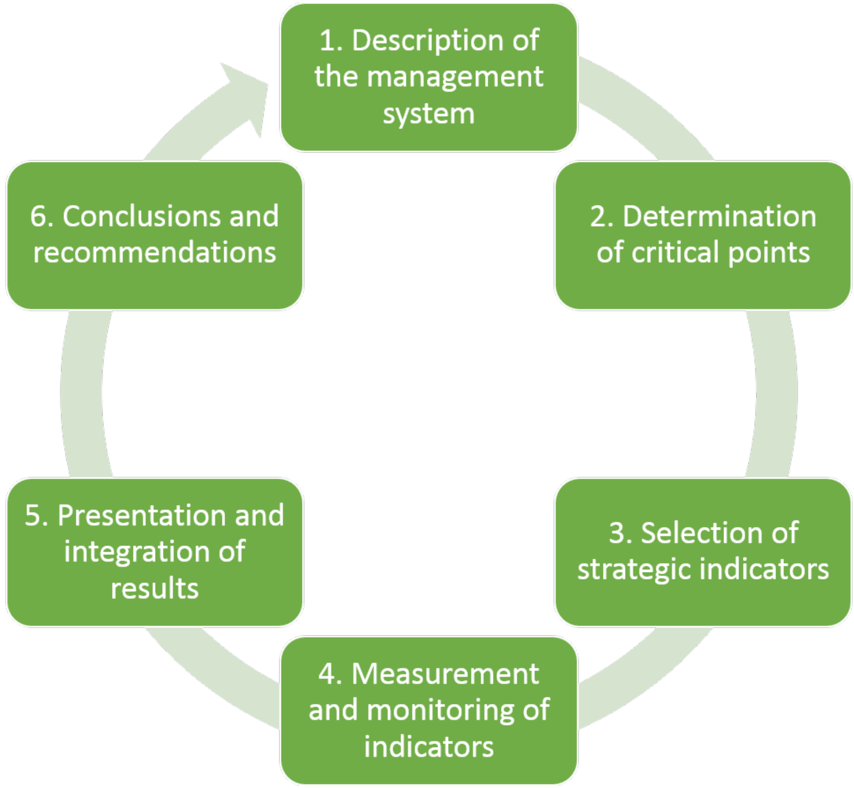


Figure 3. Cyclic process of MESMIS evaluation framework; results inform new adaptive management approach.

Evaluation methods are highly dependent on the desired outcomes for the sustainability investigation. From these outlined methods, we can draw some ideas about the key parameters to measure within an agroecosystem and tailor that to the site. Defining the metrics to measure sustainability at the Garden are explored in the following section, and are guided in part by the MESMIS framework.

MEASUREMENT PARAMETERS

To determine the best methods of measuring sustainability within an agroecosystem, it is worth visiting the definition of sustainable agroecosystems:

> *"[…] a sustainable agroecosystem is one that maintains the resource base upon which it depends, relies on a minimum of artificial inputs from outside the farm system, manages pests and diseases through internal regulating mechanisms, and is able to*

recover from the disturbances caused by cultivation and harvest" (Gliessman 2014, 287).

Within that definition are four overarching concepts of site sustainability: (1) stewardship of natural resources; (2) input sources; (3) internal regulation of processes; and (4) resiliency (the ability for a system to recover from a shift or shock). For a parameter of analysis to be robust, it should include these concepts. While the definition above is generalized, specific parameters are categorized in Figure 4. The main parameters are soil, hydrology, biotic factors, and ecosystem level characteristics. Each of these has subunits of analysis which vary in the manner in which they encompass the four concepts.

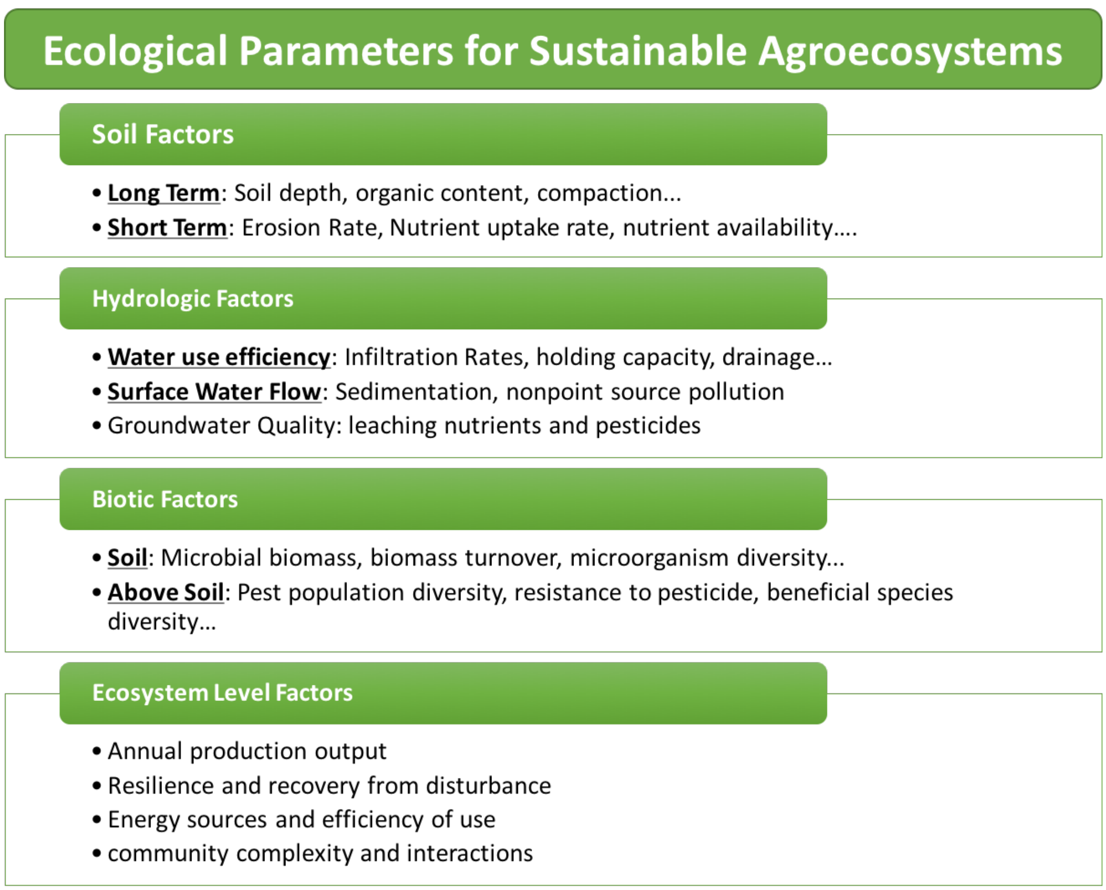


Figure 4. A few of the conditions and parameters necessary for agroecosystem sustainability; adapted from Gliessman (2014).

While Figure 4 covers the main components of a farm (land, water, and crops), it is a short list of the components that go into a sustainable agroecosystem, since ecosystems are complex systems with many interlinks. Such complexity makes completely capturing how an ecosystem works nearly impossible. Thus, key indicators must be selected that have a higher overall impact on the system than others.

Myriad components and processes go into making an ecosystem function. The constraints of this project limit the number of measurements that can be made. Thus, the processes within an agroecosystem must be explored to determine the most critical components. A generalized process diagram for agriculture is shown in Figure 5.

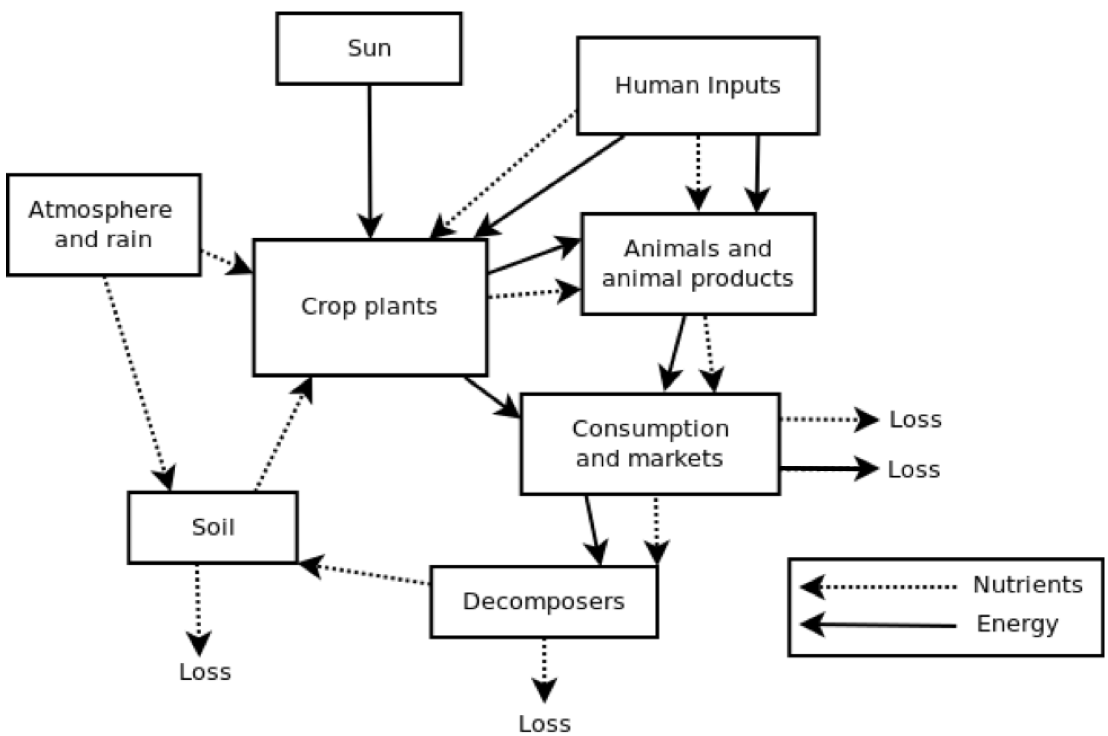


Figure 5. System analysis of agroecosystem including natural and anthropogenic inputs, processes, and outputs; adapted from Gliessman (2014).

Figure 5 shows the various inputs for an agroecosystem as well as a high level overview of the internal processes (decomposition and soil building for example). Farmers lack control over things such as the sun, atmosphere and rain; however, they have significant control over human inputs, and nutrient cycling processes. This gives a general idea of how to approach the key parameters to measure for this project. A fine-grained example is called a "system boundary analysis," which determines which processes can be influenced or modified by the user.

This system boundary analysis, in addition to depicting flows in a system, incorporates cutoff thresholds for items to be considered in the analysis of a system (Sander and Murthy 2010). In Sander and Murthy's (2010) analysis, they examined which processes users had control over, and used the system boundary analysis to constrain their model. They identified a cutoff threshold for analysis, in this case processes that contributed 5% or more to the production of biodiesel. Their resulting model only included processes that contributed at least 5% to the overall process.

This concept of a cutoff threshold can also be useful in establishing process boundaries when applying this approach to an agricultural system. Much like the example above, farmers lack control over every aspect of the agroecosystem, such as sunlight and rainfall. These process models allow identification and prioritization of more critical components or parameters within the system, whether controllable or not.

The concepts of a system flow and boundary analysis were combined, adapted, and scaled to create a model that applies specifically to the Student Garden's processes, resulting in the material and energy flow, and threshold cutoffs shown in Figure 6[2].

[2] Note that this figure will not include everything pertinent to the site. It exists to give better insight than the previous figures for the Student Garden and to determine the sustainability parameters for measurement within this project.

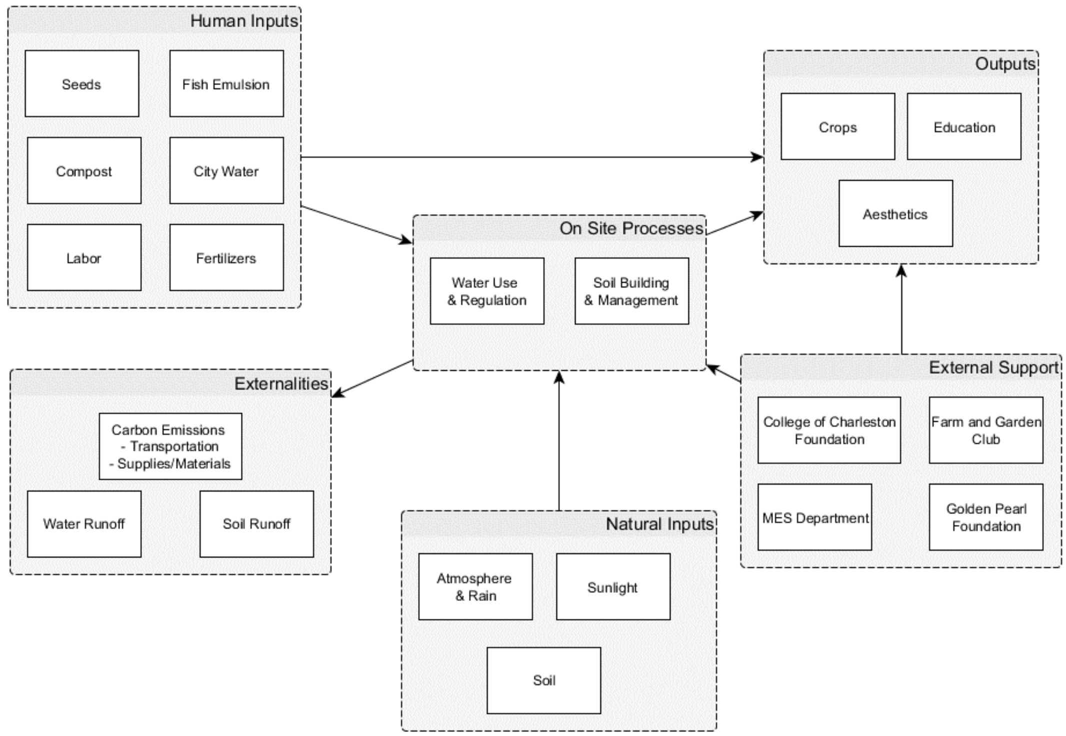


Figure 6. Preliminary scoping model for Student Garden including natural and human inputs, external support, externalities, and outputs.

Categories of External Support (funding and labor), Human (nutrients) and Natural (rain and sun) inputs, On Site Processes (soil and moisture management), and Outputs (food and education) are labeled in the above figure. Some factors are out of our control, such as Natural Inputs; however, many are within our realm of control: Human Inputs, On Site Processes, and Outputs. Through evaluating these we have some control over external support. For example, we can justify future funding because of the employment of certain practices and goal attainment. This project will focus on the parameters over which we have greatest control; of these soil characteristics and water use were determined as the most feasible. Research into these characteristics will allow an informed landscape design to be developed.

DESIGNING LANDSCAPES

The "goal of quality sustainable design is to create aesthetic, functional, maintainable, and cost-effective landscapes that are well suited for a specific location or region" (Cook and

VanDerZanden 2011, 15) for both the short and long term. Five components come together to form the theory of landscape architecture and allow for the creation of a landscape plan that is responsive to human behavioral patterns and site specific characteristics, thus enabling a design uniquely suited for that site. These are natural processes, human factors, methodology, technology, and values (Laurie 1986).

Natural processes include soil, hydrology, topography, climate, vegetation, and wildlife and are fundamental to understanding the ecosystem that is to be modified by agricultural processes. Human factors are the cultural variations in use and appreciation of a site which are important for understanding the impact of the environment on behavior. Methodology refers to the systems in which the landscape is defined, how the various factors are combined, and the values incorporated into the design. Technology is the means of implementing the design and includes a broad swath of aspects such as soil science, microclimate control, communications, and political process. Lastly are values, which are the ethics a designer subscribes to – judgments for what is best for the common good and the land (Laurie 1986). These five components can then be grouped into three activity types which are decision making, technical planning, and the actual landscape design. These interplay to make the final landscape design.

Decision making involves building methods and means for planning and providing direction for carrying out decisions. Technical planning includes processes and services used in support of both decision making and design activities, and includes environmental assessments like soil testing and vegetation mapping. Landscape design entails the layout of uses, features, and facilities that are to be constructed, preserved, or changed (Marsh 2005). Each of these provide feedback into the other components, thereby allowing for a responsive design; however, it is important to first know the baseline state of the site.

Planning and Analysis

A design for a landscape must first analyze the current status of the site. This requires a detailed investigation from large (macro) to fine (micro) scale of characteristics of the region and site (Laurie 1986; Marsh 2005). At the large scale (macro), the landscape is dominated by physiographic regions which are "defined by the composite patterns of the main elements of landscape: landforms, drainage features, soils, climate, vegetation, and land use" (Marsh 2005, 26) as well as many processes that operate within them. North America consists of nine such regions. The physiographic region relevant to this project is the Atlantic Coastal Plain, in which the Lowcountry resides. This coastal plain is divided into inner and outer regions. Charleston, South Carolina, lies in the outer region, specifically within the Cape-Island (Sea Island) section.

The Sea Island physiographic region is characterized by flooding from high runoff caused by the climate and frequent storms, extensive built development adjacent to rivers and the coast, and engineered structures such as levees. Charleston lies in the humid subtropical climate, which has 40 – 60 inches of rainfall and vegetation patterns that follow topography and drainage: oaks and pines in the uplands, and gums, tupelos, and bald cypress in the wet lowlands (Marsh 2005). Additional regional characteristics to be aware of are cultural trends, local government regulations, and availability of services (Laurie 1986). Designers must be cognizant of these regional trends and characteristics in order to create appropriate landscapes.

At a medium, or meso, scale is consideration of how the site interacts with neighbors. This is especially important for agriculture, since it is impacted by what others on adjacent land are doing. Regional trends in laws, zoning, labor, and transportation also impact how a site may be used. Coordinating usage of a multifunctional site amongst the various users also falls into this meso scale. Coordination allows for maximum utility amongst all users when assigning usage is based on the best fit with landscape constraints. This requires an analysis of the site.

Progressing to a finer, or micro, scale is important in planning: “By and large, the forms and features we see in the local landscape are the products of the processes that presently operate there. ... [This] implies that it is possible to understand the landscape according to the workings of the environment in the present era...” (Marsh 2005, 56). Given this, we can examine what is currently happening at the Garden to understand the processes that are occurring. For example, we can see if an area becomes highly saturated after rain, which would indicate on a micro scale that the soils in that location have poor drainage.

Touching back on the components that form landscape theory, there are two parts in the planning phase. The first is research which includes site data, maps, and other information. The second is a site assessment in which visual values, relationships, feelings, and moods are recorded. This phase also includes data on geology, soil, topography, vegetation, wildlife, climate, the existing features of the site, as well as social factors such as building codes and visual quality (Laurie 1986). These two parts are explored in the following section.

Site Characterization

Spatial assessment of a site is based on the processes that form landscape features. These are correspondingly divided into upper, middle, and lower tiers. The upper tier is comprised of air and its flows. The lower section is the soil mantle, bedrock, and aquifer, which are important when relying on groundwater.

Most of the concern for the site lies in the middle tier, since that is where the designer has the most control. This layer consists of the vertical distance from the upper limits of vegetation canopies to the bottom of the root zone and is the most active layer of the landscape. Water movement is one of the dominant features within this layer, and the most significant of them is runoff, which impacts water quality and quantity for the site (Marsh 2005). Suitability and restraints of the site for a given purpose must be calculated from the physiographic features.

These vary based on the goals of the design. Agriculture site suitability design considerations center around soil quality, water and light availability.

Large scale data related to soils can be found on soil surveys, which map the distribution of soil types and provide data about characteristics, as well as soil usage and limitations. This data tends to be useful for sites greater than 100 acres (macro and meso), so a more refined investigation of the site is needed for smaller sites (Marsh 2005). The site's soil determines how water behaves, with certain types draining or retaining water at different rates. This has a profound influence on agricultural productivity. Thus, usage constraints for a site are often dictated by the type of soils there.

Solar radiation is essential when considering site design and management due to its influence on microclimates, soil moisture, and plant ecology. The sun angle can be calculated for a specific site with three variables: the latitude of the site, the date, and the declination of the sun. Solar radiation will not vary much in the Lowcountry since this region has relatively little change in slope; however, light can be consciously exploited by building landscape features that alter exposure to the sun and create microclimates (Snel 2010).

Microclimates are variations of ground level climate. They can be thought of as pockets of heat and cold within the landscape, created by more or less sunlight. They can have profound influence on vegetation patterns and soil conditions. For example, in the northern hemisphere, south facing slopes are more exposed to solar radiation and therefore have more evaporation and energy than northern facing slopes (Marsh 2005).

Soil, water, and light characteristics can be mapped individually and then overlaid to create a composite map that determines areas of the site that are suitable for agriculture. This integration of various data inputs forms the basis of the landscape design.

Design

The final step is the site design. This phase is an extension of the planning phase and involves the selection of components (materials and plants) and combines them in a way that provides a solution to the various needs of the site (Laurie 1986). The process typically includes determining how the site will be used, generating design ideas relative to this, creating a preliminary design, gathering feedback from the client, and then creating the final design (Cook and VanDerZanden 2011). The design must take into account the inherent relationships at the site, both in a cultural sense as well as ecosystem dynamics. These two are coordinated to maximize benefits and utility for all. Existing features, constraints, and needs can then be overlaid to create a composite map.

Ian McHarg (1992) does this composite mapping with light, soil, water, and users' constraints and needs. Buildings and other support structures are placed in areas less suited for natural spaces while agriculture and other natural systems are placed in locations with the best suitability.

One important aspect to keep in mind is that design is an ongoing process, not a final stage to be reached. This is because the landscape is constantly changing due to both natural and human influences. Thus dynamic and adaptive management of the landscape must be addressed as an integral part of the design (Cook and VanDerZanden 2011; Laurie 1986).

Management approaches change as the landscape's ecosystem becomes more established. For example, trees become fuller and shade out more sun tolerant species, necessitating the switch to shade tolerant species, thereby changing the site's microclimates (Cook and VanDerZanden 2011). Inputs such as fertilizer and human labor become less needed as the ecosystem reaches a climax state. Due to this, species succession and the desired stage of the ecosystem must be accounted for in the initial design for proper management of the site.

