

## ABSTRACT

Title of Thesis:

**STEWARDSHIP, FOOD SECURITY,  
COMMUNITY: NATURE-BASED  
INTERVENTIONS TO SUPPORT  
ECOLOGICAL DIVERSITY, FOOD EQUITY  
AND YIELDS, AND COMMUNITY  
INCLUSION AT A SMALL URBAN FARM.**

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Master of Landscape Architecture, 2025

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This thesis explores the ways in which nature-based interventions, like a food forest can be used to support and enhance ecological diversity, food equity and community inclusion at a 1.5-acre urban farm in Edmonston, Maryland. Urban farms are an integral part of our food system with the potential to lower the carbon footprint of our food, connect people with locally sourced healthy produce and bolster community engagement and connection. I examine the three areas (diversity, food equity and community) through case studies and site analysis as common themes emerge to unite and emphasize their interconnectedness. Through concepts rooted in permaculture and agroecology, I redesigned an unused space on the farm into a diverse and productive landscape ripe with educational features to engage the community with one another and our surrounding ecosystem.

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INTERVENTIONS TO SUPPORT ECOLOGICAL DIVERSITY, FOOD EQUITY  
AND YIELDS, AND COMMUNITY INCLUSION AT A SMALL URBAN FARM**

by

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Thesis submitted to the Faculty of the Graduate School of the  
University of Maryland, College Park, in partial fulfillment  
of the requirements for the degree of  
Master of Landscape  
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Professor Deni Ruggeri, PhD  
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## Preface

I grew up on 40 acres in a west Michigan farm town. Every growing season, my mother, sister and I planted, tended and harvested a massive vegetable garden. We sold what we couldn't use via an honor system. Drive-by customers were asked to pay what they could by dropping money through a slot cut into the top of a coffee can nailed to a dusty roadside table. I did not recognize then the great fortune to be connected to the process and the land that grew my food.

A decade later, waitressing at a small family-owned and operated New Orleans restaurant, I witnessed the magic and magnetism of a simple meal bringing people together. The distinctive cadence of Ray Charles' voice flickered above the candlelit atmosphere and in those peak hours it felt like we were all a part of a far greater feast. My supporting role in that nightly ritual was an awakening to what would become a tireless quest for that same sense of community, purpose and service.

Later in life, I became a Registered Dietitian and worked for Detroit's public health department. I installed demonstration gardens on the front lawn of our facility and spent my summer mornings watering the beds while socializing with neighbors. I prepared home-cooked meals with at-risk community members while chatting about community connections and the challenges of personal nutrition on extremely fixed budgets. I experienced the correlation between the built environment and our physical and mental health and came to recognize the undeniable interplay between these factors.

The next decade found me living overseas as a member of the foreign service. I gave birth to my daughter in Johannesburg and spent the first years of her life pacing the streets between our house and the embassy in Luanda, Angola seeking connection and fellowship within that community. I bicycled through the blocked Sunday streets with the rest of Santiago to the massive farmers markets in Chile and bumped down narrow alleyways of Phnom Penh in the back of a tuktuk while brushing my daughter's long blonde hair en route to kindergarten drop off. After that was Hyderabad, India where I joined the daily hour-long commute to and from the consulate to take a job as a biometrics clerk and spent my days screening Visa applicants. All these experiences helped broaden and reinforce my beliefs on the importance of community, service to that community and a meaningful sense of purpose.

Now the dust begins to settle as I approach the end of my graduate school years, and I sense a scaffolding has emerged. It is crafted from Landscape Architecture theory and design, buttressed with personal experience, growth and reflection. It is this body of knowledge and introspection that lends cohesion to these recurrent themes of my life: stewardship, food security, and community.

The inspiration for this thesis springs from that place. I was contacted by ECO City Farms, Edmonson in the summer of 2024. ECO was in the process of applying for a grant to redesign and replant an area that had recently been cleared of a decades-old tangle of invasive vines and shrubs. They were interested in transforming this new space into a permaculture-principled native food forest that would support their CSA offerings and complement the educational outreach at the core of their values. I

promptly provided a rough sketch of a planting plan and plant list for inclusion in the grant application but recognized immediately the need to research more fully the most optimal programming to bolster their success. What follows is an investigation of those ideas guided by the requests of the ECO city farm managers, grant specifications and my own passion for supporting human and ecological health through stewardship, food security, and community.

## Acknowledgements

Many thanks to Professor Jack Sullivan, my thesis chair, for your encouragement, guidance and patience throughout this process. I would also like to thank Dr. Deni Ruggeri and Professor Sherry Russell for generously lending your time and expertise. To my dynamic cohort, I feel so lucky to have learned and grown along with you all and can't wait to see where our paths lead. Lastly, to my husband, daughter and big sister, I am incredibly grateful for your constant love and support.

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“Designing equitable food landscapes means creating spaces where beauty, access, and nourishment are shared—not sold”

Paraphrased from Kate Orff  
Landscape Architect, SCAPE

## **Chapter 1: Introduction**

Question: How can nature-based interventions best support ecological diversity, food equity and yields, and community inclusion of a small urban farm?

The human population growth in urban areas continues to outpace rural areas, with more than half of the global population (4.4 billion people) residing in cities. In the next 25 years, that percentage is projected to reach nearly 70%. (The World Bank, 2025). The environmental impact of the strained food supply chain will increase along with the cities' growing populations. We must maximize urban farms' potential to provide food, community, and green space while supporting the ecosystem on which all life depends. In this study, I investigated nature-based interventions to bolster an urban farm's potential while staying rooted in regenerative concepts.

By increasing biodiversity, we can improve ecological health, farm yields, and community outreach. Integrating sustainable agricultural practices can create a respectful balance between food production and ecosystem preservation. Agroecology exemplifies these practices. Underutilized spaces, even on small properties, can be managed to promote regenerative practices that will, in turn, benefit the entire urban farm ecosystem and surrounding communities.

I investigated the theory that greater community engagement is fostered when there is greater diversity in farming methods and species planted. Neighborhood residents, children, and students visiting on field trips will be introduced to the concepts of classic row farming using organic and regenerative principles. They will

also experience the abundance of gardening with perennial species planted in a food forest. Visitors will learn to recognize that nature provides for our needs if we steward the land in a way that enables this symbiotic and cooperative relationship. Through repeated visits and interactions with the farm, a valuable sense of interconnectedness to and responsibility for our food system will emerge and remain, inspiring current and future generations to tread more lightly as they seek a more sustainable path forward.

The design indirectly enhances the health and abundance of current farm yields by attracting more diverse insects for pollination and predation. Crops harvested from the food forest plantings will demonstrate direct impacts on farm yields. There is also potential for "value-added" items like jams, herbal teas, and dried or fresh flowers.

The third aspect is the ecological impact of nature-based solutions on an urban farm. Utilizing the edges of the property and pathways, underplanting existing fruit trees, and implementing a food forest design in a currently unused space will all improve the ecological health of the land by slowing stormwater runoff due to greater evapotranspiration, enhancing carbon sequestration, building the soil biota and increasing biomass production. Food forestry mimics nature's layered structure, increasing resilience against extreme weather conditions due to our changing climate.

Despite evidence that urban agriculture lacks the production capacity to satisfy urban residents' needs, we can maximize the multiple positive benefits gleaned from nature-based solutions in community green spaces with some thoughtful interventions. When these tactics are applied to urban farms, they can compensate for

what is lacking in food production. Landscape architects are an asset in the thoughtful and skilled analysis of existing conditions to make research-backed suggestions for maximizing community engagement, food security and restoring ecological balance.

## **Chapter 2: Literature Review**

### **Section 1: Urban Agriculture**

Early urban agriculture practices can be traced back to ancient civilizations, where communities cultivated crops in available spaces near temples and homes ("Urban Agriculture," 2025). During the medieval period, monks grew herbs, veggies, and hops in monastery gardens (Ibid). Urban allotments were standard in pre-industrial societies as cities expanded (Ibid). These were characterized by small-scale operations integrated into daily life, where families relied on local resources for their food supply. These practices fostered a sense of community and stewardship but weren't always fool proof with regard to food production.

The first part of the 20th century saw a resurgence in urban gardening due to the World Wars and the popularity of Victory Gardens. Governments encouraged city residents to grow fruits and vegetables on any available land to help supplement the food supply and contribute to the war efforts. During the peak of this movement, over 40% of vegetables grown in the US were produced in these Victory Gardens (Indiana University Bloomington, 2025).