On the human side, movement around the site is mediated by the design and must be accounted for. Scale, boundaries, and pathing all influence this. Pathing must accommodate the mood the site evokes, often called desire lines. If people are rushed, large and straight paths between features are important (or people will make them – as observed on college campuses). Less hurried environments allow for smaller and more meandering paths that open up to permit people to pause for observation or contemplation, rest, or group together. These can be two feet in width for one way, or seven feet for two-way traffic (Laurie 1986).

Related to both pathing and management of ecosystem succession, permaculture utilizes a concept of zones when designing placement of features. Zones can be thought of as areas of autonomy within the landscape. They range in classification from 0 to 5, with lower numbers requiring more human intervention and thus are placed closer or more conveniently for access. Zone 5 is classified as wilderness, and is rarely touched if at all (Holmgren 2002; Mollison 1988). Figure 7 demonstrates the concept and typical uses of each zone (Müller 2014).

Figure 7. Permaculture Zones 0 - 5 and corresponding uses.

The desire lines between areas can be used to determine the zone number of an area or feature. This concept of zones can be used to orient placement of structures and uses based on distance, overall utilization, type of usage, and convenience. This will also determine where and how much management intervention will be used or needed. Areas of higher use such as cultivation fields managed daily should be placed in close proximity to Zone 0, which is typically the house, or main gathering structure.

All of these pieces put together allow for the creating of a site design. The final design will entail a map of usage constraints determined by the site assessment with the proposed structures and features positioned in the corresponding best locations to maximize utility of the site.

RESEARCH QUESTIONS

SCOPE

This thesis is intentionally broad in scope. The work is intended to take a scoping, reconnaissance-type approach to landscape design that integrates the diverse inputs of natural science information, stakeholder preferences, institutional vision, and infrastructure analysis, rather than a detailed technical assessment of each of these aspects. The goal is to develop an implementable landscape design that attempts to balance stakeholder aspirations with the practical reality of the ground itself – what is naturally present in this lowcountry ecosystem and what has been built over the years. The need for this type of practical design is typical for most non-profit land management and conservation enterprises, which rarely have the advantage of gathering all the scientific data desired, nor all the stakeholder input required for the most robust analysis possible.

STAKEHOLDER ANALYSIS

1) Who are the stakeholders at the Student Garden (administration, employees, and student users)?
2) What do stakeholder groups view as the mission or purpose of the Garden?
3) What are their views for the vision of the Garden?
4) What are the infrastructure and support needs associated with the stakeholder mission and vision of the Garden?
5) How do the various stakeholder groups align or diverge on their views of the Garden?

LANDSCAPE SUITABILITY ASSESSMENT

1) What is the current layout of the Garden’s utilities, infrastructure, and fields?
2) What is the spatial distribution of soils in and around the Garden?

3) What characteristics do these soils have for agricultural productivity and hydrology?

4) Which of these soils are best suited for the Garden's purposes?

LANDSCAPE PLANNING

1) How was the Garden Site used historically?

2) How does historic use inform current and future use of the Garden?

3) How does the mission, vision, and needs of stakeholders alter the Garden's boundaries or landmass?

4) How can the Garden be designed to maximize stakeholder needs within the physiographic constraints of the site?

METHODS

STAKEHOLDER ANALYSIS

Persons involved with the Student Garden in a management, project, and administrative capacity were identified from research gaps in the Master of Public Administration (MPA) capstone project (Taylor 2015b). These include people with more day to day management of the Garden whose views were not included in the prior project. Identified groups were student users, student managers, and administrators overseeing the garden. Student Users of the Garden are groups or students with projects at or using the Garden. This included graduate research projects and undergraduate clubs. Student Managers are the Master of Environmental Studies (MES) graduate students who run the day to day operations at the Garden. Garden Administrators are those with direct administrative power over the Garden. Identified personnel were:

Student Users

- Carmen Ketron – MES project is coordinating and establishing a student run CSA program at the garden
- Nolan Barrett – Farm Coordinator for the Farm and Garden Club (FGC)

Student Managers

- Tyler Hassig – Helped establish the Garden, and has worked there for the past year
- Sean Dove – Currently working at the Garden and will become the Garden Graduate Assistant (GA)

Garden Administrators

- Abbie Cain – MES Program Coordinator, and Garden Director
- Tim Callahan – MES Program Director, and Interim Garden Director.

Prior to the interview, a series of interview questions were designed to collect the information needed to determine thoughts on mission, vision, and infrastructure needs of the Garden both now and in the future. Many of these were modeled or modified from the MPA capstone project (Taylor 2015b). Each group was asked the same series of questions except Student Users, who were asked an additional two questions targeting their projects. Interview survey questions are given in Appendix: A: Interview Questions, page 88.

Interviews were recorded and transcriptions were later combined with notes taken during the interview to document this input. Results from individual interviews were aggregated to capture the range of perspectives and generate a comprehensive view regarding the Garden's mission, vision, and infrastructure needs. Interview data was sorted into those three topical areas shown in Table 1:

Table 1. Categorization of interview questions by mission, vision, and stakeholder needs.

Mission
Purpose of Garden
Fulfillment of Purpose
Vision
Major Project
5-year Vision
Needs
Needs for Major Project
Utility from Infrastructure
Needs for Vision
Organizational Goals/Needs

LANDSCAPE SUITABILITY ASSESSMENT

Mapping of the Garden's landscape was completed in two phases: an initial baseline documentation to gain an understanding of the current state of the Garden, and a landscape suitability analysis using GIS data.

Baseline Documentation

The Garden's current state was recorded in a baseline documentation survey which involved taking GPS points, lines, and photos of features at the Garden. This was completed using a map prepared for ESRI Collector App for Android, Version 10.3.7, (ESRI 2016b). The process entailed creating a File Geodatabase in ArcGIS's ArcMap, Version 10.3, (ESRI 2015) containing a feature dataset with a projection of "NAD 1983 UTM Zone 17N." In the feature dataset, feature classes were created for photo points, line tracks, and miscellaneous points. Each of these had a text field for description of the Garden feature being recorded, as well as time stamps for the user and date created and modified. These three feature classes were uploaded to ArcGIS Online (ESRI 2016a) individually. The photo points feature class had attachments enabled, so photos could be taken in the field. The three uploaded feature classes where then combined into an ArcGIS Online map which enabled the use of the Collector App. Field data was then collected in the app using an LG Nexus 5x running Android 6.0.1 paired with a Garmin Glo external GPS unit paired to the phone via the app Bluetooth GPS, version 1.3.7, (GG MobLab 2015) and set as the "mock location provider" to allow external GPS unit to provide the phone with GPS data accurate to 1.8 meters. Photos and GPS data were taken of agricultural fields, structures, art installations, utilities, and access points. These data were then combined into a photo document showing each of the pictures along with a brief description and an identifying number. A photo table is given in Appendix: B: Garden Baseline Documentation, page 89, showing the photo number, description, and latitude and longitude of the point; and a map showing where each of the points were taken along with the category it fell under: Art, Agriculture, Structure, or Utility (water and electricity).

Landscape Suitability

Mapping of the existing landscape at the Garden was completed in three phases. Data were collected for soil, water and water drainage patterns, and building confinements. Imagery data was also utilized. Both categories were from publicly available datasets. Soil, water, and building data were from the 2014 ESRI packaged SSURGO data, or the Soil Survey Geographic Database, using the ESRI map viewer to download data for the Edisto River watershed (ESRI 2016c). Water data from SSURGO was also combined with a prior project modeling water runoff at Dixie Plantation (Taylor 2015b). These data were overlaid on National Agriculture Imagery Program (NAIP) 2015 aerial imagery for the region (Farm Service Agency 2015), as well as 2007

Light Detection And Ranging (Lidar) imagery of elevation (SCDNR 2007). Maps were created to highlight the various features found in those datasets.

The soil map layered several fields from the SSURGO dataset to show areas better suited for agriculture. These layers included the Land Capability classification for non-irrigated crops and the USDA Farmland Soil classification. Both of these were superimposed on the current Garden area, while using the NAIP imagery as a basemap. GIS layer symbology were configured such that the aerial was visible, and different layers were distinguishable. Labeling of the NRCS Land Capability was done along with a color gradient to differentiate between more and less suitable agricultural land.

Also from the SSURGO dataset, a map was created that showed soil suitability for buildings without basements. For small structures, this soil dataset examines "slope, inundation, mass movement, potential frost action, depth to bedrock and to cemented pans, shrink-swell, rock fragments >75 mm, erodibility, subsidence, and soil strength" (NRCS 1993) and rates them for how suitable they are for buildings. Data were symbolized based on limitations the soil would prescribe on structures within the current Garden extent and the surrounding areas. Data were layered over NAIP aerial imagery.

The water map was similar to the soil map in that it also superimposes several fields of data from the SSURGO dataset; however, not all attributes were useful, so those were ultimately excluded. Overall, water data included water table depth, flooding frequency, and soil drainage class. Drainage patterns were layered over this and developed in a separate project (Taylor 2015a). These data were placed over basemaps of NAIP imagery and elevation Lidar. A separate map showing just the calculated drainage patterns was created in ArcScene, which allowed for a 3D representation of the Lidar and other datasets. To increase visual effect of elevation changes, the topographic relief was exaggerated by a factor of five. Layered over this were the current area of the Garden, along with the drainage patterns classified by stream order. Stream order was symbolized by increasing thickness at higher orders, as well as differing colors for each order.

The final landscape suitability map developed was a layout map of the current infrastructure at the Garden. This was developed by taking the GPS points from the baseline documentation and pairing that with interview data about infrastructure to plot polygons and point features on 2015 NAIP aerial photographs of the Garden to give an overview of the current spatial layout. Infrastructure included buildings, fencing, agricultural features such as vegetable beds, utility hookups for water and electricity, and artistic features.

LANDSCAPE PLANNING

In developing the landscape design, several steps were taken. A Cultural Composite map was constructed by looking at historical maps for Dixie Plantation to gain a sense of use through time for the location. A model site was visited to gain an understanding of how other small scale commercial operations are successfully laid out. Pairing both of these data with results from the interview, an area of expansion was proposed, and used for the landscape design. The landscape design incorporates all of the landscape suitability analysis results, needs identified in the interviews, and the targeted expansion area to come up with a plan for expanding and spatially organizing the Garden.

Cultural Composite

In order to understand the current usage of Dixie Plantation and the area around the Garden, a composite of historical features was constructed. This included data from historical surveys, plats, and topographic maps. Historic maps came from four sources: plats from 1807 ("Plat of Stono River Land" 1807) and 2010 (GPA 2010), and topographic maps for 1919 (USGS 1919), and 1960 (USGS 1960). Each of these maps was overlaid on the current boundary data for Dixie Plantation using the georectification tool in ArcGIS. Rectification was performed by placing control points at manmade features such as roads and train tracks that exist through to the present.

Once rectification was complete, features from each map were added into a geodatabase using the create features function in ArcGIS. Features included roads, buildings, water features such as swamps and ponds, and other infrastructure near the Garden. Fields were added for the year these features first appeared on the maps. A composite map was then created from these features showing all recorded features on a single map, color coded for year and labeled with use or type.

Model Site Visit

Two model sites were visited to gain an understanding of how small scale commercial operations are spatially configured: Church Creek Nursery and Sea Island Savory Herbs. Building and building configurations were examined to develop ideas for the Garden expansion. Pictures were taken of features of interest to get a sense of layout. A document showing selected photos with descriptions was constructed for Church Creek Nursery. A layout map of buildings and agricultural features was constructed in GIS from pictures and information from Mari Beth, the manager at Church Creek Nursery.

Garden Expansion Delineation

The Garden's expansion area was originally projected to include 17 acres from its current location to the bounding roads to the north and east. This project, from several sources, has modified the acreage as well as the location of the original expansion. Results from the interviews changed the total acreage of the expansion. Data from the soil and water landscape suitability assessment shifted the target location. The Cultural Composite data further shifted the target location to avoid some features, and to include others.

Design Concept Drawings

Concept drawings were constructed for the Garden expansion. These incorporate data from the landscape suitability analysis, cultural composite, and model site visit. The three mission areas of the Garden as identified by stakeholders were also incorporated (education, research, and production). In addition, the infrastructure needs associated with each mission area were included – generally folded in with the ideas from the site visit, such as greenhouses, and a centralized office.

To develop the concept drawings, large format aerial maps were printed for the Garden expansion areas. Scale was set to 1':20". Trace paper was overlaid on the map and ideas sketched based on the parameters mentioned above. Several iterations were completed until a cohesive whole was developed. Then a composite design sketch was created. All drawings were completed by James Ward, landscape architect and member of the advisory committee for this thesis.

This first iteration was presented to Abbie Cain, the Garden Director for feedback on July 15, 2016. Feedback was incorporated into a second design sketch and presented again for final approval.

RESULTS

STAKEHOLDER ANALYSIS

Composite responses from each group interviewed are shown for the topical areas of mission, vision, and infrastructure needs.

Student Users

Student Users are students at the College with projects, research, or who volunteer at the Garden. This category is represented by Carmen Ketron and Nolan Barrett. Ketron's MES Internship project was to do a feasibility study and trial run of a student run CSA. Barrett is the liaison between the Garden and the Farm and Garden Club (FGC), which was established in 2014 for undergraduates to have a multidisciplinary approach to sustainable farming, including marketing produce from the Garden. Thus, FGC is an integral component for reaching undergraduates.

Mission

Student Users viewed the mission or purpose of the Garden as an "interactive educational program to teach students, faculty, staff, and even community about the larger implications of farming and agriculture and how humans interact with our food system generally and how that plays into the ecology of Dixie Plantation and the Lowcountry broadly" (Ketron 2016). Barrett stated that the Garden served a broader purpose for individuals as a refuge from work and downtown Charleston allowing him to de-stress and learn (2016). He was also interested in the Garden's ability to serve as a research area for students.

In terms of the Garden fulfilling the understood mission, neither Barrett nor Ketron thought it was doing so completely. Concerns lie in three areas: infrastructure, collaboration, and the market. Both noted that the lack of some basic infrastructure inhibited the use of the Garden. The Garden lacks access to restroom facilities. The second major infrastructure issue is transportation. Ketron noted that there were no outlets to get people to the property and that the road washed out for several months following the October 2015 floods. Barrett noted that vehicle transportation was a major issue for the FGC. Renting a van from the College costs the club $100, which only becomes economically feasible with six or more people. Below that threshold, renting the van makes little sense, but they don't always have enough people with cars to drive since the FGC is an undergraduate club. Barrett noted that collaboration between the Student Users and Garden Managers and Administration has decreased. Ketron advertised in undergraduate science courses for the FGC and to increase awareness about student research opportunities at the Garden. This stopped after she moved from the Garden GA position, and FGC attendance has dropped markedly. Another area of mission un-fulfillment is in the FGC Market, albeit, this is out of the Garden's control. FGC has encountered many unforeseen hurdles in creating the student run garden. The Student Government Association (SGA) controls when popup stands (famers market type booths located on campus) occur and the procedures for implementing them.

Vision

Both Barrett and Ketron were asked visioning questions for the Student Garden relating to their major project wish and where they saw the Garden in 5 years. Major projects differed in that Ketron wanted four to five successful workshops focused on food systems, and Barrett wanted a small orchard of pecans and citrus. They both aligned on the five-year vision. Both interviewees see the Garden as having an increased or expanded role as an educational and production facility. Barrett wants the FGC market running, increased student body participation and research.

Needs

Interviewees were asked about their perceived needs for infrastructure in general and as it relates to their major project and five-year vision. Responses were broken down into basic needs, overarching needs such as at Dixie Plantation, programmatic needs, production facility or CSA market needs, and other.

For basic needs, Ketron noted that the Garden needed to be moved to a more appropriate location within the same general area. She also noted that instead of having the Garden expand to the proposed 17 acres, a better approach would be having 5 acres run very efficiently with a highly diverse and integrated set of plants rather than acres of corn. Barrett focused on basic needs for the FGC to function better, which included increased student involvement and a budget or funding source.

For overarching needs, Ketron noted that Dixie Plantation needed better infrastructure for the Garden to function optimally: roads and bathroom facilities specifically. For this to happen, Dixie Plantation will likely need increased direction and support from the College which will involve a full time caretaker, manager, or director – no one is watching Dixie full time, which may contribute to the theft of equipment.

Programmatically, the Garden needs include a coordinator or staff that is full time, especially as the Garden expands because the GAs cannot run it with a 20 hour per a week maximum. An advisory committee would help in legitimizing the Garden in the eyes of the College administration as well as donors. The committee would also help with bringing people in for events and help in the visioning process (Ketron 2016).

For the production facility, a washing facility that is South Carolina Department of Health and Environmental Control (DHEC) approved is necessary, along with a bagging and processing area. SGA requires health and safety standard operating procedures for handling produce. Lastly, a plan for who, what, and when to sell produce is needed (Barrett 2016).

Barrett also noted that the FGC was interested in having chickens, insects, and worms (vermiculture) at the Garden someday, which would likely necessitate a full time staff (2016).

Administrators

Garden Administrators are those College of Charleston MES Program faculty who have administrative oversight for the Garden. These include Tim Callahan, the MES Program Director, and Abbie Cain, the MES Program Coordinator.

Mission

Garden Administrators had two main focuses for the mission of the Garden. The first being a demonstration and educational site for community members, College faculty and staff, friends of the College, and the wider community (especially Kindergarten through 12th grade students) to observe how permaculture activities work in the lowcountry. The second focus is as a research location for growing vegetables, securing and maintaining seed stock, managing land for extreme conditions, and allowing students to more holistically learn since lots of time, effort, and planning go into managing the land which leads to wide ranging lessons (Cain 2016; Callahan 2016).

Neither Cain nor Callahan thought the Garden had reached its potential. Buy in from the community resonated with both, as they were concerned with how to reach wider audiences or to rekindle relationships that had withered. Callahan looked at strategic planning and was concerned with how to reach a wider audience through telling the story of the Garden and creating multiple pathways for engagement, while keeping engagement flexible and creative so potential participants were not limited. With the established pathways, people will figure out on their own how to engage the Garden, thereby allowing for a more inclusive and flexible interaction on things the Garden personnel had not thought of. Cain was concerned about constraints for the Garden in terms of funding which limited workforce, equipment, and staff time. She also noted that the Garden had buy in from various parts of the community at different times, which needs to be re-fostered; also, additional avenues need to be pursued so the Garden can fulfill its mission.

Lastly, Cain noted that production needs to be more of a focus – the Garden should be producing a yield so people can see the fruits of their labor when they work or volunteer there.

Vision

Both Cain and Callahan had major projects focused on community buy in and a five-year vision that included the CSA. Cain was interested in tapping into the K-12 and farm-to-table movement to educate urban students with limited access to food and growing things, as a public health initiative. Callahan was interested in creating a regular set of engagement pathways so people know what's going on at the Garden such that incoming first year undergraduates are aware of opportunities for visiting, planting, and independent research at the Garden. He was also interested in developing undergraduate research at the Garden through the SURF program (Summer Undergraduate Research with Faculty) at the College. This would aid the Garden through increasing topic specific research. Cain stated that management complexity increased significantly after five acres, and suggested that be the medium term target.

Needs

Overarching needs for the Garden Administrators include building and facilities available for use at Dixie Plantation. Programmatically, the main themes from the interviews were staffing the Garden and awareness of the opportunities the Garden and Dixie offer. For staffing, Cain stated: "Growing up on a farm, I know all the things that can go wrong and that need to be fixed pretty immediately and might be outside the realm of expertise of graduate students" (Cain 2016) and thought a full time land manager would be important. Increased staffing and community buy in would allow for something to be going on year round so there is always something to see. This would require funding, and larger scale equipment.

Callahan elaborated on the SURF program, which would not need much in the way of resources. It does; however, require the student and professor to work together on a research application, necessitating thinking and planning in advance as well as continuity from the GA staffing of the Garden and increased awareness of the Garden.

Student Managers

Student Managers are the graduate students employed at the Garden, and thus in charge of day to day care and maintenance for the area. These include Sean Dove and Tyler Hassig.

Mission

The main themes the student managers of the Garden had for the mission were that it functions as a demonstration and educational site that the students and community could see. Hassig said the Garden was "… about having something student driven, student initiated, [and] student planned" (2016). The educational component is important because the Garden serves as an incubator site for students who typically have little to no agricultural experience; it allows them to experiment through volunteering and research. Additionally, the Garden serves as a highly multi-disciplinary area engaging many different groups within a small area and it shows them different possibilities (Dove 2016). Both thought the Garden was approaching its fulfillment of the mission, but not there yet since it is not reaching many students currently.

Vision

Major projects for the Garden were to increase its productivity (Dove 2016) and make it low maintenance (Hassig 2016). Productivity would include having 10 or so species growing in the main production fields, and would allow for the interconnection with health and public service. Transitioning to low maintenance includes switching to plants that do not require as much watering, reworking the layout of the Garden and its design prioritization – de-emphasize "looks," and switching the grassy areas to wildflower patches or fields. The wildflowers do not require mowing (currently a significant time expenditure) and perform more habitat functions than grass.

The five-year vision of the Garden also includes an expansion to three or five acres from the current two, and having that run well. Other parts of the vision include establishing a process so that there are no major lull periods where things get out of hand such as after the flood, and there are established documents outlining planting methods and patterns throughout the year (Dove 2016). An additional focus on resiliency in the Garden's organizational structure is also key, so that if one person or project moves on, finishes, or fails, the whole Garden doesn't suffer (Hassig 2016).

Needs

The Student Managers mostly focused on physical assets the Garden would need for their projects, vision, or expansion. For the low maintenance landscape alterations, wildflower seeds, fuel for the tiller, manpower, grading of the land for drainage, and collaborative input on designs are needed. Several tools have been stolen recently, so replacement of those is needed. New buildings are also needed: a larger greenhouse and shed, with wash station and bathroom, and a gazebo for meetings and escape from the sun and rain.

More strategy focused needs include marketing towards other students and the community (Dove 2016; Hassig 2016). This could include creating lists of projects or ideas for student research projects (Hassig 2016). Both of these need known avenues of contact with the Garden so that it is easy to get to the Garden and organize the project.

Other programmatic needs include the Garden advisory committee. Tyler thought that the group would be able to provide advice and resources for the GA, as well as input or crafting of the vision and mission of the Garden.

LANDSCAPE SUITABILITY ASSESSMENT

This section examines the spatial features and landscape attributes of the Student Garden. The first section is a baseline documentation of the current features and layout. The second section is a landscape suitability assessment for agricultural production.

Baseline Documentation and Layout

Baseline documentation consists of a document containing GPS referenced photographs (Available in the Appendix: B: Garden Baseline Documentation), a table of current infrastructure, and a map of the current layout of the Garden. For the photo document, photos were taken of structures, fields, utility sites, and artwork that comprise the Garden. Based on the interviews, each picture was given a description or purpose. Numbered photos are shown with their descriptions. Following the photo layout is a table summarizing all of these as well as cataloging the latitude and longitude of each photo location. Table 2 contains a summation of the current infrastructure at the Garden, categorized by Structures (built environment), Agriculture (food and habitat features), and Utilities (electricity, water, and parking features).

Table 2. Inventory of current infrastructure at the Garden

Current Features of the Student Garden		
Structures	**Agriculture**	**Utilities**
Tool Shed	Production Fields	Water
Greenhouse	Demonstration Beds	Electricity
Fencing	Pollinator Field	Parking

These categories are shown spatially in Figure 8, which combines interview data and baseline documentation. The map has locations of fields, structures, utilities, and other infrastructure. Each major feature is labeled and symbolized with either a color, hatch marks, or an icon. Fields are colored according to their use: buff colored for agricultural uses and green for habitat. There are three agricultural areas: production fields in the northwestern area of the Garden; demonstration beds to the south of the production fields, and a medicinal and culinary herb garden. Encompassing all of the agricultural fields is a deer fence to prevent deer from eating produce. As of June 2016, the fence is under construction. The completed areas are shown in yellow. As an intermediate step, much of the demo bed area is fenced. Utility features are mostly centered in these agricultural areas with water spigots bordering the northern edge of the demonstration area. Only three of the four spigots are shown, since the last one does not work. Electrical outlets are located at the shed and greenhouse area. These are the only buildings on the site. Lastly there are the areas used for compost and soil storage. These are generally just piled in the noted location with needed materials transported throughout the Garden. Parking is in the southeastern quadrant of the Garden, and is a cleared field. There is some gravel leading off the road and down the southern edge of the defined parking area.

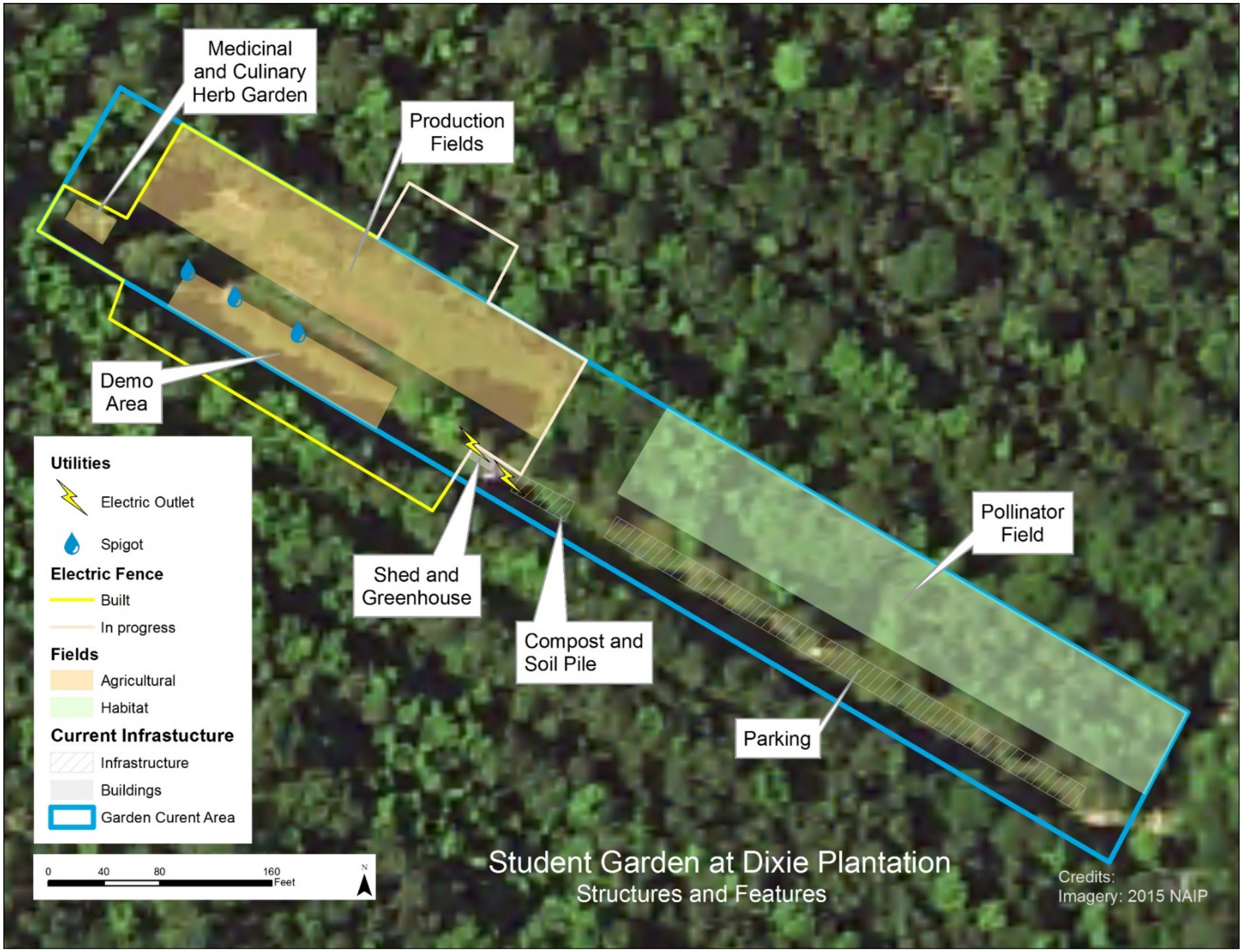


Figure 8. Layout of current structures, features, and usage patterns of the Student Garden

Landscape Suitability

This examines soil, water, and infrastructure at the Garden to assess how suitable the Garden and surrounding area is for agriculture.

Soil

The soil profile of the garden is shown in Figure 9, a map displaying the spatial distribution of two characteristics in the SSURRGO dataset: NRCS Land Capability and USDA Farmland Classification. These are both aggregate indicators which describe agricultural productivity.

Land capability is an aggregate indicator developed by the National Resources Conservation Service (NRCS) for how productive a soil is for agricultural cultivation. In the classification "...soils are grouped according to their potentialities and limitations for sustained production of the common cultivated crops that do not require specialized site conditioning..." (Klingebiel 1961, 1). Classifications range from 1 to 8, and are a composite factor of four types of hazard: erosion, wetness, rooting zone limitations, climate. Risks to soil damage or agricultural limitations increase with the classification; ergo, a classification of 1 is best (Klingebiel 1961).

The second indicator is the USDA farmland classification. This is divided into Prime Farmland, Farmland of Statewide Importance, and Not Prime Farmland. Prime Farmland is what the USDA deems as "…the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses" (NRCS 2016). The Prime Farmland classification takes into account moisture supply, climate, soil acidity, salinity, permeability, and ability to till, as well as a low slope (NRCS 2016).

The Land Capability ratings work on a scale where smaller is more suitable for agriculture; as such, a rating of one is the best. Dixie Plantation does not have any ratings better than 2. Around three quarters of the Garden area is comprised of ratings of two; however, the main agricultural plots of the Garden are in a zone rated 3, and are thus less suited for agriculture than the rest of the Garden.

The USDA Farmland classification rates as either Prime Agricultural land (the best), Farmland of Statewide Importance (Good, but not the best), and not prime (lacks features or attributes that make the other land better). Prime Agricultural Farmland is represented as stripes in the map. These are distributed on the eastern half of the Garden. This area is currently used for parking and is the proposed area for a pollinator habitat. The areas used for agricultural production are rated as Statewide Importance, a lower classification.

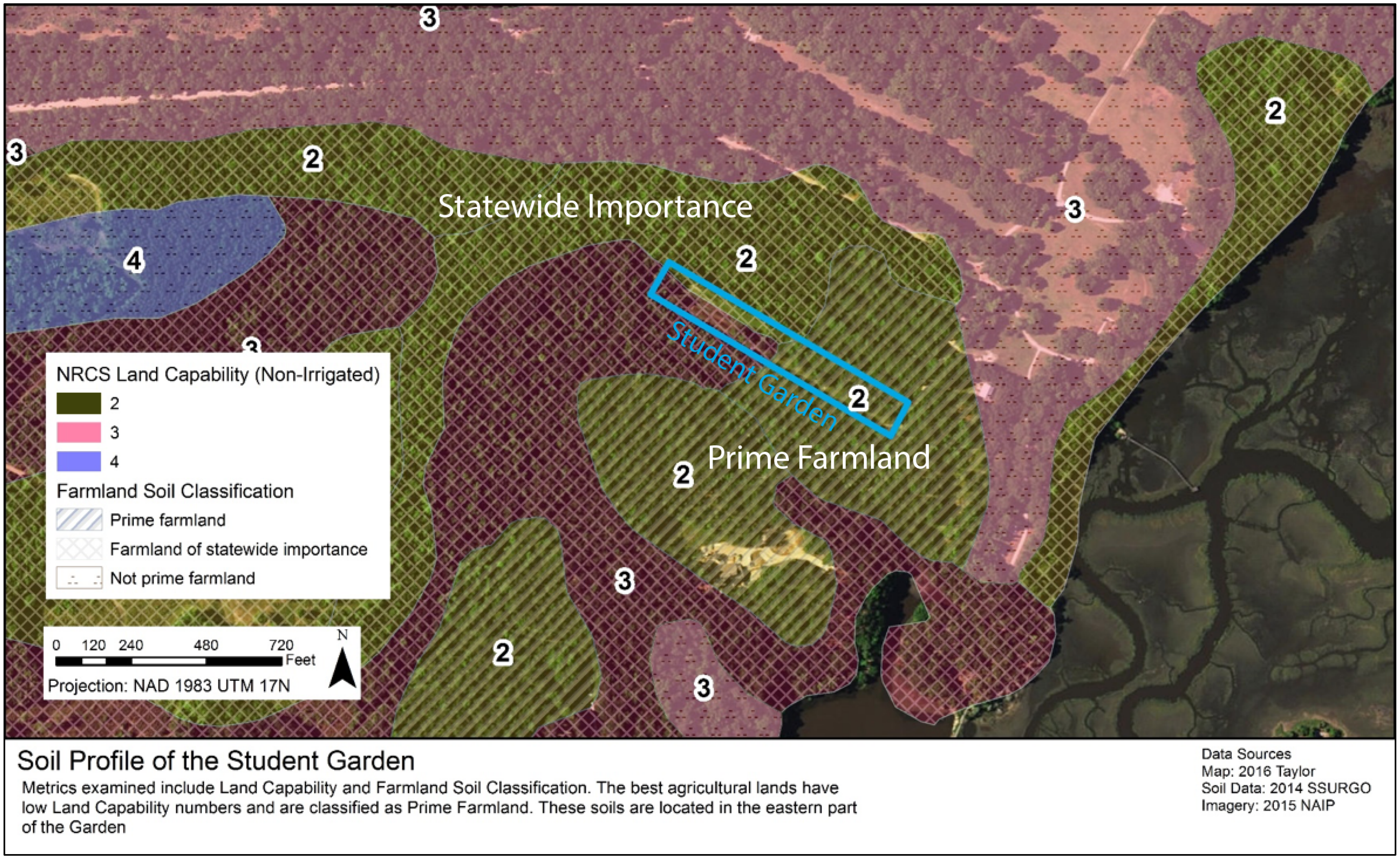


Figure 9. Soil suitability for agriculture using composite indicators

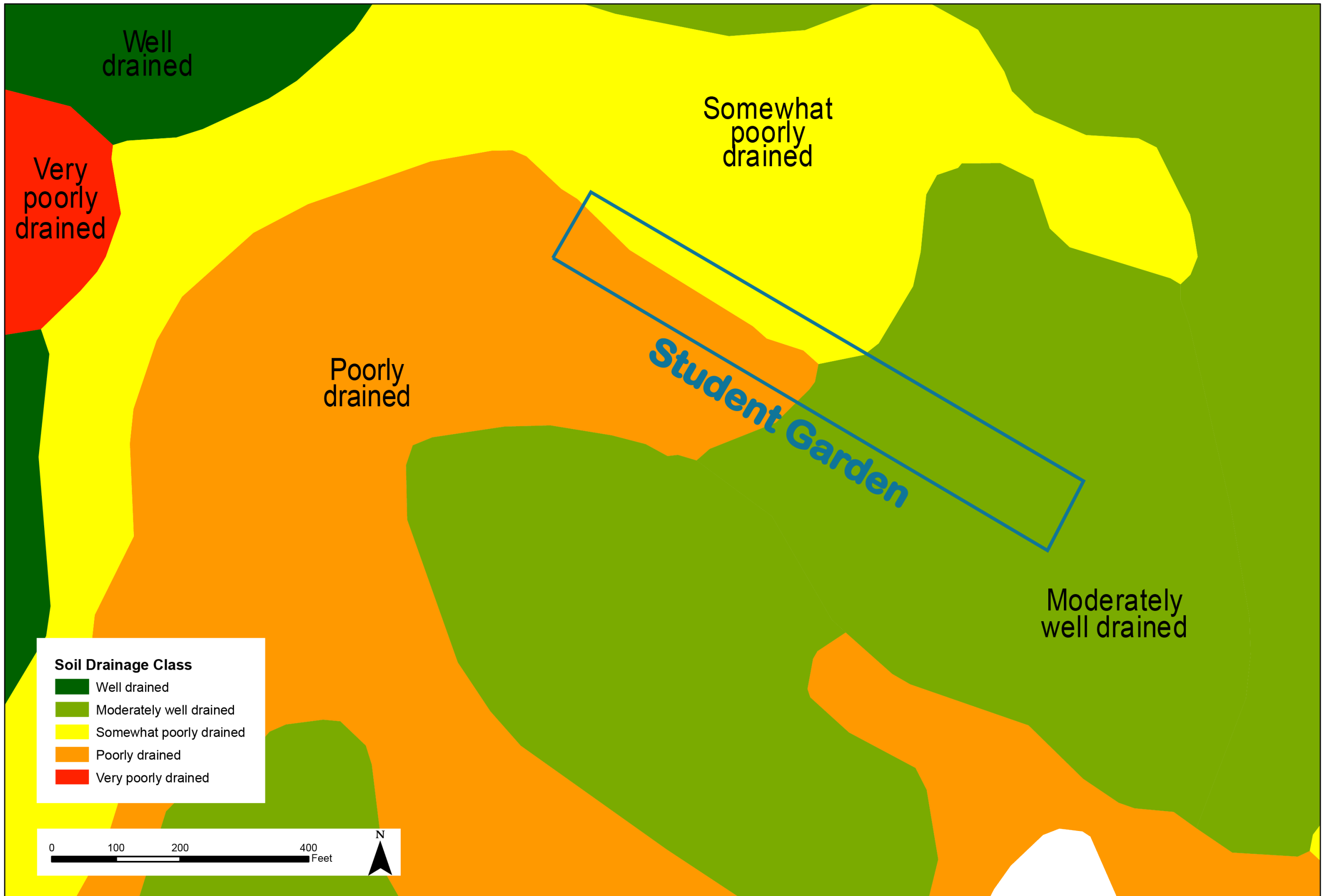
Water

Two sets of water data are shown in Figure 10 through Figure 11: drainage and calculated runoff pathways. For drainage, (Figure 10) the main Garden area is dominated by poorly drained soils. The production area is dominated by somewhat poorly drained soils. The parking area and pollinator fields are dominated by moderately well drained soils. This is the best classification in the Garden, as well as the surrounding area.

Calculated runoff pathways show the pathways rainfall is likely to flow along. This data is symbolized by the colored lines in Figure 11. The lines thicken and change color as other streams join them. Thus, thicker lines equate to higher volumes of calculated flow. Runoff from the road and oak alley to the north of the Garden pass through the northern bordering forest and are caught by the drainage ditch that forms the current boarder to the Garden. From the ditch, the flow is calculated to pass through the herbal and medicinal garden area to another drainage ditch, and ultimately to the Stono River.

Three smaller flows start in forest north of the Garden. Two of them join and pass through the pollinator field and parking area. Ultimately all of these join the drainage ditch noted above. Thus, all water passing through the Garden ultimately joins up and flows to the Stono. An interesting feature of note is that, other than the northern drainage ditch channeling the flow for a short distance, the ditches do not seem a major contributor to the flow in the Garden area.

Several other values were examined, but not included in the figure, such as flooding frequency, which had all areas near the Garden indicated as "None." This infers that other than time of extreme events (such as the October 2015 floods), this area should not be prone to coastal flooding. Rather, it is prone to localized flooding in the sense that areas drain poorly, especially in the southwestern quarter of the Garden.



Water Profile at the Student Garden

Assesses the suitability of the soil for agriculture in relation to drainage. Soils rated as Well Drained are the best since most crops prefer that. This allows for fewer drainage control structures to be built. Areas in the eastern part of the Garden contain Moderately Well Drained, the best around the Garden. The western portion contains poorly drained soil. This is were most of the agricultural production is currently taking place

Data Sources
Map: 2016 Taylor Thesis
Hydrologic Data: 2014 SSURGO
Imagery: 2007 SCDNR Lidar

Figure 10. Soil drainage profile of the Garden.

The calculated stream runoff data were imported into a 3D visualization package, ArcScene, to get a better sense of the lay of the land. Elevation was exaggerated to emphasize the drainage patterns. Figure 11 shows that the Garden lies between a high area and the marsh and Stono River. The high zone contains the main road from gate four, used to access the portion of Dixie that the Garden is in. A few calculated rainfall runoff paths flow through the Garden, mostly through the higher areas that are the location of the road and oak alley. An historic train track to the west of the Garden serves as a barrier to flows from that side into the Garden.

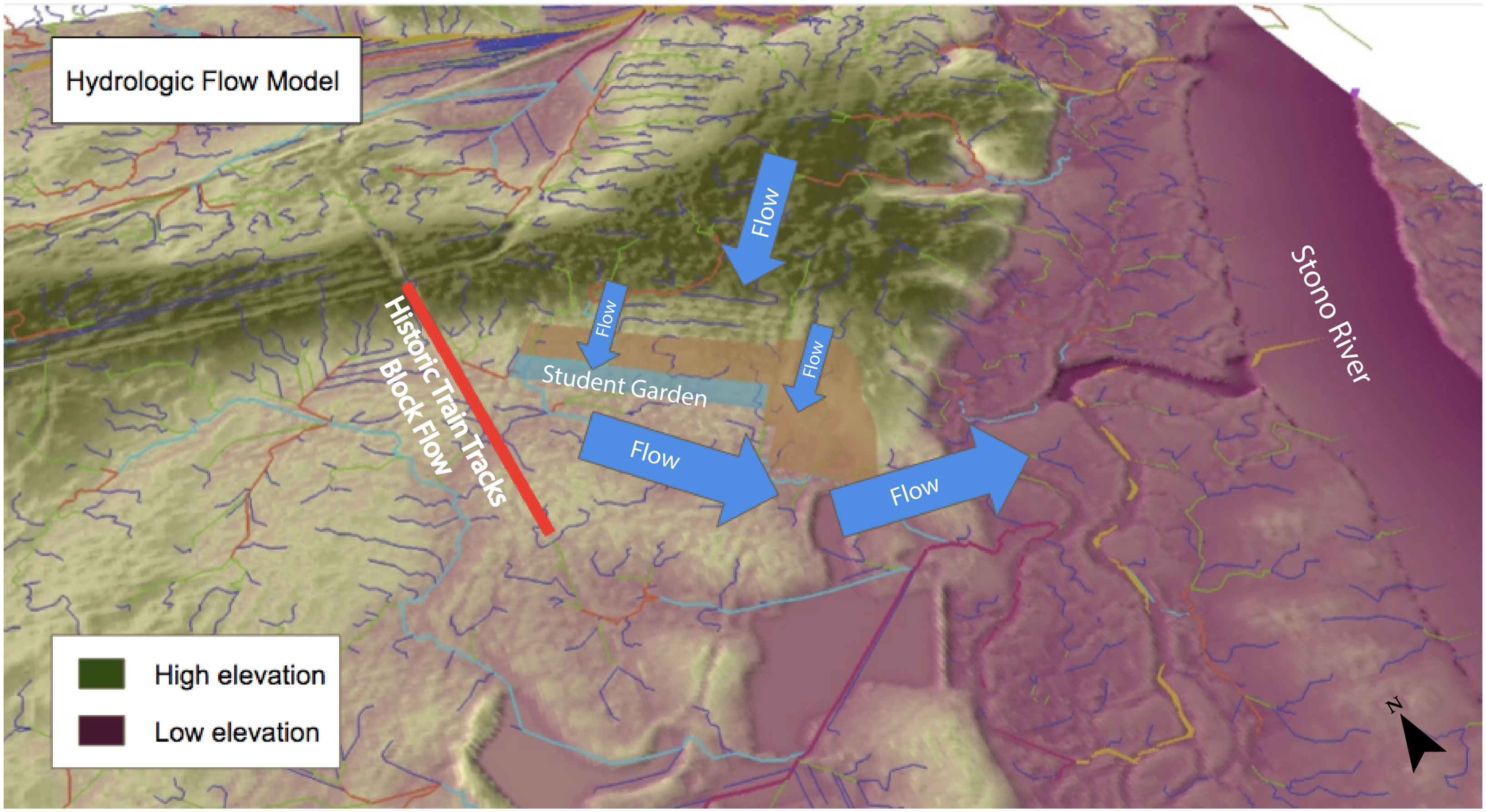


Figure 11. Visualization of surface water flows through the Student Garden

Infrastructure

Soils dictate the types of buildings and structures that can be built. The SSURGO data set has several variables that detail how soil types relate to structures. For the purposes of this project, buildings without basements were considered, as some of the identified needs are for a large shed with bathroom, wash area, and storage for tools and produce. Building suitability for this type of structure is shown in Figure 12. Suitability is symbolized with different colors. Soils that do not limit structures are shown in blue. Soils listed with "some limitations" are shown in red. Soils with significant limitations are shown in orange. The northwestern half the current Garden has limitations on structures. The southeastern is not limited. The current area where produce is grown has the highest limits. The expansion areas contain several acres that are not limited.