When the wars ended, urban sprawl expanded further into the agricultural perimeter, as development favored industry and housing. The land available for gardening within city limits decreased as population density increased. This brought a changing relationship between agriculture and city life. The shift contributed to food insecurity in cities and the environmental degradation of natural areas as development continued its creep outward. In addition, the visibility of food production was diminished. People began to lose touch with how food was produced. Food production shifted toward a more mechanized approach to large-scale agricultural operations, disrupting the connection to food production for entire generations. In recent years, though, interest in urban agriculture has surged again, driven by research, community initiatives, and growing concern about sustainability. Agriculture is increasingly viewed as a vital component of city planning and ecological design. (Siegner et al., 2018).

As urban farming continues to evolve, it is increasingly recognized for its potential to address broader social and economic issues. Community gardens and urban farms often emerge in marginalized neighborhoods where vacant lots are available, or property has less commercial value. These small pockets of grass roots development provide fresh produce, potential employment opportunities, and resident training (Sapkale & Sonawane, 2024). Urban farmers and local businesses can create economic opportunities that benefit both parties. By promoting sustainability and resilience, cities can ensure that urban agriculture remains vital to their development strategies and economic and social fabric by embracing these collaborative approaches.

The environmental and social contributions of urban agriculture are well-studied and documented. A systematic review found trends in urban farming studies highlighting the benefits of "city greening and beautification to improved nutrition; public and mental health; community food security; climate change mitigation; community building, economic development, and empowerment." (Siegener, 2018). Environmental benefits are plentiful and widely recognized: reduced urban heat island, improved air quality, improved stormwater metrics, increased pollinator populations, and increased carbon sequestration.

The uptick in publications on urban agriculture in recent years indicates that it is becoming a significant part of scientific discourse based on its many benefits. Another review highlights this factor regarding the multiple benefits of urban agriculture besides food production, like income opportunity, biodiversity, education, and health (Pradhan et al., 2020). This study also considered the constraints, pointing out that although urban agriculture can increase access to some fruits and vegetables for urban dwellers, it cannot supply the total calorie and nutrient demand. In addition, depending on the type of urban agriculture, it may require intensive inputs, so raising awareness regarding sustainable practices is essential. Resource-saving, dense, layered peripheral plantings for climate mitigation and stormwater management are just a few tactics to consider. This study concludes that urban agriculture should be promoted to encourage sustainable practices, recognized for its nutritional contributions and crop yields, and even more so for its social and community health benefits.

Localized food production through urban farming can reduce the carbon footprint associated with food transportation (Anushi et al., 2024). It also catalyzes social change, promoting inclusivity, cohesion and educational opportunities. The innovative and dynamic solutions offered by urban agriculture become essential for building resilient urban ecosystems as cities continue to face pressures from population growth and climate change (Ibid).

Researchers found that participants in a 2020 study demonstrated an average carbon reduction of 12.1% annually after a five-year observation period (Puigdueta et al., 2021). Initially, I assumed this was due to the lower carbon footprint of food transported into the city center. However, these metrics arose from participants composting more food waste and consuming more locally produced organic products. The most surprising discovery was that the participants consumed fewer animal-sourced foods (the production of which is a major contributor to greenhouse gases). These encouraging findings suggest that urban gardens inspire pro-environmental social change in factors that are difficult to influence, such as personal dietary choices.

Urban food production also contributes to sustainable place-making which is an important aspect of any successful community (Farrier et al., 2019). Empowering local people and providing space for marginalized communities improves mental health and well-being, helping to establish a sense of ownership. This builds strength and resilience among the community's people. The graphic (*Figure 2.1*) representation of the "model for sustainable food systems" highlights the interconnectivity of community, learning, and business (Lee-Wolf, 2009).



*Figure 2.1: Model for a sustainable food system. (Lee-Woolf, 2009)*

## **Section 2: Nature-based Solutions and Increased Biodiversity**

When exploring the potential of small urban farms through the filter of nature-based solutions (NBS), the role of biodiversity cannot just be considered as a goal but as a means to enhance ecosystem services that directly benefit agricultural productivity. For instance, diverse plant species improve soil health, increase pollinator activity and diversity (enhancing pest control), ultimately leading to more resilient farming systems. Community gardens are important habitats, contributing to urban biodiversity while addressing challenges like heat mitigation and stormwater

management (Larcher et al., 2021). The relationship between agriculture and biodiversity underscores the potential of NBS to transform urban landscapes into multifunctional spaces that support ecological integrity and food security (Li et al., 2023). Urban farms can produce food and create environments that promote social connections and enhance the overall quality of life in urban areas. (Clement, 2021) (Li et al., 2023).