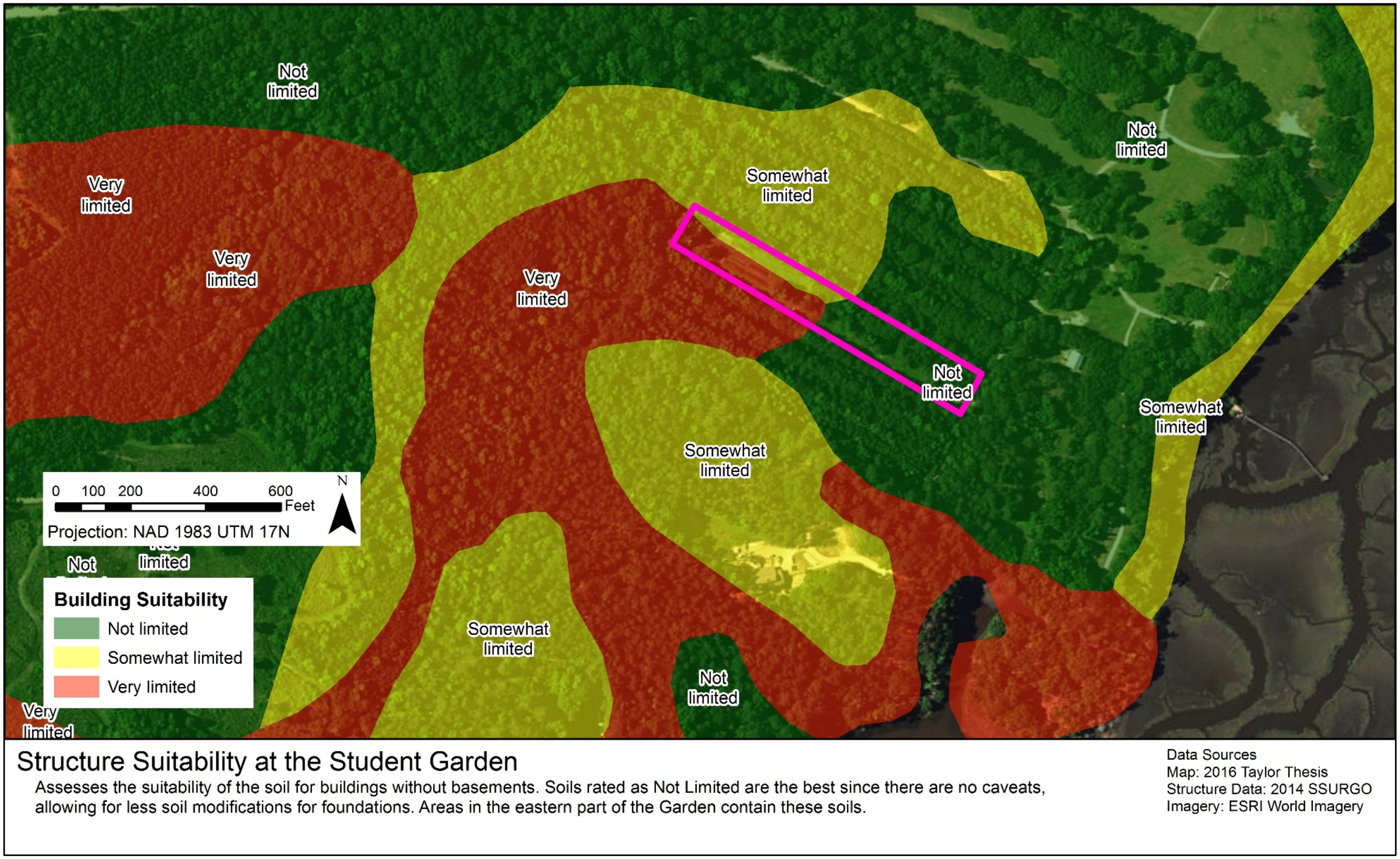


Figure 12. Structural suitability assessment of soils around the Garden.

LANDSCAPE PLANNING

The landscape design consists of three steps: (1) constructing a cultural composite map of the historical uses of Dixie plantation; (2) a site visit to a small-scale commercial nursery to gain insight into well laid out gardens; (3) a concept drawing integrating these features while taking in to consideration the lessons learned from the interviews and landscape suitability assessment.

Cultural Composite

A map of the cultural components surrounding the Garden is shown in Figure 13. Four time periods were used: 1807, 1919, 1960, and 2010. Features from each time period are color coded, and labeled with useage. The 1807 map (orange features) has several interesting features.There was a marsh going through the middle of the Garden at this time and the road going east of the Garden had a triangle feature to the south; slave cabins were located to the north of the Garden. The 1919 data shows sharecropper cabins located in the same vicinity as the slave cabins. These are likely of archaeological interest. There was also a train track located to the west of the Garden. Though the tracks do not show up in the 1960 map, they are still visible on current elevation data, and therefore impact hydrology. Ponds to the southeast of the area where the Garden is located today show up in the 1960 map. These were constructed by John Dick for wildlife. They have since fallen into disuse and become overgrown. One overall trend shows that the roads have all followed roughly the same pathing, with some minor configuration changes.

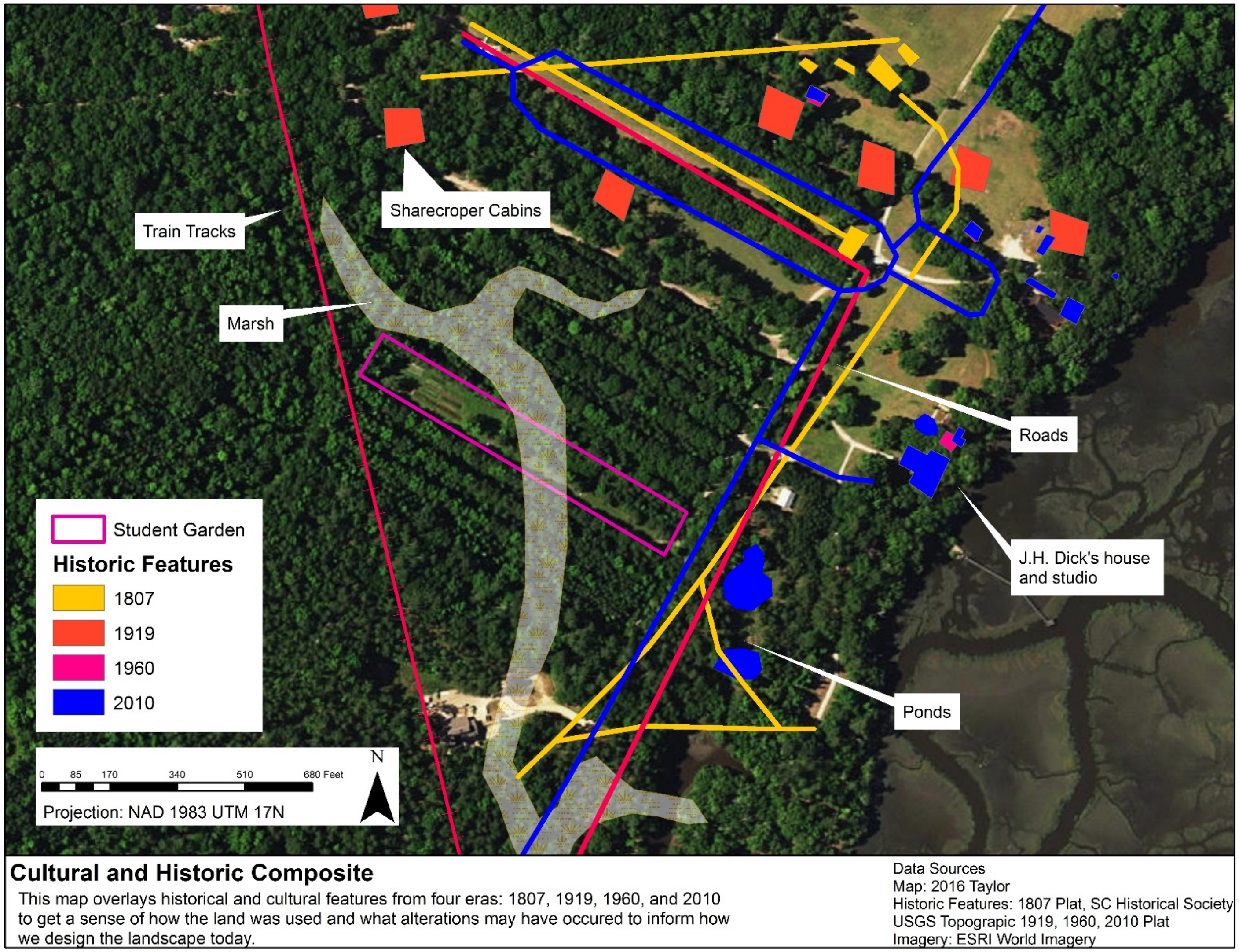


Figure 13. Cultural and historic composite map of the area surrounding the Garden. Includes features from 1807, 1919, 1960, and 2010 to gain an understanding of how the site was used

Site Visit

Two local nurseries were visited to gain an understanding of how small-scale commercial operations are laid out and to serve as a potential model for the Garden: Church Creek Nursery and Sea Island Savory Herbs. Of the two, Church Creek was more informative, and is the model shown in the remainder of this section. Photos were taken of the features and buildings of interest that may be adapted for use for the Garden. Shown first is the spatial layout of the nursery in Figure 14, photos of features are shown in the Appendix: C: Site Visit Documentation.

The main office and work area is centrally located and easily accessible from all points of the nursery. Areas that require more human intervention are located closer to the main building, such as greenhouses and areas customers are likely to wander. Areas requiring less interaction are located farther out, such as the irrigation pond and orchard. The greenhouses allow for different types of climate control for plants of differing needs. All the greenhouses are individually controlled for lighting, humidity, and temperature. The sides can be rolled up to allow heat to escape, and shade cloth can be draped across it to cut sun exposure. Additional climates come in the form of full sun exposure outdoors, shade structures, and wetter conditions for marshy plants such as grasses. The garage allows for storage of equipment and supplies in a secure environment.

Site Visit Overview: Church Creek Nursery

Site that can serve as a model for the Student Garden. It has a multifunctional main building that contains an office along with a shaded work and rest area, which is all centrally located. Multiple climate conditions are available for growing plants: full sun and shaded outdoors, as well as multiple greenhouses.

Credits:
Map: 2016 Taylor Thesis
Imagery: ESRI Basemap (Imagery) 2016
Labeling Data: Mari Beth, Manager, Church Creek Nursery

Figure 14. Layout of Church Creek Nursery, John's Island, SC. Used as a model for expanding the Student Garden.

Garden Expansion Delineation

One of the goals for the landscape design concept was to expand the Garden so it would have the space required to fulfill its mission. Several iterations of the expansion area have been developed. Figure 15 shows the current area the Garden occupies, the initial expansion area, and the finalized expansion area.

The original expansion plan was to increase the Garden's footprint to the bounding road to the north and east of the current area, for a total of 17 acres, which comes from the Dixie Planation visioning documentation for developing the site into a field research location. Results from the interviews indicated that this was far too much land to be planning for in the short to medium term given the current funding and staffing levels. Rather, there was consensus around a 3-5 acre increase.

The landscape suitability assessment gave some guidance on where those additional acres should be located. Soil suitability for agriculture, drainage, and buildings all improved markedly to the east and north of the current Garden extent. Thus, this area was considered for shifting the main components of the Garden to. The cultural composite analysis gave a northern boundary to avoid any archaeological sites, while also revealing historic ponds that might be of benefit in aesthetic and production sense. These ponds are located across the road from the Garden.

Distilling the guidance each of these separate analysis give, shows that the Garden should limit the expansion to around 5 acres, with most of the new acreage in the east to utilize better soils, and across the road as well to include ponds. The finalized expansion area is shown in Figure 15 that accounts for all of these features. Note that the acreage is somewhat above the 5 acres indicated in the interview results; however, not all of that acreage is actively managed for agriculture, as shown in the concept drawings in the following section.

Figure 15. Finalized Expansion Area for the Student Garden.

Design Concept Drawings

The development of concept drawings required a process of several iterations, incorporating data from the interviews and feedback from the prior concept drawings to create a refined and more applicable concept. The initial concept drawing, shown in Figure 16, incorporated the missions that were cataloged during the interviews: education, production, and research. Each of these missions have specific areas dedicated to them within the concept drawing. Demonstration beds for education; greenhouses and food forests/orchards for all three; and row crop fields for production. Newly proposed buildings flesh out the concept. The centerpiece of the first concept is a multifunctional office and work building centrally located. This allows for easy access to the rest of the grounds, an obvious visitor check in point, a place for a full time staff person to work and rest out of the sun, as well as a place to perform preparation and post-harvest work. Greenhouses allow for production to occur year-round, as well as serve as a space for climate controlled research. The garage is for secure storage of equipment. There are defined parking areas, turn around loop due to the narrow nature of the parking lot, and a service road for maintenance and moving through the Garden. This concept does shift the current plans for the pollinator field slightly to make room for the central office/work building. Concept 1 was presented to the Garden Director, Abbie Cain, for review. Changes were incorporated into Concept 2.

The second iteration, shown in Figure 17, builds on the previous concept and factors in feedback. Feedback includes incorporating the existing shed across the road, accommodating parking for a bus, and expanding the service roads for increased accessibility. Including these changes, the second concept expands the area to the other side of the road to include the existing shed (referred to as "existing barn" in the concept), enlarging the food forest/orchard area. It also proposed a new nature walk that incorporates the ponds as natural features. This concept does still include the multifunctional office/work area since the utility shed would not replicate the centrality or multifunctionality of the office. The shed could serve as an intermediate step as it contains restroom facilities and a covered area for work and storage.

Figure 16. Student Garden Expansion Concept #1 (July 12, 2016)

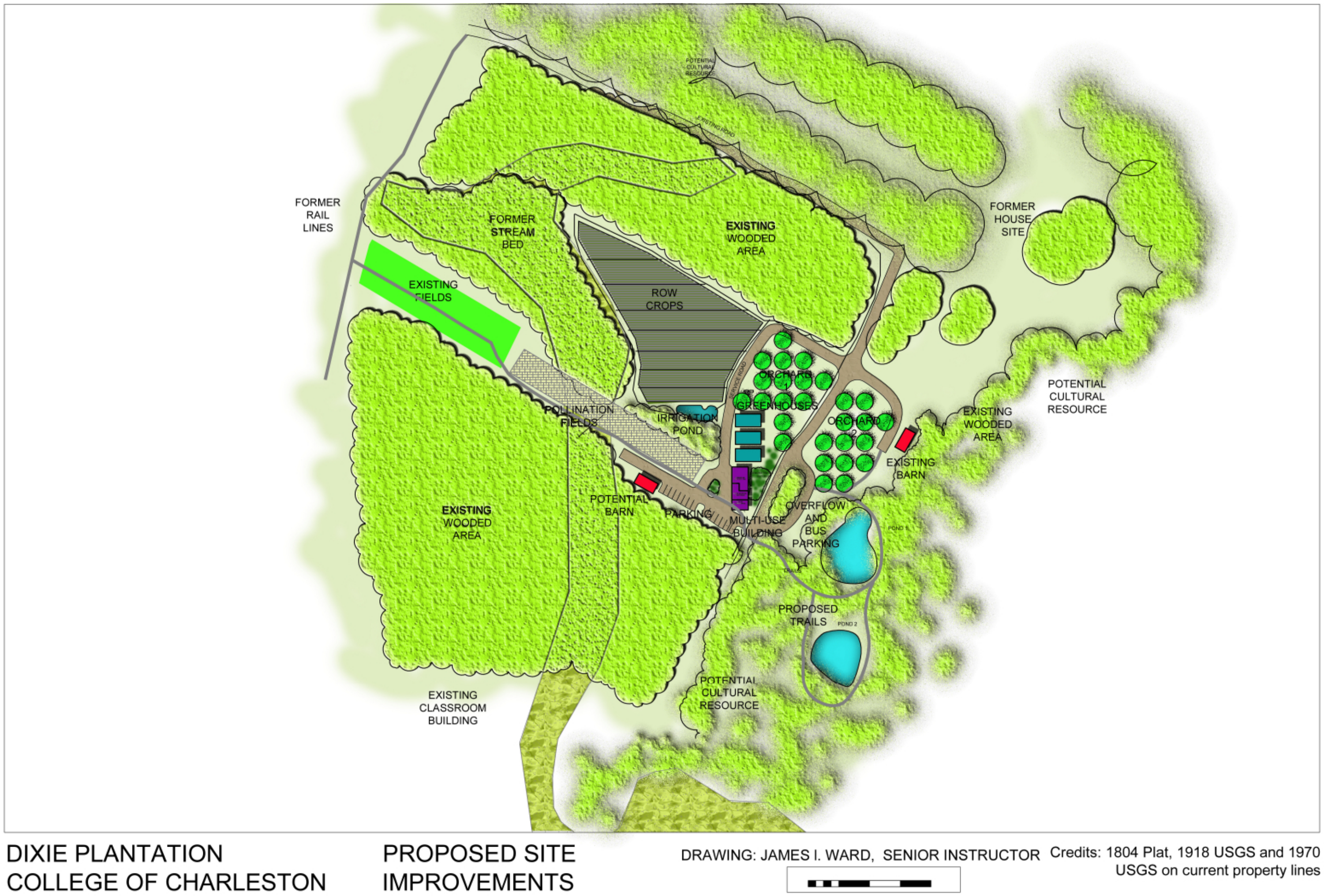


Figure 17. Student Garden Expansion Concept #2 (July 19, 2016)

DISCUSSION

STAKEHOLDER ANALYSIS

This section examines the degree of alignment for the different groups interviewed regarding their thoughts of the mission and vision of the Student Garden. Mission, vision, and goal statements are then proposed that attempt to build on commonalities and unify input from these stakeholder groups. Also drawn from the interviews are the needs associated with each proposed mission and vision from interviewees.

Mission Alignment

This section examines how the three interview groups agree or disagree on areas of the Garden's purpose or mission, shown in Table 3. The four components of the mission listed in Table 3 come from topics interviewees brought up in the interviews. Following the list are columns for each interviewee group, and an overall qualitative assessment on agreement. Explanation of the coding is shown at the bottom of the table.

Table 3. Mission Alignment

Mission	Student Users	Administrators	Student Managers	Agreement
Demonstration	Yes	Yes	Yes	**Yes**
Research Location	Yes	Yes	Yes	**Yes**
K-12 Education	Yes	Yes	Vague	**Most**
Campus Produce	Yes	Vague	No	**Mixed**
Yes (green) indicates interviewees specifically wanted the mission parameter. Vague (yellow) indicates they made reference to, but didn't explicitly mention that parameter. No (red) indicates they did not talk about that item during the interview. Agreement looks at how all the groups aligned on a specific mission parameter.				

Areas of mission agreement include the use of the Garden as a demonstration site for sustainable gardening and farming techniques as well as using the Garden as a research location for undergraduate and graduate projects for College of Charleston students. Slightly less agreement existed over use of the Garden as an educational site for kindergarten through grade 12 school students. Most contention existed around the use of the Garden as a source of produce for the College. Student managers did not talk about this at all when asked about the mission, and administrators made allusion to it. The Student Users group was most heavily involved in this, so it makes sense that they would bring it up as a mission for the Garden. Current Student Managers have had little interaction with campus produce at this point and for Administrators it has been mostly an academic exercise.[3]

An interesting takeaway from this qualitative assessment is that while these are results from interviews and questions explicitly asked about the mission, the topic of CSA was not brought up. Although there has been talk of the CSA outside of these questions during the weekly meetings, or other informal conversations; the fact that it wasn't talked about explicitly during the mission questions is telling. This small example of incongruence indicates that a cohesive mission statement is needed for agreement to coalesce.

Vision Alignment

This next section looks at how the interviewee groups aligned on vision for the Garden's future. This follows the same color coding and labeling as the Mission Alignment section. All classification is based on explicit mention within the questions pertaining to vision.

[3] Note that Carmen Ketron, currently classified as a Student User championed using the Garden to provide students with produce through a CSA while she was employed at the Garden. This is a snapshot of the current people and their positions within the Garden.

Table 4. Vision Alignment

Vision	Student Users	Administrators	Student Managers	Agreement
Student Research	Yes	Yes	Yes	**Yes**
Garden Size 3 - 5 acres	Yes	Yes	Yes	**Yes**
Student CSA	Yes	Yes	No	**Most**
Garden Productivity	Yes	Vague	Yes	**Most**
Continuity of Knowledge	No	Yes	Yes	**Most**
Workshops	Yes	No	Vague	**Mixed**
Food Forest	Yes	No	Vague	**Mixed**
Low Maintenance	No	No	Yes	**No**
Yes (green) indicates interviewees wanted that vision parameter. Vague (yellow) indicates they made reference to, but didn't explicitly mention that parameter. No (red) indicates they did not talk about that item during the interview. Agreement looks at how all the groups aligned on a specific vision parameter.				

Areas of agreement for the vision include increasing student research at the Garden, and sizing the Garden to around 5 acres in the coming years. The student research makes sense owing to its inclusion by all groups as part of the mission. Areas with slightly less agreement are the student run CSA, garden productivity, and continuity of knowledge; these are classified in the column “Agreement” as Most. So, while the CSA is not included in the mission for most groups, it is included in the vision by most, which is interesting. Some of this might have to do with the confusion over mission and vision statements, or current emphasis on other areas of the Garden such as work to recover it after the devastating floods in October 2015. Garden productivity includes making the Garden grow more vegetables in an effort to become more self-sustaining financially or as an effort to gain traction with undergraduates who likely want to see something for their labor. Continuity of knowledge includes creating documents that can guide future Garden staff through planting and harvesting rotations, as well as creating systems that keep the Garden resilient such that it does not collapse with the absence of a single person or project. It makes sense that Administrators and Managers are concerned about this while Users are not, as the former group must deal with the fallout of staffing and knowledge base absence, and Users (while affected) have other priorities.

Areas showing disagreement include workshops, food forest, and making the Garden low maintenance. Workshops means that the Garden hosts education workshops on specific topics that the student body and community can attend. Student Users were most concerned about this, and it aligns well since their use of the Garden is mostly for personal or academic education. The food forest was brought up as an educational technique by the Student Users group, so it aligns well with the workshops area of the vision. Making the Garden low maintenance was brought up only by the Student Managers. This makes sense as they are the ones who have to deal with the day to day weeding, pruning, and overall maintenance of the Garden. Most of them live in or nearby downtown, which makes commuting daily to the Garden a challenge.

Proposed Mission, Vision, and Goal Statements

Given the lack of clarity, but broad consensus, on the mission and vision for the Student Garden among the key stakeholders shown in the prior section, proposed mission, vision, and goals statements were created that attempt to unify the various interests. These are based on the interview results as well as three years of interaction with the Garden, and knowledge through the MPA program on how nonprofits use and implement these statements.

For the mission statement, three areas leap to the fore as the main roles the Garden plays: Education, Research, and Production. These are targeted towards three audiences: the College of Charleston student body, local primary schools, and local community members. This, plus the guidance that mission statements should ideally be around 100-150 words and readily recited by staff members and volunteers, lead to the proposed mission statement:

> *"The mission of the Student Garden is to provide and support experiential education, research, and food production for the College of Charleston, local schools, and Charleston regional community members using sustainable lowcountry gardening practices."*

Vision statements expand upon the mission statement to show what the world would look like in the future if the mission of the organization was achieved. Thus, it serves as a way of situating the mission in a broader context. The proposed vision statement is:

> *"A lowcountry community that knows where and how their food is produced, and feels empowered with knowledge and skills to grow their own food with practices that preserve the land for future use."*

Goal statements are far more fluid than the prior two, and can be readily modified by the organization to adapt to short-term needs and current projects. These must still fit with the mission and vision statements to demonstrate by line-of-sight how the organization is fulfilling its mission. Examples of proposed goals for the Garden are:

- Educate the College of Charleston community by conducting themed workshops once a month
- Provide space and resources for student research at the Garden.
- Feed the community by having a student run and supported agricultural subscription program.
- Educate the broader community by serving as a demonstration site for sustainable gardening techniques in the lowcountry.

Note that these proposed statements are just a first step; members of the Garden should take these and modify them as an inclusive group to ensure they fit their needs. With separate mission, vision, and goal statements, those affiliated with the Garden should have less confusion over the role the Garden plays in the College and community as well as the methods of achievement. Firming up agreement among the stakeholders regarding the mission, vision and goals and then moving to implementation will also lead to a more unified image of the Garden being presented to the College and the community.

Consolidated Needs

The interviews also served as a way of gathering all the infrastructure needs and expectations for the expanded mission and vision of the Garden. These are shown in Table 5 by use type. These consolidated needs are used in the landscape design when formulating a concept drawing for the expansion.

Table 5. Consolidated infrastructure needs

Needed Features of the Student Garden		
Structures	**Agriculture**	**Utilities**
Larger Greenhouse	Food Forest/Orchard	CSA wash and preparation station
Larger Shed	Production Area	
Gazebo	Demonstration Areas	Bus Parking
	Heritage Crops	
	Better Drainage	

The consolidated infrastructure needs in the above table provide guidance later on for the landscape concept design of the Garden. Structures to include are new and larger greenhouses, sheds, and a rest area (gazebo). Future agriculture includes expansion of the production and demonstration capabilities of the Garden, a new food forest or orchard area, space dedicated to traditional plantation crops (such as indigo, cotton, tobacco). Supporting all of this is better drainage, which can come in the form of altering topography or location. Support utilities for the expanded and revised mission come in the form of a wash and preparation station for the CSA produce, and parking area for a bus and other visitors. The wash station is required for DHEC Good Agricultural Practices (GAP) certification, which is a prerequisite for distributing food. Parking allows for more outreach to local school groups. With K-12 students, other facilities will be needed such as restrooms.

LANDSCAPE SUITABILITY ASSESSMENT

Landscape suitability analysis is comprised of three factors: soil, water, and infrastructure. Each of these are explored in the following paragraphs.

Soil suitability included two sets of data: NRCS land capability for non-irrigated crops, and USDA farmland classification. Both are composite indicators for how well suited a soil is for agricultural purposes. Land capability is defined by numbers ranging from 1 through 8, with 1 being the best suited for agriculture. Dixie Plantation contains soils ranging from 2 through 8, with the Garden containing soils rated 2-3. The current area used for production and demonstration is rated at 3, the worst within the Garden area. Interestingly, the parking area and pollinator habitats are rated at 2, and are therefore better suited for agriculture than the current areas.

USDA farmland classification follows the same trend for the most part, with the current Garden area as unrated, and areas to the east rated as Prime Farmland. Areas to the north of the current area are rated as Statewide Importance – so while better than unrated soils, that region is not as good as Prime Farmland. Both the USDA and NRCS composite indicators, suggest that the Garden should have its production areas moved from the current location to a location in the eastern area. Areas with both Prime Farmland and a Land Capability rating of 2 should be targeted.

Water suitability largely follows the same trends as soil suitability, showing poor drainage in the current production and demonstration areas, with moderately well drained soils in the eastern extent. Flow modeling reveals some interesting details in that the areas from the road and oak alley drain through the Garden in two drainage basins. To modulate this, a buffer should be kept along the road to keep surface runoff to a minimum. Another possibility is to situate water features like ponds based on drainage pathways.

Building and infrastructure suitability show some limits in soils on the western half of the Garden, while these are unlimited in the eastern half. This means that large sheds and assorted other buildings should be located in the western half of the Garden so as to not run into foundation issues with the soils.

Integrating these data together supports a recommendation to move the garden or main agricultural production areas from the southwestern corner to the eastern edge. The expansion of the Garden should occur in this area as well. Situating it along the road gives increased access, better soils, and better drainage, as well as the potential to expand across the road and utilize the currently abandoned ponds in the future.

LANDSCAPE PLANNING

Cultural Composite

Layering the four historic maps (1807, 1919, 1960, and 2010) gave context to the site in addition to the soil and water analysis. Not meant to be an in depth analysis of the archeological features, the composite indicated that there were a number of historic building sites located near the Garden. Slave cabins in the 1807 survey, share cropper cabins in the 1919 topographic map, John Henry Dick's studio and house in the 1960 topographic map, and the current day structures in the 2010 plat. These give the Garden some boundaries for the expansion. While there are no visible ruins associated with the nearby building sites, the Garden does not want to expand into an area with a high likelihood of historical significance. This prevents conflicts with other departments performing research at Dixie such as the Archaeology Department, which has performed research and excavations for slave cabins at Dixie Plantation.

The roads largely follow the same areas, though there have been some shifts over time. In the 1807 survey, the southeastern road used to form a triangle. This feature borders the ponds Dick constructed in the 1960s for birds. Those ponds were abandoned to some extent and have grown over. They could be rehabilitated and integrated into the Garden in a variety of ways: irrigation source, aquaponics, wildlife habitat, or a combination of these.

The train tracks from the 1919 map, while no longer active, have left a legacy. The increased elevation of the soil under the tracts is still visible on the 2007 lidar imagery. This feature now serves as a hydrological divide between the Garden and the western part of Dixie, forcing rainfall from the area north of the Garden through the Garden to reach the Stono River. Rehabilitation of the drainage ditches through and around the Garden would mitigate some of the soil saturation this flow could cause. Additionally, forested buffers bordering the Garden would absorb some of the flow and serve as a visual break.

Another historic feature of note is the marsh shown on the 1807 survey. The impact of a 200-year-old former marsh is uncertain, but it does run along the border between the more and less suitable agricultural soils which was found in the Landscape Suitability section. Given its delineation as a less suitable soil for crop production, this seems to be a feature to avoid.

Site Visit

The site visit to Church Creek Nursery had three key features of note for the Garden: a centralized, multifunctional office, secure storage, and multiple climate zones. The main office building was roughly in the center of the area occupied by the nursery. It was clear that was the place to go when visiting the site for the first time. The building was also multifunctional; it served as an office, bathroom, storage, and multiuse shaded work area. From that location it was easy to access the rest of the site, as well as see most of the other buildings and site – which can be important from a control standpoint.

Additionally, there was a multi-bay garage that served as a secure storage space for the nursery. This is key for the Garden as it expands. Already equipment has been stolen several times from the current shed. With the expansion, larger scale and more expensive equipment will be used, making any thefts harder to replace due to the costs. Thus, a secure storage space is important.

Lastly, the nursery had multiple climactic zones for growing plants. Outdoors there was full sun, full sun with wet area for marshy plants, and shaded areas. This allows for a diversity of plants to be grown. The shade structures were especially interesting and necessary given the sun intensity during the summer in the Charleston area. The site also had a number of greenhouses. Each had its own climate control, allowing for a variety of different plants to be grown, thereby expanding the nursery's portfolio. This could be applied to the Garden for seed starting in one greenhouse, and another for a different phase or type of plant.

Concept Drawings

When creating the design for the Garden expansion, three main ideas based on landscape/ecosystem analysis were combined: the missions determined from the interviews, shift the Garden to a more productive location, and ideas from the site visit. The main missions identified were education, research, and production. Thus, the expansion area must include demonstration beds for education, row crop area for the CSA production, and for research a food forest/orchard area, greenhouses, and additional demonstration beds for student use.

To support the expanded functions, several new structures are proposed. A centralized building that serves as an office and multiuse workspace. This is good for teaching classes, performing agricultural preparation, and processing work. Two greenhouses, with the possibility to add an additional one, allows for climactic conditions for different plants or lifecycle stages. A service road enables easy access to everything, and a designated parking area allows for visitors.

The first concept was presented to the Garden Director, Abbie Cain, to largely positive review. She liked that the original Garden was kept to show how we started and how we grew. The shift of the main Garden body along the road enabled accessibility to the Garden as well as proximity to features like the pond. The road infrastructure was also well received as it enabled driving through the main body of the Garden for tours as well as serviceability.

Cain had some changes to implement for the second iteration. First, K-12 education has become a large selling point for Dixie Plantation, so parking area for a school bus is needed. Additional infrastructure such as bathrooms and ADA accessibility are also needed (although this isn't typically depicted in a concept drawing). Lastly, Cain requested a second version that includes the current utility shed across the road from the Garden in the event that the Garden can gain access to that.

The second concept incorporated the changes requested. The layout is largely the same on the western side of the road, but has more land developed on the eastern side. It includes the currently built shed. The orchard/food forest is expanded across the road and serves as a buffer along it. More roads are included such that busses can access the main building and current shed. Walkways extend to the pond such that the Garden serves both an agricultural purpose as well as a relaxation and contemplation purpose.

LIMITATIONS

This project has several limitations. The interviews are qualitative input from a representative subset of stakeholder but not all of them. Those the results do not encompass all facets necessary for a robust strategic plan. Budget data is not included as this is a large enough task for a separate project. The SSURGO data used for GIS maps is at a national scale, and therefore local accuracies are unknown. Soil samples should be taken to ensure the recommendations are accurate. Lastly, the concepts presented here are most appropriate for a 5-10 year planning horizon; specific methods to achieve the goals and implement the plan are beyond the scope of this project.

FINDINGS AND RECOMMENDATIONS

This project came about in a desire to quantify the sustainability profile of the Student Garden, since it is housed within the academic department of Environmental Studies Master's program. This, paired with the Gardens functioning like a nonprofit in the College of Charleston – seeking its own funding, developing unique education and outreach initiatives, creating an identity as an organization through a defined mission and vision, dovetailed well with my education in the Masters of Public Administration program. In scoping this project, we found that the Garden had undergone a number of changes in the past few years that has left it adrift in a leadership and directional capacity. This project serves to provide broad guidance in a number of fields to orient the Garden. These include an analysis of stakeholder views towards the mission and vision of the Garden. This is paired with an analysis of the current environmental conditions at the site. Based on the findings of both, a landscape design is developed to best fit needs with what the land can offer.

FINDINGS

Research for this project took part in two phases: a stakeholder analysis via interviews, and a landscape suitability assessment using readily available GIS data. The stakeholder analysis included interviews of six people involved at the Garden in an administrative, employee, or research/volunteer capacity. Each grouping had two members. Questions were asked about the interviewee's thoughts on the mission, or purpose, of the Garden, where they saw the Garden in 5 years (vision), and the goals they had for the Garden. Results from this showed that all groups had the same general direction for the mission and vision of the Garden: education, research, and vegetable production were the main focuses. Emphasis on which of the three were the main priority varied by group, contributing to a lack of clarity on the mission and vision of the Garden.

Based on this lack of clarity, succinct and cohesive mission, vision, and goal statements were developed based on the results from the interviews. These are not final without buy in from all stakeholder groups, which requires strong leadership.

The second section of this project examined the suitability of the land for agriculture though analyzing SSURGO data on soil, water, and infrastructure ratings. It was found that the soils in the current Garden area had the lowest ratings for productivity, were poorly drained, and had limitations for what structures could be built there. Areas to the east, along the road were much better rated for all these features.

Paring the interviews with the landscape suitability gave a guidance for redesigning and expanding the Garden. Two concept drawings were developed. In both, the main body of the Garden is shifted to the east, along the road, where better soil is. Visiting Church Creek Nursery, a small scale commercial operation provided ideas for strictures and layout. Features of the new design include a centralized building that serves as an office and workspace for staff. This provides a base of operations that easily accesses the rest of the grounds. There is an area for row crops to provide for the CSA production, greenhouses for year round production, varied climates, and research, demonstration beds for education, and parking for visitors. The second concept drawing expanded across the eastern road to incorporate two historic and disused ponds, as well as the existing shed. The purpose of this second concept was to provide an intermediate step that would allow use of currently existing infrastructure (the shed) which is greatly needed, and allow for additional ecosystems and features in the form of the ponds. These are left in a more natural state in the concept; however, they could be adapted for irrigation to reduce reliance on city water.

RECOMMENDATIONS

As with any good organization, leadership is key. At the Garden, leadership has been haphazard or lacking, which shows in the mission and vision sections. Given the expanded role the Garden is to play in education, research, and production, strong leadership is a must. This will aid in buy in for the new mission and vision statements, provide continuity of the vision, and allow for a stronger presence when interacting with the other departments involved at Dixie Plantation and the College of Charleston.

After stakeholder buy in, expanding the staffing of the Garden is needed. The expanded role and acreage of the Garden is too much for a single part time graduate student employee to handle. A full time farm manager to provide expertise and day to day care and maintenance of the Garden is the first priority. We currently have a coordinator that can tie everything together. Additional positions would be an educational outreach and programming staff member. They would develop the curriculum for workshops and events at the Garden as well as perform outreach functions to College classes and other interested parties. Lastly is a volunteer manager, who would manage volunteer experience at the Garden. This includes getting volunteers to and from the site and organizing their work and learning experiences. This frees up time for the current Garden GA to actually work and research in the Garden.

This project provides a broad framework of what the Garden needs. From it, a strategic plan can be developed that more fully fleshes out the way the Garden will implement these various changes, as well as identify areas that were not included in this project (such as financial modeling).

Once the mission, vision, goals, and strategic plan are finalized, expansion of the demographics the Student Garden reaches is suggested. This includes increasing collaboration within the College of Charleston by incorporating additional academic departments and classes as well as inviting outside organizations to use the site for collaborative workshops, events, and education. A list of potential College of Charleston courses to reach out to are included in Appendix D: Academic Courses for Collaboration. Courses include more integration with the Graduate Environmental Studies program, as well as many undergraduate classes: Anthropology, Biology, Historic Preservation and Community Planning, History, Public Health, Sociology, Studio Art, and Supply Chain Management. These classes might be able to use the site as a teaching space, or provide students to do research that would benefit the Garden while also bringing fresh perspectives. Appendix E: List of Potential Organizations for Collaboration rounds this out with a listing of outside organizations that might be interested in collaborating with Dixie Plantation and the Student Garden. These are divided into Agricultural Education, Agriculture and Food, and Environmental organizations.

To bring more people into Dixie Plantation and the Student Garden, a highly collaborative event that examines the archaeology, history, agriculture, and culture of the Lowcountry could be held at Dixie. This would include many different organizations specializing in those various topics, and would have the potential to bring in a wider audience than a single topic event would (such as only gardening). This event could serve as an introduction between the College of Charleston/Dixie Plantation and community members in Hollywood, as well as various other interested parties and might even increase synergy between the organizations and stakeholders in the area.

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APPENDICES

A: INTERVIEW QUESTIONS

These are the questions asked of interviewees. Questions 11 and 12 were asked only of the Student Users group.

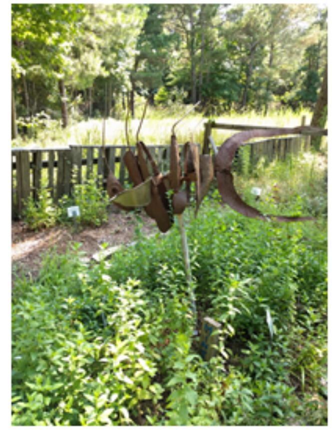
1. I know a bit about your involvement at the Student Garden; however, I would like for you to describe it in your own words.
2. What got you interested in participating with the Garden?
3. What do you think the purpose of the Garden is?
4. Does the Garden currently fulfill that purpose? What are the factors that aid or inhibit it from fulfilling that role?
5. What other groups or people do you interact with while using the Garden?
6. What is the current infrastructure at the Garden? For example, storage areas, water retention areas, and other items that affect the visible footprint there.
7. What utility are those things providing for the Garden's role as you understand it?
8. If you had one major project you could have succeed, what would it be? Why is it important? What resources do you think it would take?
9. The Garden has the potential to expand upwards of 17 acres in the future. Given this extra space and a best case scenario where do you see the Garden in 5 years? What role is it fulfilling then?
10. What will need to happen or be obtained to reach that vision? For example, what new or expanded infrastructure will be needed?
11. What are your organization's or project's goals? How does the Garden meet these goals?
12. What needs does your organization/project have? How does the garden meet them? What ways could it better meet those needs?
13. We've discussed your involvement at the Garden, its mission, potential future role, and infrastructure needs. Is there anything else you'd like to add about the Garden and its needs?

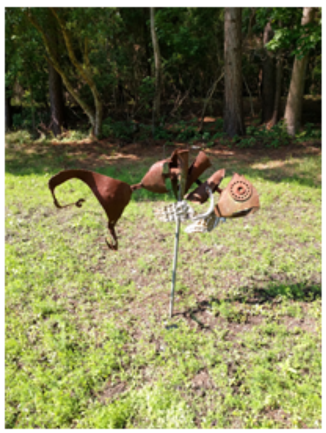
B: GARDEN BASELINE DOCUMENTATION

Appendix B details what the Student Garden looked like in July 2016. In the following pages are photos with captions of the features shown, a table listing all the photos, caption, GPS location, and Map ID number, and a map showing the location of each photo in the Garden.

Student Garden Baseline Photo Documentation


1. Culinary and medicinal herb garden


2. Art installation in herb garden


3. Another art installation


4. Huglekultur demo bed

Student Garden Baseline Photo Documentation

5. Garden beds

6. Communal fire pit and gathering area

7. Fenced garden area

8. Garden area with electric fence, facing east

Student Garden Baseline Photo Documentation

9. Garden area with electric fence, facing West

10. Tool shed

11. Greenhouse

12. Electric meter and outlet

Student Garden Baseline Photo Documentation

13. Entrance gate


14. Shade garden by entrance gate


15. Spigot #1


16. Spigot #2

Student Garden Baseline Photo Documentation

17. Spigot #3

18a. Production fields

18b. Production fields

19. Bridge to production fields

Student Garden Baseline Photo Documentation

20a. Pollinator field

20b. Pollinator field

21. Cleared area used for parking

22. Entrance from road to parking lot

Student Garden Baseline Photo Documentation

23. Utility box


24. Road leading to Garden


25. Nearby covered shed with facilities

Map ID	Photo name	Description	Longitude	Latitude
1	Taylor_Thesis_Photo_1.jpg	Culinary and medicinal herb garden	-80.18056908	32.73785064
2	Taylor_Thesis_Photo_2.jpg	Art installation in herb garden	-80.18062208	32.73787364
3	Taylor_Thesis_Photo_3.jpg	Another art installation	-80.18051008	32.73778964
4	Taylor_Thesis_Photo_4.jpg	Huglekultur demo bed	-80.18045208	32.73773864
5	Taylor_Thesis_Photo_5.jpg	Garden beds	-80.18032808	32.73772864
6	Taylor_Thesis_Photo_6.jpg	Communal fire pit and gathering area	-80.18029608	32.73770664
7	Taylor_Thesis_Photo_7.jpg	Fenced garden area	-80.18021408	32.73771564
8	Taylor_Thesis_Photo_8.jpg	Garden area with electric fence, facing East	-80.18022408	32.73768764
9	Taylor_Thesis_Photo_9.jpg	Garden area with electric fence, facing West	-80.17989108	32.73746764
10	Taylor_Thesis_Photo_10.jpg	Tool shed	-80.17977708	32.73743864
11	Taylor_Thesis_Photo_11.jpg	Greenhouse	-80.17973608	32.73741364
12	Taylor_Thesis_Photo_12.jpg	Electric meter and outlet	-80.17967708	32.73743164
13	Taylor_Thesis_Photo_13.jpg	Entrance gate	-80.18068108	32.73798464
14	Taylor_Thesis_Photo_14.jpg	Shade garden by entrance gate	-80.18071808	32.73791564
15	Taylor_Thesis_Photo_15.jpg	Spigot #1	-80.18045308	32.73781164
16	Taylor_Thesis_Photo_16.jpg	Spigot #2	-80.18035608	32.73773364
17	Taylor_Thesis_Photo_17.jpg	Spigot #3	-80.18020408	32.73765764
18	Taylor_Thesis_Photo_18a.jpg Taylor_Thesis_Photo_18b.jpg	Production fields	-80.18010508	32.73778764
19	Taylor_Thesis_Photo_19.jpg	Bridge to production fields	-80.18029308	32.73781264
20	Taylor_Thesis_Photo_20a.jpg Taylor_Thesis_Photo_20b.jpg	Pollinator field	-80.17880008	32.73699764
21	Taylor_Thesis_Photo_21.jpg	Cleared area used for parking	-80.17913508	32.73719064
22	Taylor_Thesis_Photo_22.jpg	Entrance from road to parking lot	-80.17833108	32.73663664
23	Taylor_Thesis_Photo_23.jpg	Utility box	-80.17828108	32.73676164
24	Taylor_Thesis_Photo_24.jpg	Road leading to Garden	-80.17823508	32.73667164
25	Taylor_Thesis_Photo_25.jpg	Nearby covered shed with facilities	-80.17743108	32.73711964
GPS points and photos were taken using ESRI Collector App on June 4, 2016 between 2:00 and 3:32PM in sunny conditions.				


Student Garden at Dixie Plantation
Photograph Locations
Features
Agriculture
Art
Infrastructure
Utility
0 50 100 200 300
Feet
N
Projection: NAD 1983 UTM Zone 17N
Credits:
Imagery: 2015 NAIP
1
2
3
4
5
6
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C: SITE VISIT DOCUMENTATION

Appendix C gives a photographic record of the model site visit to Church Creek Nursery, located on Johns Island, SC. Photos were taken of features and structures that might be applicable to the Student Garden expansion.

Church Creek Photo Documentation

1. Main building with office, shaded work area, storage, and bathroom

2. Other side of main building; shade cloth enables more versitility

3. Offices have open ceiling for increased ventilation

4. Greenhouses with climate control

Church Creek Photo Documentation

5. Greenhouse siding can roll up for ventilation, shade cloth to reduce sun

6. Cooling system for greenhouses

7. Multiple types of watering systems and flooring (gravel or tarp)

8. Greenhouses have integrated lighting

Church Creek Photo Documentation

9. Nearby pond drawn for irrigation

10. Outdoor plants have multiple microclimates: full sun and shade

11. Tables are simple, cheap, and easily moved

12. Greenhouses require propane heat during winter

D: ACADEMIC COURSES FOR COLLABORATION

This appendix includes a listing of courses that have already used Dixie Plantation and or the Student Garden in some educational capacity, as well as a list of classes that could be reached out to for inclusion in fieldwork, coursework, labs, and so forth at Dixie and the Garden.

Prior Use:

- Water Resources (GEOL 291)
- Ornithology (BIOL 333/333L)
- Plant Physiology (BIOL 304/304L)
- Hydrogeology (GEOL 438/438L)
- Intro to Hydrogeology (EVSS 638/638L)
- Field School in Archaeology (ANTH 493)

Potential Graduate Courses:

- Pollution in the Environment (EVSS 631/631L)
- Environmental Biology (EVSS 610)
- Plant Ecology (EVSS 544/544L)
- Ecopreneurship (EVSS 695)
- Intro to GIS (EVSS 549/549L)

Potential Undergraduate Courses

- Anthropology
    - Theories for the Origin of Agriculture (ANTH 318)
- Biology
    - Biodiversity, Ecology, and Conservation Biology (BIOL 211/211D)
    - Botany (BIOL 300)
    - Plant Taxonomy (BIOL 301)
    - Plant Anatomy (BIOL 302)
    - Plant Physiology (BIOL 304)
    - Parasitology (BIOL 336)
    - General Ecology (BIOL 341)
    - Plant Ecology (BIOL 444)
- Historic Preservation and Community Planning
    - Cultural Landscapes Studio (HPCP 375)
- History
    - History of South Carolina (HIST 222)
    - Disease, Medicine, and History (HIST 291)
    - Special Topics in Lowcountry History (HIST 320)
- Public Health
    - Principles of Nutrition (HEAL 257)
    - Health Promotion/Field Experience (HEAL 325/325L)
- Sociology
    - Environmental Sociology (SOCY 346)
- Studio Art
    - Drawing (ARTS 119)

- Painting (219)
- Sculpture (ARTS 220)

- Supply Chain Management
  - Green Supply Chain Management (SCIM 371)
  - Supply Chain Planning and Analysis (SCIM 373)
  - Supply Chain Planning and Operations Management (SCIM 424)

E: LIST OF POTENTIAL ORGANIZATIONS FOR COLLABORATION

A list of Charleston regional nonprofits was compiled by the graduate assistants in the MPA Community Assistance Program in 2015: http://puba.cofc.edu/community-assistance-program/nonprofit-directory/index.php. This has more details on many of the organizations that follow, including mission statements and contact information.

Agricultural Education, K-12

- The Green Heart Project (http://greenheartsc.org/)
- Farm to School Initiative (Head: Olivia Thompson)
- Charleston Area Children's Gardening Project (http://www.childrensgardenproject.org/)

Agriculture & Food

- Carolina Gold Rice Foundation (http://www.carolinagoldricefoundation.org/)
- Lowcountry Rice Culture Project (http://www.lowcountryriceculture.org/)
- Charleston Horticultural Society (http://www.chashortsoc.org/)
- Clemson Cooperative Extension, Charleston County (http://www.clemson.edu/extension/charleston/)
- Fields to Families (http://www.fieldstofamilies.org/)
- Lowcountry Food Bank (http://www.lowcountryfoodbank.org/)

Environmental

- Coastal Conservation League (http://coastalconservationleague.org/)
    - GrowFood Carolina
    - Monarch Butterfly Habitat Creation
- Lowcountry Land Trust (http://www.lowcountrylandtrust.org/)

F: MPA CAPSTONE PROJECT

The following document was completed as part of the Master of Public Administration (MPA) Capstone Seminar. The course, PUBA 701, was taught by Dr. Jo Ann Ewalt in the fall 2015 semester. Capstone projects aim to integrate and apply knowledge gained through coursework in management, policy, and organizational theory into an applied project, thereby linking academic theory with professional practice.

The project examined the administrative context of Dixie Plantation and the Student Garden by interviewing stakeholders with administrative oversight for views of mission and usage of the two facilities. Data were compared to other non-land grant universities to draw lessons from. Findings are as follows:

- Lack of concrete mission statements causes ambiguity
- Utilization of facilities are low, need to employee engagement practices like nonprofit, with signature events and newsletters
- Need onsite coordinators for better management and more increased academic inclusion of other departments
- Structural improvements such as roads are needed

Making the Most of Our Gifts: Dixie Plantation and the Student Garden

Carl Taylor

Master of Public Administration 12/14/15 Capstone: PUBA 701

EXECUTIVE SUMMARY

The Student Garden and Dixie Plantation are both underutilized resources at the College of Charleston but provide a great environment for experiential education that complements coursework on the main campus. The focus of this Master of Public Administration Capstone project was to determine ways to better fit Dixie and the Garden into the College.

This was approached through interviewing key stakeholders and determining what they view as the mission and use of Dixie and the Garden. In conjunction, comparisons were drawn from non-land grant university gardens to determine the different ways the Garden could develop. These results were used to create suggestions for better incorporating Dixie and the Garden into the College.

Findings indicated that Dixie and the Garden have similar challenges. They both lack concrete mission statements, which in turn causes ambiguity of their role within the College. There is informal consensus around the missions of both; however, some tension of usage of Dixie. Developing a mission statement is recommended to get everyone on the same page.

Due to Dixie's distance from the College's main campus, student and faculty utilization of the site is low. The newly constructed research stations will help engage these groups. For the Garden, operating it like a nonprofit might prove beneficial. Nonprofits employ "donor engagement" to interact with and retain their key donors and volunteers. This typically includes having a yearly "signature" event, which builds community and awareness around the organization, and keeps people thinking of it. A monthly newsletter highlighting past and future events at the Garden would also serve to keep students engaged. Ultimately, these efforts would aid both Dixie and the Garden since visitors realize the value Dixie provides.

Dixie and the Garden would significantly benefit from onsite coordinators. A Dixie coordinator would dispel the perception that the site is mostly for the School of Science and Mathematics use, and would promote academic inclusion. Additionally, infrastructure improvements are needed if the site is to become a field research station or to adequately support a functional garden. At minimum this would include navigable roads. Admittedly, this comes with tradeoffs which are explored in the report.

In all, Dixie and the Garden serve as a vital place for applied research and experiential learning within the College. Dixie Plantation, with its rich history and myriad ecosystems, is a rare and valuable resource for the College. Both are well on their way towards fulfilling these roles, and just a bit more help would propel them far.

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INTRODUCTION

PURPOSE OF CAPSTONE

This project was completed as part of the requirements for the Master of Public Administration (MPA) Capstone course at the College of Charleston. Capstone projects aim to integrate and apply knowledge gained through coursework in management, policy, and organizational theory into an applied project, thereby linking academic theory with professional practice. The MPA program accreditation body, National Association of Schools of Public Affairs and Administration (NASPAA), has five core competencies expected of graduates:

1. Leading and managing in public governance
2. Participating in and contributing to the public policy process
3. Analyzing, synthesizing, thinking critically, solving problems and making decisions
4. Articulating and applying a public service perspective
5. Communicating and interacting productively with a diverse and changing workforce and citizenry

This project provides tangible evidence towards these competencies.

PROJECT OVERVIEW

The College of Charleston received Dixie Plantation as a charitable gift in 1995, and the Student Garden was established there in 2010. There is a desire on the part of both the College and the Garden to take a strategic look at how both can be best managed and utilized to advance the goals of the College. To that end, this Capstone project examines the organizational context of Dixie Plantation and the Student Garden. Both Dixie and the Garden lack integration with the College of Charleston overall. This project seeks to determine how various departments and organizations with influence or oversight into both these entities view their role within the College, and how to best collaborate with the other departments involved in management. The results of this evaluation are compared and contrasted with research of how other university gardens function. The combined data provide lessons learned and potential best practices which are used to provide recommendations on how to better integrate the Garden with Dixie and the College of Charleston. This is relevant because both Dixie Plantation and the Garden provide experiential education that the main campus cannot simply due to location. Having this type of education more fully developed and paired with traditional academic coursework will enhance students' liberal arts education.

Research Questions

This project is divided into two components: first-hand data collection through interviews, followed by benchmarking through literature review and comparison. Research questions addressed during interviews were:

- What departments and organizations have financial and management oversight into Dixie Plantation and the Student Garden?
- What do the heads of these departments consider the mission or role of Dixie and the Garden to be within the College?
- How do these departments collaborate with others to manage Dixie and the Garden?

Research questions addressed through literature review and benchmark comparison with other student run gardens are:

- How have other colleges or universities organized their student gardens?
- What is the garden's mission?
- What are the garden's characteristics?
- How does the garden balance efforts, investments, and priorities between education and production?

METHODS

This project was designed through an organic process. I had volunteered for a couple years at the Garden and had started formulating my Master's thesis to examining the physical aspects of sustainability at the Garden. In discussing the limitations of the thesis with Dr. Victoria Vazquez, the Garden's faculty advisor, we hit upon the administrative needs of the garden. We determined that examining the organizational context of Dixie and the Garden would allow for the Garden to better fulfill its role at the College. As stated above, the project work was conducted in two parts – through interviews (Part 1) and benchmarking through literature and internet research (Part 2).

PART 1. MAPPING AND INTERVIEWS

The first step was identifying major stakeholders through mapping the various departments, programs, and organizations that have management and financial oversight of Dixie and the Garden. Using organizational charts as a starting point, an organizational map was created that identifies key stakeholders for Dixie and the Garden and the relationships between them. Organizational map shown in Figure 1.

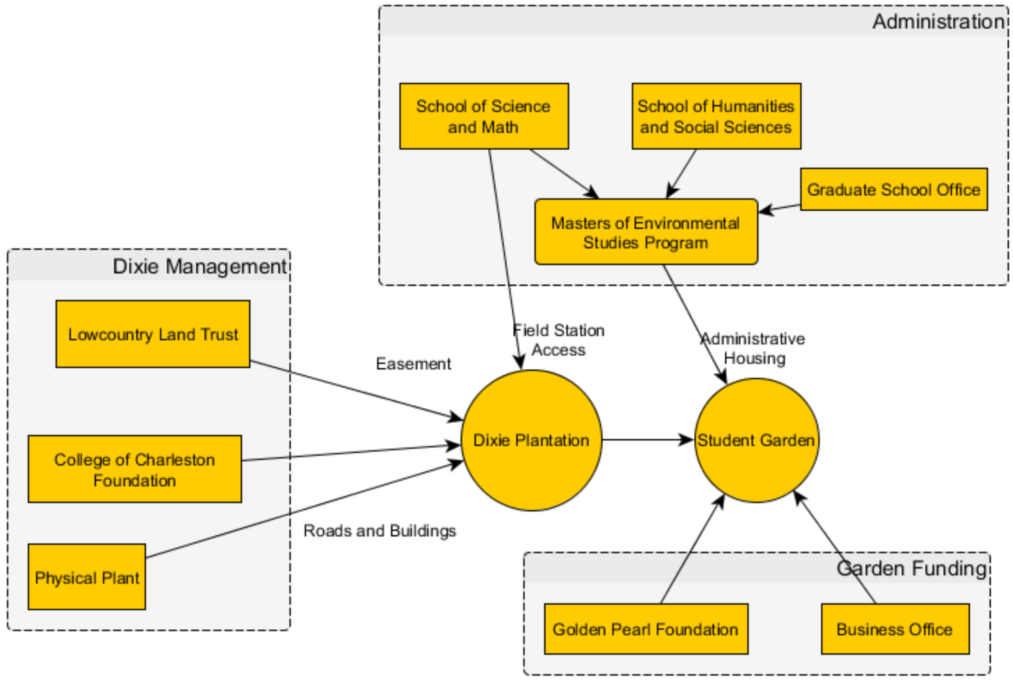

Figure 1. Organizational Map of Dixie Plantation and the Student Garden for identifying interviewees.

In Figure 1, the solid gold rectangles represent departments or entities with influence over Dixie Plantation and the Garden; the dashed grey rectangles are groupings of similarly tasked entities; the golden circles are Dixie and the Garden; and the arrows show the relationship between the entities. Organizations and entities outside the College of Charleston such as local governments and community members were not included to limit the scope of investigation. The only external organization interviewed was the Lowcountry Land Trust.

The main entities that hold decision-making authority or influence over Dixie and the Garden were determined to be the College of Charleston Foundation (CCF), the School of Humanities and Social Sciences (HSS), the School of Science and Mathematics (SSM), the Masters of Environmental Studies Program (MES), the College of Charleston Business Office, the College of Charleston Physical Plant, and the Lowcountry Land Trust (LLT). With the key stakeholder organizations and departments identified, the heads of those entities, or those who were the main points of contact in regards to Dixie Plantation and the Student Garden, were identified. Identified people were then contacted for interviews to be conducted from November 2 – 19, 2015. Responsive interviewees representing the three major stakeholder groups identified are shown below along with their position and organization.

- **College of Charleston**[1]
    - Glenn McConnell – President, College of Charleston
    - Mike Auerbach – Dean, School of Sciences and Mathematics
    - Jerold Hale – Dean, School of Humanities and Social Sciences
    - Timothy Callahan – Program Director, Masters of Environmental Studies
    - Carmen Ketron – Student and former Garden Graduate Assistant
- **College of Charleston Foundation**
    - Barney Holt – Director of Property Management
- **Lowcountry Land Trust**
    - Garrett Budds – Director of Conservation

Prior to the interviews, a series of interview questions were developed designed to collect the information needed to address strategic, organizational and management issues raised for this project. Questions were typically configured to initially gather information from each interviewee on management or leadership philosophy, and then narrow to specifics about the role of Dixie Plantation and the Student Garden within the overall College's mission and goals. This was to determine how various departments viewed both Dixie Plantation and the Student Garden.

Questions were developed with the aid of Dr. Jo Ann Ewalt, the Program Director of Masters of Public Administration. Each interviewee had customized questions except for Deans Auerbach and Hale and Program Director Callahan, since their roles were fairly similar. That said, there were similar questions amongst many of the interviews. Interview questions available in the Appendix.

[1] Victoria Vazquez – Program Coordinator, Master of Environmental Studies also provided information throughout this process.

Interviews were recorded and transcriptions were later combined with notes taken during the interview to document this input. Results from individual interviews were combined to capture the range of perspectives and generate a comprehensive view regarding Dixie and the Garden's role within the College.

PART 2. BENCHMARK COMPARISON

Comparisons on the stated missions of Dixie Plantation and the Student Garden from their respective websites with other college academic gardens were made (through a consulting interview with Victoria Vazquez). Identified gardens are:

- University of Virginia
- Florida International University
- University of Georgia
- Clemson University
- Furman University

These were gardens were selected as a result of site visits conducted by Dr. Vazquez and Carmen Ketron during the prior year for the purpose of seeing how other gardens functioned. Data from these visits and supplemental internet research was integrated with a literature review of the typical issues faced by student-run gardens. The following specifics were targeted for each garden in order to draw comparisons.

- Mission
- Year Established
- Size
- College and Administration Support
- Student Support

The interviews, comparison to other gardens, and literature review were then synthesized into a cohesive view of the current missions and roles of Dixie and especially the Student Garden within the College. Recommendations were generated based on a synthesis of these data.

LIMITATIONS

This project, by its very nature in dealing with people's sense of mission and purpose for a piece of land as articulated in personal interviews, is qualitative. This report does not provide a complete picture of the organizational context of Dixie or the Garden because not everyone who is a stakeholder was included in the interview process. However, most department heads with significant oversight were included. Notably lacking are student perspectives. One was included, though the interviewee was also an employee of the Garden for several years. Further research or development of the Garden should take into account perspectives of the student members of the Farm and Garden Club at the College. Another area lacking are K-12 teachers, who are becoming more significant users of Dixie, as well as community members. Lastly, data collected about other student gardens was varying and incomplete. Future data gathering should build off this.

DIXIE PLANTATION

INTRODUCTION

Dixie Plantation is an 881-acre property located along the Stono River in Hollywood, South Carolina, approximately 17 miles west of the College of Charleston's main campus. Dixie is owned by the College of Charleston Foundation for the College's use as an educational location. A map of the Plantation is shown in Figure 2.

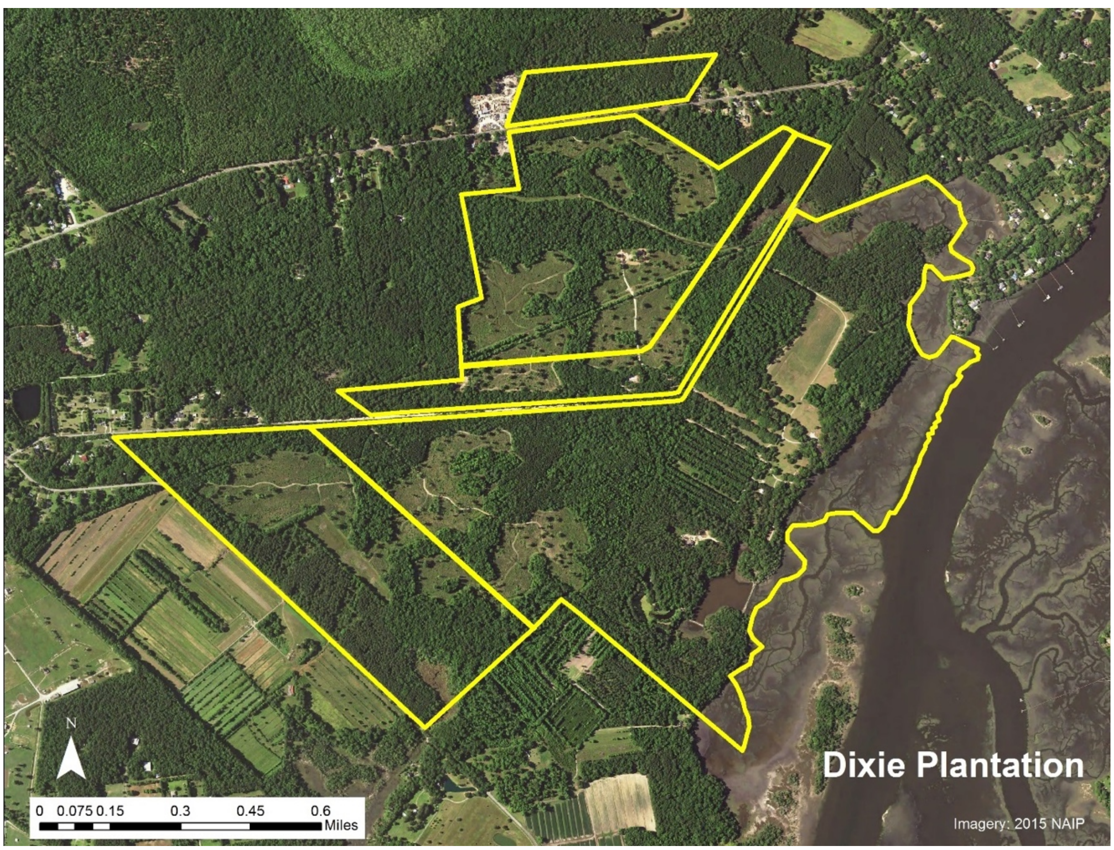

Figure 2. Satellite View of Dixie Plantation.

Figure 2 is a true color satellite view of Dixie Plantation. The gold outline is the boundaries of the various tracts that make up the Plantation. The image shows the variety of ecosystems there that lend themselves well to academic study: longleaf pine, wetlands, savannahs, tidal marshes, and brackish, saltwater and freshwater ponds. This diversity of ecosystems within a single tract of land is fairly uncommon within the Charleston area, given the rapid rate of development.

The closest formal definition to a mission or vision given for the Plantation is: "Dixie Plantation enables the College of Charleston to educate its students in an unparalleled natural setting; inspire collaboration across campus, industry and governmental agencies; and prepare students and faculty to be leaders in today's environmentally challenging global society" (College of Charleston 2015). Much of the focus in the quote is a result of the history and legacy of the land.

HISTORY

The land now known as Dixie Plantation has been inhabited for thousands of years, first by Native Americans. Documented history begins in the 1680s, when the site was known as Church Flats. From then until 1790, it was used as a church, of which remnants can still be seen. In the 1790s the land was converted into a plantation and the iconic alley of oaks was planted (pictured on the cover). The property passed into John Henry Dick's family in the 1930s, when they used it as a part time residence (College of Charleston 2015).

Dick, a renowned ornithologist and bird painter, inherited Dixie Plantation from his mother in 1941, and he resided there full time. He built the three ponds (one freshwater, one brackish, and one salt) to attract a diversity of bird species. In 1993, Dick placed a conservation easement on the property to prevent commercial development and prepare it for educational use. Upon his death in 1995, Dick donated Dixie to the College of Charleston Foundation.

The College of Charleston has put resources into making Dixie an educational facility while honoring Dick's conservation ideals. In 2010, the Student Garden was established at Dixie

Plantation, with the goals of teaching students at the College about the importance of local food systems and organic farming techniques, all while connecting them with the land. In 2015 two field research stations were built on the property. These provide space and resources for classes that use Dixie as a learning space, thereby making Dixie more accessible to education.

RESULTS OF INTERVIEWS

This section provides a composite of responses from interviews conducted with representatives of the three major stakeholder groups – the College of Charleston, College of Charleston Foundation, and the Lowcountry Land Trust. Results discussed here focus specifically on the questions dealing with Dixie Plantation as a whole. Responses have been categorized into topic areas.

Mission

The overall view of Dixie's mission and vision seems aligned among interviewees as an experiential learning site for the College. Dean Auerbach of the School of Science and Mathematics (SSM) summed it up nicely:

> *"The vision [of Dixie Plantation] has always been for it to become a field station and field location for formal teaching, facility and student research, and informal education or educational outreach, touching as broad a spectrum of the community as possible." (2015)*

For those interviewed, the mission and vision really centered around how the College could use Dixie as a field site for research, especially now with the addition of the field stations; even going so far as to hope it becomes the "*Woods Hole*[2] *of the south*" (Holt 2015).

[2] Woods Hole Oceanographic Institution is a renowned marine science field research station in Massachusetts.

Oversight

Multiple entities are charged with oversight of Dixie Plantation and there was some confusion or disagreement over that management. For example, some of the buildings are managed by SSM in the form of granting access to the research stations; however, the buildings are available on a first come basis (Auerbach 2015). This was not always the perception of faculty at the College, who thought the buildings were SSM's or primarily for SSM's use.

Additionally, there was some disagreement regarding financial responsibility in covering costs. The College of Charleston Foundation is the owner and steward of the property (Holt 2015; Budds 2015). The College of Charleston splits some of the costs and maintenance of the property with the Foundation (Holt 2015; McConnell 2015b; Auerbach 2015). I gathered there was some tension on who picks up the tab from time to time.

The Lowcountry Land Trust retains the conservation easement on Dixie and is in charge of ensuring compliance with the terms that John Henry Dick signed. Currently everything is in compliance and the future vision and use of Dixie appears to be in compliance as well, based on the current understanding of the Land Trust (Budds 2015).

Collaboration

The Foundation and the Lowcountry Land Trust have a close working relationship and share similar goals in regards to Dixie Plantation (Holt 2015; Budds 2015). When asked about the differing missions of the College and the Land Trust, Budds responded that the two organizations missions are actually quite complementary. The Land Trust focuses primarily on conservation and protection of the Lowcountry's resources. For that to happen, there must be a well-educated public, which happens through strong partners that support education in the community. The College on the other hand focuses on education, and secondarily on creating, producing, or having access to resources for education.

Figure 3. Mutually beneficial focuses and needs of College of Charleston and Lowcountry Land Trust.

In Figure 3, we see that LLT's first goal is conservation and their second goal is education. The College's goals are first education and then conservation (through the need of educational sites). Since the two goals are flipped between the organizations, they are actually quite complementary and lead the College and LLT to work well together (Budds 2015).

The Foundation and the College also have a close relationship, since responsibility is shared between them for management of the property. The Foundation takes care of most of the property, and the College maintains trails and roads (Holt 2015; McConnell 2015b). Cost sharing does seem to occur, one number shared was 50% (McConnell 2015b); however, specifics on cost sharing were not provided.

The various Schools at the College share both strategic and administrative functions across the Schools and the Foundation (Hale 2015). The School of Science and Mathematics (SSM) sent faculty to other successful field research stations to interview the heads and determine how the station evolved to that level of success as formal academic entities and public outreach and education facilities (Auerbach 2015). Additionally, the Schools collaborate together. This has mostly been SSM and the School of Humanities and Social Science (HSS), especially since they jointly administer the Masters of Environmental Studies Program and the Environmental Studies undergraduate minor (Auerbach 2015; Hale 2015). More recently, the Schools of Education and Human Performance have become involved in coursework and programing at Dixie, specifically for collaborating with the Charleston County School District to bring kindergarten through 12th grade students to learn at Dixie (Auerbach 2015; Hale 2015; Callahan 2015).

Academic Use

Dixie Plantation's purpose is mainly academic, this section looks at how the College and the various Schools within it utilize Dixie for educational purposes.

There is the perception that SSM utilizes Dixie (Holt 2015) the most, although it is available for all to use. SSM has six departments within it and not all of them utilize Dixie; Biology and Geology are most involved. The other schools are intermittent depending on the professors, and some may just utilize the area for strolling (Auerbach 2015). HSS also utilizes the site extensively for historical applications since Dixie is rich in history; anthropology department performs digs on site, for example (Hale 2015).

More recently there has been increased usage by the School of Education (SE), local K-12 students, and the community (Callahan 2015; Auerbach 2015). SE has started using Dixie as a site for summer programs. This is valuable since most urban children have limited access to nature and Dixie might be the most they are exposed to rural environments (Auerbach 2015).

A theme that emerged from the interviews was accessibility, specifically about distance of the site from the main campus. This worked in Dixie's favor in regards to environmental quality since it needs to be remote to have more intact ecosystems (Auerbach 2015). However, this remoteness negatively impacted use as classes or students were less likely to drive the 30-40 minutes to get there and deal with transport of equipment. The research stations and other support facilities planned for the future will provide a base of operations for classes and students conducting research so that they will have onsite storage for equipment and supplies. Many think that this will greatly increase use (Hale 2015; Auerbach 2015; McConnell 2015b). As people start visiting the site, they understand its value and want to utilize it more (Holt 2015; Hale 2015).

Links to Sustainability

Interviewees were asked about their perspective on how Dixie Plantation fits into the College's new campus wide sustainability Quality Enhancement Plan (QEP). The following quote describes what the QEP's purpose is, and how sustainability fits into it:

> *"[The]…QEP is a carefully designed course of action to address a well-defined and focused topic related to enhancing student learning and/or the environment supporting student learning which is appropriate to the mission and strategic vision of the College. […] The focus of the selected QEP is to generate sustainability literacy across the campus community, starting foremost with our students. The student learning goals include: expanded awareness of sustainability literacy; integrating and synthesizing knowledge; building skills and competencies through application of sustainability literacy; experiential learning to evaluate context and cultural implications of sustainability."(McConnell 2015a)*

This QEP was announced to the student body in October of 2015, with a finalized plan due in 2017. As such, it is still in the early stages, as reflected by the comments most of the interviewees had. Planning had yet to begin – committees of students, faculty, and staff were being formed to determine how the sustainability QEP would work. However, interviewees couldn't imagine that Dixie Plantation would not be included (Callahan 2015; Auerbach 2015; McConnell 2015b). Dean Hale went so far as to call Dixie "*the best resource we have for studying the environment*" (2015). This might be due to the diversity of ecosystems there, the "learning laboratory" aspect of Dixie, and how the site would expose urban students to a rural setting which has both environmental and cultural aspects they may not typically encounter (Callahan 2015).

Discussion

The interviews and research showed that there is no agreed upon and publically stated mission for Dixie Plantation, which means that implementations of "accepted" mission often diverge based on individual perceptions. For example, results of the interviews gave a sense that there was conflict over academic and other uses of the property. Some of the potential tradeoffs in managing for different uses of Dixie are shown in Table 1. Main tradeoff areas are the purpose of Dixie (which dictates the focus of the property), the student and faculty perception, how investments are viewed at the College, the type of research taking place at Dixie, and the overall sense of ownership for the property.

Table 1. Tradeoffs Inherent in College Oversight and Management of Dixie Plantation

Potential Trade Offs			
Main Purpose of Dixie	**Conservation/preservation goal supporting intact, undisturbed ecosystems**	**Versus**	**Learning Laboratory goal supporting access for students to study ecosystem and public to know about and value it**
Focus of Property	Production		Academic
Student and Faculty Perception	Perception of value: Investment in infrastructure and maintenance for large tract of land used by small number of students and faculty Related: Donor interest or focus		Investment in facilities used by more students and faculty
Investment	Investment in remote locations		Investment in main campus facilities
Research Type	Research and theoretical studies		Hands-on work by students
	Which Could Result In:		
Engagement and Ownership	The classic "tragedy of the commons" where no one really takes responsibility	**Versus**	Everyone engaged – sense of joint ownership of the property

It became apparent during multiple interviews how much an onsite manager would aid in Dixie's growth. Coordination of the property seems ad hoc with many different entities controlling small and large parts of the administration of the property. This may be limiting or slowing the potential of Dixie as a research station. Establishing an onsite manager may also give the property a more academically neutral image (depending on who they report to) since there is a perception that the research stations are SSM's. This would also give a sense of ownership, which can head off a "tragedy of the commons" type situation.

The Sustainability Literacy QEP will likely shape educational priorities at the College in the medium term. If committees are to be determining the trajectory of the QEP, a few people with knowledge of Dixie's ability to contribute to the QEP should provide input. Dixie could clearly play a significant role in the QEP by providing students with interactive experience in a variety of ecosystems, both managed and more natural, as well as expose them to cultural communities and partners that they would not encounter on the main campus.

STUDENT GARDEN

INTRODUCTION AND HISTORY

The Student Garden at Dixie Plantation was established in 2010 through both a class and a Graduate Student's project and enabled by a grant from the Golden Pearl Foundation. The Garden is a 1.25-acre organic, student-facilitated learning garden used for education, research and food production. The Garden's location within Dixie Plantation is shown in Figure 4.

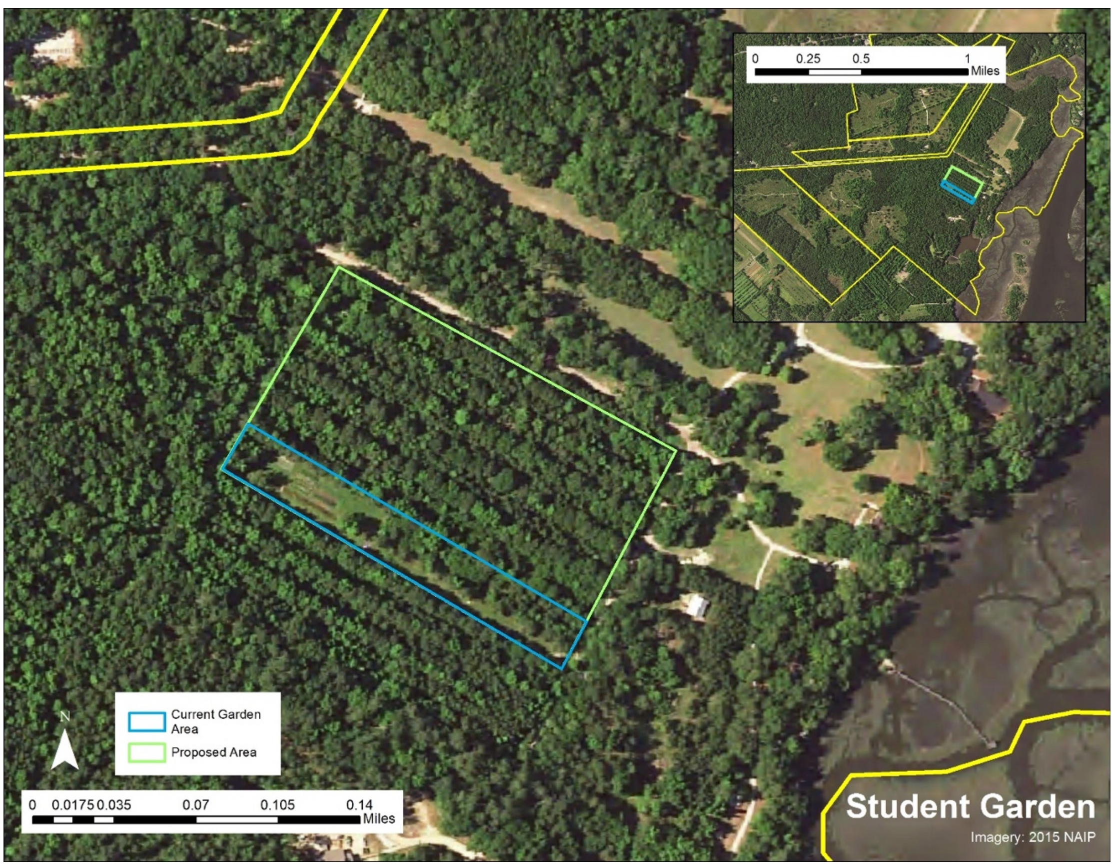

Figure 4. Satellite Image of Student Garden Location within Dixie Plantation.

The figure above shows the current extent of the Student Garden (blue outline, 2 acres), and the proposed increase (green, 17 acres). The inset on the top right shows the location of the Garden within Dixie.

The vision of the garden is "…to educate, inspire, and nourish the College of Charleston community. The garden is a place where students can learn firsthand about agriculture, gardening, food systems, business development and holistic land management by engaging directly with a functioning market garden" (Student Garden 2015). It fulfils this vision through:

> *"Workshops and the Farm and Garden Club are two outlets for students to get their hands dirty at the garden, and both venues provide students the opportunity to learn about everything from marketing strategies to the latest in sustainable agricultural techniques. In addition to the market garden [vegetables grown for sale/consumption], the Student Garden provides dedicated research space for students to hone their skills in project management and field research. By providing a stake in the life and health of the garden, rather than mere access, the garden allows students to grow both mentally and physically, all while working to get good food to their fellow classmates" (Student Garden 2015).*

With this vision and goals, the garden has been employing a variety of organic food production methods.

Higher educational facilities have been using gardens for education and food production for many decades. Since the College's Student Garden is relatively new, a comparison to other, more established, gardens is useful. This allows us to map the trajectory gardens tend to follow as well as specific issues they face.

INTERVIEWS

All seven interviewees were asked what they thought the mission of the Student Garden was and how they collaborated with or for it. Both of those topics are covered below, followed by a discussion of the findings.

Mission

At it's very core, the garden exists to teach about organic food production, a hope expressed by Dean Hale (2015). It also exists as a more focused example of Dixie Plantation's mission in a few ways. It is an experiential education that allows students to learn what works in a real system, such as growing a tomato (Callahan 2015). This lets them see the complexity of systems that go into something even as mundane as a tomato. The result of this can be a linking to local food systems (Callahan 2015). Overall, the Garden fits in as part of a liberal arts education (Callahan 2015; Hale 2015).

Collaboration and Oversight

The Garden is housed administratively under the Master of Environmental Studies Program (MES), which in turn receives program direction and funding from both Schools of Humanities and Social Sciences (HSS) and School of Science and Mathematics (SSM). HSS' major role is to provide financial resources for staffing and keeping the garden going (Hale 2015). SSM isn't actively engaged beyond approving administrative requests and getting some faculty time dedicated to the garden (Auerbach 2015). Additionally, there is a Farm and Garden Club of student members that typically volunteers weekly at the Garden, as well as provides some direction on planting choice.

While the Lowcountry Land Trust (LLT) interacts mostly with Dixie Plantation staff, the conservation easement restrictions on the property apply to the Garden as well. LLT's mission of protecting the agricultural heritage of the lowcountry is closely aligned with the Garden. When asked about the implementation of the student-run CSA (community supported agriculture), Budds stated that it would create some interesting questions about finances since the easement prohibits commercial use, but the CSA is likely fine since it is a complementary use for education and agriculture and the revenue would be funneled back into the Garden. However, the Garden should consult with LLT and Budds before implementation. Additionally, the easement does not limit the Garden's expansion – based on the current vision of ~17 acres with some support structures (2015).

Discussion

Several themes emerged during the interviews pertaining to the Student Garden. Overall, interviewees recognized how it provided an agriculturally focused example of Dixie's overall mission as an experiential learning facility. However, not everyone was aware of what the garden was doing. Dean Hale, who has financial and programmatic oversight into the MES program[3] and provides salary time for the garden director positon, used the word "hope" when talking about what the Garden does and the benefits students derive from it. To me, this aspirational term indicates that he isn't aware of all that is already happening currently at the Garden, which is a failure on the part of those of us who work at the Garden. A key aspect for organizations that receive funding from other sources is providing timely feedback about how their resources are being used and the benefits clients gain. This may indicate a lack of top level awareness in general for the Garden. President McConnell understood the basic purpose of the Garden, but didn't seem to grasp the mission or greater purpose we hope the Garden provides within the College. Mainly, those with experience of the garden recognized how it provides a focused example of Dixie's overall mission as an experiential learning facility. Others did not see this broader view.

[3] The Student Garden is administratively housed under the Master of Environmental Studies Department (MES).

This relates to the mission statement for the Garden, or lack thereof. Similar to Dixie Plantation, the Garden has more of a general consensus rather than explicitly defined mission. Again, this lack of a concrete definition creates ambiguity and promotes individual interpretations of the mission, therefore scattering effort and direction. A mission statement should be developed along with a separate vision and goals statement.

Discussion and information about the Student Garden did not include the topic of academic integration in the form of coursework, which is something that many of the other gardens profiled in this paper. I am personally unaware of any classes utilizing the Garden; however, there are a few graduate students (myself included) doing master's thesis research there. There have also been a few undergraduate independent study projects as well.

GARDEN COMPARISON

Five gardens were visited in order to draw comparisons to our Student Garden. Characteristics of each garden are explored individually, and include the following:

- Mission
- Year Established
- Size
- College and Administrative Support
- Student Support

After, similarities and differences are drawn from all in order to compare to the College's Student Garden. This comparison is for student-engaged small farming type of efforts and excludes the large research enterprises of major agricultural universities.

University of Virginia: UVa Community Garden

The UVa Community Garden was established on campus by student initiative in 2009/2010 under the oversight of the Department of Urban and Environmental Planning (the School of Architecture) and as a special project of the Student Council's Sustainability Committee. This gives the garden both student club support and support through the department

(University of Virginia 2015). The physical size of the garden could not be determined from the information provided.

The garden has five objectives:

1. To provide a valuable educational resource to UVa students, faculty, and staff;
2. To serve as a resource and link to the greater Charlottesville community;
3. To model the most economically, socially, and ecologically sustainable farming practices available to us, while preserving an integral part of the landscape and the local economy;
4. To provide UVa students, faculty, and staff with the opportunities to work on a farm and to learn the skills needed to produce food, experiencing its joys and challenges; and
5. To make UVa a model of organic gardening and sustainability (University of Virginia 2015).

Most of these objectives center around hands-on education for sustainable farming techniques, as well as linking the school to the community it resides in.

The garden does have some production functions in addition to educational mission in the form of a community supported agriculture (CSA; a farm produce subscription) with 15 members (Vazquez 2015).

Clemson University: Clemson Student Organic Farm Project

Clemson University's Student Organic Farm Project (SOF) was established in 2001, organic certified in 2005, and came under the guidance of an advising committee in 2007 which includes students, faculty, and staff. SOF occupies 15 acres. It has multiple purposes within the University: providing experiential education; production of high value vegetables, small fruits, herbs, and cut flowers; and selling produce through a CSA and to local restaurants and markets (Clemson University 2015).

The CSA is on campus and consists of 100 shares. SOF is mostly focused on running the CSA, which requires consistency in the form of 5 half time students in the summer, in addition to regular paid workers. Thus, there is a tradeoff between education and the production aspect of SOF, leaning towards production. Funding for the garden is generated through the CSA, comes in grants and from the Clemson Extension service. The University donates the land, electricity, and water. Educational mission of the garden consists of some experimental plots (such as till and no till experiments) as well as the on the job experience workers gain through their labor (Vazquez 2015).

Furman University: Furman Farm

The Furman Farm and Furman University is a 0.25 acre farm that focuses on sustainable and organic farming techniques (but is not organic certified) and sells produce in a CSA program as well as local markets (Furman University 2015). The date the garden was established was not indicated by the information provided.

The garden's educational programs include labs, classes, and tours. It is on campus which makes access easier and allows for greater integration in the form of composting, ease of transport, as well as a place for sustainability and environmental science course work.

Administratively, the garden has two full time and two half time positions, and enjoys a good funding level through large grants and top level support. This includes partnership with the Shi Center for Sustainability, established by former University President Shi. The Center promotes and infuses sustainability education throughout the university; and further support in the form of a line item in the school budget and inclusion in the University's Sustainability Master Plan as part of its "learning laboratories" (Vazquez 2015).

This great amount of funding, top level support, and proximity to students allows it to have both production and education functions.

University of Georgia: UGArden

University of Georgia's four acre, student run, UGArden was established in 2010 by student initiative. Startup funds came from the Horticulture department, with preparation of the site provided by the Grounds Department. United States Department of Agriculture (USDA) also provided a grant to support an onsite certificate program.

The garden's mission is building a community of students centered on sustainable food systems. Within this are four goals:

1. To teach students to grow food using organic practices
2. To share healthy, sustainably grown food with members of the local community who are less fortunate
3. To engage students in the local community through service learning
4. To provide opportunities for students to learn practical skills and experiment with new ideas (University of Georgia 2015)

The garden utilizes organic practices to produce vegetables, fruits, shitake mushrooms, and herbs. Most of these go towards the partnership organization, Campus Kitchen, which distributes the produce to families in need. Additionally, produce is shared with a local middle school for cooking and sampling, and taken home by UGArden volunteers. UGArden specifically avoided operating a CSA or selling produce to the University dining halls since the main focus of the garden is education. A focus on production would limit their education priority and the ability to halt work and show students how to do things like till the soil (University of Georgia 2015). Instead, they focus on teaching and most produce goes towards the needy.

UGArden also seems fairly integrated with course work through two First Year Odyssey classes (freshman seminar classes designed to incorporate students into the university environment), as well as a few upper level courses. Additionally, they are the site of a for-credit internship (and as of fall 2015, have 5 interns), and are an integral part of the Local Food Systems Certificate. The garden is also a site for graduate level research in pursuit of a Master's degree in Horticulture or Landscape Architecture.

Administratively, UGArden enjoys significant support in the form of a Farm Manager, an AmeriCorps VISTA volunteer, several work study students and graduate students (assuming these to be Graduate Assistants similar to the College), a school garden coordinator with the middle school they donate food to, a garden director (faculty) and a "garden angel" who volunteers for administrative support.

Florida International University: Organic Garden

The Organic Garden at Florida International University (FIU) is located on campus and adjacent to the FIU 11-acre nature preserve. It was established in 2007 as a result of a graduate student's master project. It has grown through time, but is smaller than the College's Student Garden. The Organic Garden is housed under two entities: the Agroecology Department and the FIU Garden Club (Florida International University 2015).

The Agroecology Department provides most of the funding as well as three faculty advisors who approve and fund student garden projects for both the undergraduate and graduate level. The department also guides all aspects of the garden. The Garden Club provides operational management of the garden. This comes in the form of mostly volunteer labor, along with a graduate student who is in charge of day-to-day management as part of a research assistantship.

Both the Garden Club and the Agroecology Department started using the garden in 2008. The Agroecology Department has separate growing areas for two classes, and the Garden Club has assigned plots for members. Additionally, a FIU Organic Farmers' Market was started in 2008, which has separate plots. The amount of produce dedicated to this is unknown; however, the focus of the garden is very much on learning and academics (Vazquez 2015).

The garden has campus integration in a few ways. It is located on campus, which makes access simple. Aramark, the dinning services contractor, provides campus food waste for composing at the garden. Labor is provided mostly through the Garden Club, as well as through the Agroecology Department. The department requires some of its undergraduate majors receiving scholarships to work 4 hours per a week at the garden. Several classes teach onsite, and students are encouraged to conduct original research.

University Garden Lessons

Several lessons can be learned from how other university gardens are organized. All the gardens were started by or with a student initiative; many around the same time period as the College's Garden (2010). Most of the gardens were also located on campus or in close proximity, thereby easing access, course work integration, and inputs of labor and compost. Coursework integration is found to drive interest in the garden.

Several of the gardens had defined missions, visions, and goals readily available on their websites. This guides the gardens' evolution such that they stay true to the original need within the university and broader community. These missions also spoke to the garden's priorities as either academic or production. There seemed to be a tradeoff between these two (see Clemson for production focus, UVa for academic focus). That said, Furman seemed to be able to successfully balance the two due to high levels of administrative support. Research indicated that there is usually a mix of administrative housing in both a club and a school program or department (the Agroecology department at FIU for example).

The importance of administrative support also became apparent. Most of these gardens had top down support in the form of interest as well as funding. This, coupled with bottom up, student driven, support makes for a powerful level of support for the garden. Another method ensuring administrative support was integration of the student garden effort with the sustainability plan and the university's mission.

LITERATURE REVIEW: KEY ISSUES

Student run gardens at universities and colleges appear to be recent enough occurrences not to have yet developed a significant body of literature. The existing material highlights two overarching issues facing the current gardens. These are funding, and balancing leadership. Each of these issues are explored in the following sections.

Funding

Gardens face funding issues in two manners: competition for resources and whether or not the garden turns a profit.

A discrepancy can exist between the way students and faculty who are involved with the garden value its role and need within the school, versus the administrators who are responsible for allocating resources. Those involved hands-on in the garden tend to view the garden as having a pivotal role in student education. Administrators on the other hand may question if "…student farms provide a learning environment that is important enough to compete for scarce resources with academic courses in science and technology or art and literature?" (Sayre and Clark 2011, 459), or they may be concerned that the garden is pulling donor interest away from projects they view as more vital.

The second area of contention for funding centers on whether the garden is expected to be self-sustaining financially, or to generate a profit. If a goal of the garden is to create profit, this might not happen as quickly as expected: "…five years is a generally accepted time frame for reaching that key profitability threshold, a time frame that may fall well outside the tolerance of the average benefactor or provost's office" (Sayre and Clark 2011, 451). Given the typical five years lead time to profitability, the school must be willing to handle a negative balance until the garden is established. Likelihood of this is probably tied to the financial status of the school. This also relates directly to another issue gardens face: are they profit focused or education focused?

Gardens cannot straddle both effectively most times, and if they try, conflicts "…emerge between the farm as a business and its roles as a teaching facility and source of employment for students" (Sayre and Clark 2011, 826). This is because it is difficult to have an efficient and productive operation while, at the same time, instructing novices on basic agricultural principles. In the past, most students had basic agricultural knowledge since most of the population lived in rural areas; however, that knowledge is scarce now. Student labor can also be inefficient since students can only commit to short periods due to the obligation of coursework.

Leadership

Gardens at universities tend to be started by student led initiatives. Eventually, most come under some sort of academic umbrella for resources. At this point, contention rises on the leadership of the garden: should it be solely run by students, or should faculty and staff give direction? Having a purely run student garden tends not to work in reality as many successfully long run campus gardens discover that mentorship or training in a more formal capacity is needed to educate newcomers to the garden (Sayre and Clark 2011). Additionally, students have a high turnover rate, and peek work times for the garden, such as spring planting, often overlaps with final exam time. Thus, a nonstudent director or manager of the garden is often sought, often at the students' behest, to mitigate the issues of conflict with academics, mentorship, and continuity. That said, the director should be cognizant of providing "...spaces within the farm for expression of student initiative and experimentation – not just for students' own satisfaction, but for the continued vitality of the whole project" (Sayre and Clark 2011, 459).

STUDENT VIEWPOINT

To provide some student perspective to supplement the administrative interviews, Carmen Ketron, a graduate student in the dual Master of Environmental Studies and Public Administration graduate program was also interviewed. She was the graduate assistant (GA) at the Garden from 2012 through 2015, and is doing her Academic Internship research on creating a student-run CSA (community supported agriculture) at the Garden.

She had no knowledge of the Student Garden or Dixie Plantation prior to her application for the GA position. The position appealed to her interest in sustainable food systems. Through the GA, Ketron managed the grounds, volunteers, and administration of the Garden. Grounds management included planning the Garden's design, crops, weeding, and planning for future season's plantings. Volunteer management includes serving as the point of contact, recruitment of new individuals, development of programs, and tours of the garden. Administrative duties include budgeting and management of social media accounts that support the Garden.

In addition to the Garden, Ketron provided support for student independent study projects at the Garden and Dixie, provided nature walks, and support for College of Charleston Foundation efforts on site.

EXPERIENTIAL EDUCATION AT DIXIE AND THE GARDEN

Ketron believes that her role at Dixie Plantation and the Student Garden reinforced her graduate education at the College. Within the Master of Public Administration program, Ketron is focused on nonprofit and program management. The GA position allowed for program development work because the Garden was new. This gave her firsthand experience with program management and a nonprofit like entity. She was also able to do interactive research and learning in agriculture, which is her passion. The GA position at the Garden lasted 3 years which allowed her to experiment and learn from the results of the previous year's growing season. This long term kind of experimentation isn't common and was very important for education, she said.

COLLEGE SUPPORT

Since, by consensus, the purpose of Dixie Plantation is to provide experiential education, support from the College towards this is important. Ketron characterized the support she received as less than she would have liked, which was probably due to the lack of infrastructure at Dixie. Much has been added on this front recently. Financial support from the Foundation and the College was present; however, the vision for Dixie had yet to be solidified which made things more difficult. Many of the support issues stemmed from the Garden developing more rapidly than Dixie Plantation, leading to lack of infrastructure, according to Ketron.

Ketron suggested a few ways to increase support for students at Dixie and the Garden. First off, the newly built research stations will help significantly. She thought that wireless internet access would be needed for student research. Perhaps, most importantly though, is the need for basic infrastructure such as drivable roads. These are required for the Garden's basic operation and highly in need if the Garden is going to play a more significant role. She also thought that academic curriculum and infrastructure needed to be paired together so that facilities required for future academic and research work could be planned for and implemented ahead of time.

SYNTHESIS

Dixie Plantation and the Student Garden face many of the same challenges in their efforts to progress: lack of a stated mission, general unawareness across the main campus, a corresponding lack of integration with the entities on site and the main campus, and need of more investment.

MISSION

As Dean Auerbach noted, there's a lot more that can be done with the Garden (2015). Much of the low momentum in comparison to other university gardens stems from the lack of a well-defined mission, vision, and set of goals. These three separate statements will determine the future the role of the Garden. When developing these statements, consideration must go towards both the role of production and the academic focus of the Garden; focusing on one typically involves tradeoffs for the other. Typical tradeoffs are shown in Table 2, only with very high top and bottom level support can these tradeoffs be overcome

Table 2. Tradeoffs Between Production and Academic Focused Gardens.

Production Focus	Academic Focus
Profitable	Reduced profitability
High Production of Fruits and Vegetables	Spotty Production of Vegetables and Produce
Little Education	Highly Engaged and Educated Students

Developing a CSA (community supported agriculture) indicates a production focus, though having it student-run may lend itself towards education. When designing the CSA, the key question in regards to the Garden's mission is what balance is struck between student education and fulfilling orders of produce. Implementing the CSA likely depends on expanding the Garden. Currently, there are plans for increasing the garden from its current 2 acre footprint to around 17 acres (see Figure 4). This is a significant increase, and the Garden currently does not have the capacity to deal with this in terms of leadership, staffing, and funding. Large scale jumps should also be planned out rather than performed on the fly. Thus, developing a strategic plan for the next 5 years or so is recommended.

MARKETING

Unawareness of Dixie and the Garden is generally because of the distance from the main campus. For the Garden, some of the top people are not very confident in the Garden's role, or aware of what it is doing. When examining other university gardens, top level support and advocacy were highly evident in the more successful gardens. To aid in this, the Garden must keep its top level supporters in the loop.

The Garden can go about marketing itself much like nonprofits do through newsletters and events. Many nonprofits have a "signature" event they hold every year which becomes associated with the organization. This event serves to increase interactions with those who are involved with the organization such as clients, donors, and volunteers. The Garden could develop a signature event such as a "Fall Harvest Gala." This event would go beyond the mainly educational workshops the Garden currently holds, and would ideally be open to faculty, staff, students, and members of the community. It would serve to bring these various groups out to the Garden for a fun time, as well as clue them in on what the Garden is doing and connecting them with the landscape and with others who are interested in the Garden thereby building a community.

Building a community also requires contact with members throughout the year. This could be accomplished with a well-designed monthly e-newsletter that recaps events of the past month, and provides overviews of the upcoming events.

INTEGRATION AND ENGAGEMENT

Dixie is becoming more incorporated with the College through its evolution as field research station. The Garden needs to align its role towards this end as well, or at least incorporate it. Many of the other university gardens included some level of academic course work. The Garden currently does not have any academic functions beyond independent study and MES thesis projects. Admittedly, this is more difficult than some of the schools since there is no agricultural program at the College and few teachers with background in the area; however, student interest is driving the transformation at many schools, especially now "…in the wake of books like Michal Pollan's *The Omnivore's Dilemma* and Barbara Kingsolver's *Animal, Vegetable, Miracle*… students and young people are taking an unprecedented interest in where their food comes from and why it matters" (Sayre and Clark 2011, 269). The Sustainability Literacy Quality Enhancement Plan is a chance to highlight and develop some of the local food system sustainability education we have at the College. Further development can serve as a method of attracting students to the College. This would also broaden their liberal arts education, which tends to neglect basics such as where food comes from.

An additional method would be to develop partnerships or an exchange program with other institutions which would provide a greater number of students access to Dixie's unique landscape and features.

Another area needing more attention is the Farm and Garden Club (FGC). While I was not able to interview anyone from the FGC, their role at the Garden is not cemented as I understand it. Many of the other university gardens are jointly administered through an academic program and a student run club. Currently, the FGC is relegated to volunteering at the Garden and giving some input on planting selections for the season. A big part of taking care of something is ownership of some portion of it. This could be established for the FGC by providing actual plots for them to manage. Some of the other university gardens allowed students to have individual plots.

INVESTMENT

Investment in Dixie as a site will be needed for both development of student research there, as well as current functions and expansion of the Garden. One current pressing issue is the lack of usable roads. They were damaged by a flood, leaving the site inaccessible to Garden staff and volunteers for at least two months. This is untenable for both a research campus and the functioning of an agricultural facility.

Additionally, both Dixie and the Garden are impaired by a lack of staffing. Both need full time staffing for head or coordinator positions. The Garden specifically needs a full time farmer, since relying solely on one graduate student to manage the Garden is impossible at a 20 hour per week cap. Students also lack the continuity often needed to work the land since they are in the MES program for two years typically, and may not have the same position for both years. Ketron's three-year stint was likely an anomaly. Succession training is also impacted since only one graduate student is hired at a time currently, leaving no overlap between students to train the incoming ones on how the Garden is managed.

CONCLUSION AND RECOMMENDATIONS

Dixie Plantation and the Student Garden both play a vital role within the College of Charleston by providing hands on education in a setting unlike the main campus. Dixie's numerous ecosystems and natural resources provided an unmatched experience in the region, and the Garden is a more focused example of that. Both are on a good trajectory to become a much more powerful presence at the College, especially with the establishment of the research stations.

A few issues stand in the way of fulfilling their potential within the College of Charleston. Both are challenged by a lack of a clearly defined and articulated mission, though there is a general consensus on the roles they play within the College. Defining the mission will ensure alignment of all stakeholder interests. Both Dixie and the Garden also require more investment in infrastructure and staffing if they are to play a more pivotal role in experiential education at the College. Lastly, there is currently a lack of visibility for the Garden and Dixie due to the distance from the main campus; however, they are both loved and appreciated by those who do visit them. An estimate of the usefulness and costs of these recommendations is shown in Table 3.

Table 3. Recommendation Matrix of Cost and Usefulness.

Usefulness ↓ / Cost →	Less	←→	More
More	Mission Statements	Coordinators	Infrastructure
↕	Establish Farm and Garden Club Role	Strategic Plan; QEP Integration	
Less			

The costliest recommendations are providing more infrastructure and hiring on site coordinators; however, these are likely to have a high level of impact. The other recommendations do not require as much financial outlay, but may be costly in the form of time. Mission Statements are a low cost, but highly valuable addition. Once those are established, a strategic plan would be most helpful since Dixie is starting to play a greater role in the College, hopefully this will include integration with the Sustainability Literacy QEP. Additionally, the Garden needs to meet with the Farm and Garden Club to determine the role the Club will play within the Garden.

When designing recommendations such as the mission statement and the strategic plan, the inherent tradeoffs need to be considered. For the Garden this includes defining if the focus is academics or food production. These tend not to be compatible without significant administrative backing and resources. Dixie's recommendations of a coordinator can balance perception of the property, since it currently is perceived to be used mostly for science research. This will also aid in preventing a tragedy of the commons type situation since the site will be managed by a more cohesive entity than at present. Balancing all of these wisely will require management and leadership oversight that both Dixie and the Garden need.

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APENDIX: INTERVIEW QUESTIONS

ADMINISTRATORS

These questions were asked of College of Charleston Deans Auerbach and Hale, and MES Program Director Callahan

1. As an administrator, whom do you consider to be your most important stakeholders?
2. I'm wondering how much you can consider student input when making decisions about how to spend the College's scarce financial resources. How do you balance competing demands when students are just one element of the stakeholders you are accountable to? In other words, what criteria do you use when trying to balance competing demands from the stakeholders to which you are accountable?
3. Now I'd like to switch to the concept of sustainability. How would you define sustainability as implemented in your position at the College?
4. How does environmental sustainability fit into your job responsibilities? Are there other priorities that you must address that limit your ability to emphasize environmental sustainability?
5. Let's talk for a minute about Dixie Plantation. What do you believe the mission is? Relative to other facilities and student learning opportunities on campus, how important do you think Dixie is to the College's overall mission?
6. Now I'd like to ask the same question, but specifically geared to the student garden. What do you think the purpose of the garden is? How important is the garden to the College's overall mission? If so, in what ways is it important?
7. The College has selected Sustainability Literacy as its Quality Enhancement Plan. What plans do you have for implementing this QEP?
8. Do you think Dixie Plantation fits into the QEP? In what ways?
9. Now I'd like you to think about how you and your department interacts with Dixie Plantation. First, can you tell me how your department is involved with Dixie? Does this involvement extend to the student garden?
10. Does your involvement with Dixie require you to work with other departments on campus? If so, how? Which ones?
11. How would you describe the level of collaboration you engage in with others specifically concerning Dixie Plantation? By that I mean are you involved in strategic planning, programing, and that level of collaboration? Or is your collaboration mostly administrative? Does this collaborative work also include the student garden? How so?
12. Do you think if you or others could collaborate more, the College would be more effective at supporting and utilizing Dixie Plantation?
13. We've discussed competing demands, the role of Dixie, and so forth. Is there anything you'd like to add about your department's interaction with Dixie Plantation?

LOWCOUNTRY LAND TRUST

These questions were asked of Garrett Budds, Director of Conservation

1. Dixie Plantation was donated to the College of Charleston Foundation with a conservation easement already in place if I'm not mistaken. What do you view as your role or part in managing Dixie?
2. The missions of the College and LLT are inherently different. How do the differing priorities of education for the College and conservation for the Land Trust play out at Dixie? Are they opposed? How do you navigate this difference as an organization?
3. Does the College consult you about visioning and usage of Dixie? If so, what are you consulted about? With whom do you normally interact with?
4. Conservation easements are perpetually binding legal documents. How do you balance your obligation of enforcing the original easement terms with the changing or evolving needs of the current landowner such as the College? For example, I have seen plans for developing Dixie into a research campus; does this fit within the terms or spirit of the easement?
5. The Student Garden was established at Dixie Plantation in 2010 in order to expose and educate students at the College, as well as the community at large, to the importance of local food systems and sustainable farming techniques. The Garden is planning to expand its capabilities in that role. Are there any potential conflicts you foresee in this? For example, research has been conducted towards implementing a student run CSA. What about expansion of structures such as a wash station or equipment shed? In what ways can we work together to fulfill both of our goals?
6. We have talked about LLT's role at Dixie, balancing the missions of two different but collaborating organizations, implications for the student garden, and so forth. Is there anything else you would like to add about your organization's interactions with Dixie Plantation and the Student Garden?

DIXIE PLANTATION MANAGER

These questions were asked of Barney Holt at the College of Charleston Foundation

1. Dixie Plantation was donated to the College of Charleston Foundation in 1995 by John Henry Dick. I was wondering what you see as the role of Dixie within the overall mission of the College? In what ways is it important in fulfilling the mission?
2. Now I'd like to ask the same question, but specifically geared to the Student Garden. What do you think is the purpose of the garden? In what ways do you view the garden as important to the College's overall mission?
3. You are tasked in part with managing Dixie, which includes many different aspects and competing demands. What do you view as your main role at Dixie? What are the most important goals you have with regards to successfully managing Dixie? And how would you define success in this context?
4. How does environmental sustainability fit into your job responsibilities? Are there other priorities that you must address that limit your ability to emphasize environmental sustainability?
5. I imagine that some of the decisions you make require collaboration with other entities involved with Dixie Plantation. What type of decisions would you collaborate on? With whom do you make these decisions? What are decisions you are tasked with singly? Where does Lowcountry Open Land Trust fit into all this?
6. Given that Dixie is some distance from the main campus, I'm interested in the usage levels at Dixie. Is it at an appropriate level currently? What groups or individuals should be using Dixie? Are they actively using it?
7. A research station was recently completed. What impacts do you think this will have on the usage and fulfillment of Dixie's mission or role at the college? Does this alter or expand your role at Dixie? In what ways?
8. We have talked about the role and mission of Dixie, your main goals and priorities in managing it, and so forth. Is there anything else you would like to add about your role at Dixie Plantation or the Student Garden?

COLLEGE OF CHARLESTON STUDENT

These questions were asked of Carmen Ketron, a MES and MPA graduate student.

1. Can you describe how you have been involved at Dixie and the Student Gardens?
2. What aspects of the Student Garden got you interested in participating with it?
3. Have you done other work at Dixie Plantation beyond the Student Garden? If so, what?
4. Many people I have interviewed talked about Dixie as an experiential learning facility. How has Dixie and the Student Garden aided or reinforced your education at the College?
5. How would you describe the support you have experienced from the College for your learning at Dixie Plantation and the Student Garden?
6. Are there any ways the College could further support your learning at Dixie Plantation and the Student Garden?
7. We have discussed how you became involved with Dixie Plantation and the Student Garden, as well as how they have aided in your education at the College, and organizational support from the College. Is there anything else you would like to add about your interactions with Dixie and the Student Garden?

COLLEGE OF CHARLESTON PRESIDENT

These questions were asked of President McConnell at the College of Charleston.

1. As the president of the College, you have many different stakeholders both outside and inside the College. Focusing on the internal stakeholders, who are they? How do you weigh and balance input from students and faculty? What criteria do you use when balancing competing demands?
2. Now I'd like to switch to the concept of sustainability. What does "sustainability" (not just in an environmental sense) mean to you in your position at the College?
3. The College has selected Sustainability Literacy as its Quality Enhancement Plan. Now that we have to implement it, what are the top one or two outcomes you are hoping for?
4. Let's talk about Dixie Plantation. What do you believe Dixie's mission is? How does it fit within the College's overall mission?
5. How does Dixie Plantation fit into the QEP?
6. Are you aware that there is a student-run organic garden at Dixie? Have you had the chance to visit it? If so, what do you think it's mission and role is?
7. Now, I would like you to think about how you and your office interacts with Dixie. Can you describe how the Office of the President is involved with Dixie?
8. What has your role been in shaping the vision and use of Dixie?
9. The Foundation owns and stewards Dixie. How do you collaborate or work with them in regards to Dixie?
10. In a best case scenario, where do you see Dixie in 5 years? What role is it fulfilling? What is it you think the College should achieve with Dixie?
11. What steps do you see to get from the present to that vision of Dixie?
12. We've discussed competing demands, the role of Dixie currently and in the future, and so forth. Is there anything you'd like to add about you or your office's interactions with Dixie Plantation?