The green infrastructure aspects of urban farms also improve air quality and manage stormwater runoff, contributing to urban resilience. This holistic approach positions urban farms as vital to sustainable city planning (Kalmpourtzidou et al., 2024). By prioritizing ecological diversity, cities can enhance their resilience against environmental stressors and foster a more sustainable urban future.

A SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats) of urban agriculture-related nature-based solutions was laid out by Canet-Marti et al. in their article, *Nature-based Solutions for Agriculture in Circular Cities: Challenges, Gaps, and Opportunities*. They sought to understand the resource streams of urban food. The strengths of this relationship were recognized as reduced environmental footprint through sustainable production methods and increasing profitability from organic growing status (Canet-Marti et al., 2021).

The weaknesses identified included a lack of professional experience among the volunteers and workers, which may lead to misuse of phytosanitary products and aggravate pollution. Improper use of chemical agents, whether pest management or fertilizer amendments, can lead to runoff of excess chemicals, which have the potential to pollute waterways (Ibid).

Opportunities involve harnessing the resources available in cities and redirecting them to farms. Building materials, captured stormwater, biomass, and compost are all things that are usually directed out of cities at great expense. These could be funneled back into the circular city model to keep those nutrients from going to waste. They could be used to help rebuild the soil, infrastructure, and farm ecosystem (Ibid).

Threats are similar to the above weaknesses, such as the safe handling of phytosanitary products, the incongruity between the supply of nutrients entering and going out of the city, and climate change impacts. This is summarized nicely in the chart below. (Figure 2.2)

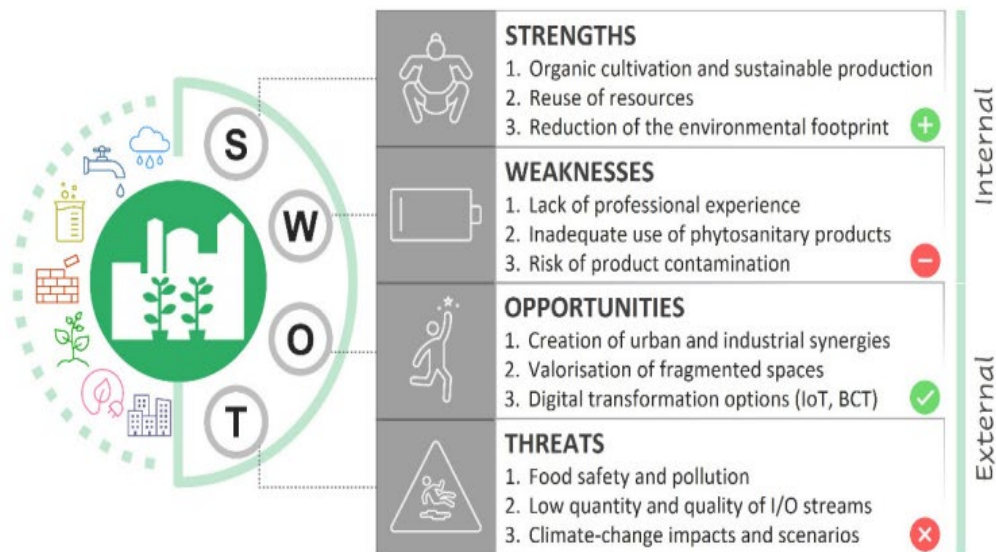


Figure 2.2: SWOT analysis of urban agriculture related to nature-based solutions (Canet-Marti et al.)

Urban agriculture plays a key role in the circularity of cities, using recovered resources to produce more food and biomass. This contributes to closing the urban cycle, maximizing the reuse of resources in the urban environment while reducing the need for external inputs (Canet-Marti et al., 2021).

### **Permaculture and Agroecology**

Industrial agriculture- large-scale cultivation of monocultures with heavy machinery and synthetic pesticides/fertilizers- has a massive impact on the biodiversity and health of our ecosystems. Runoff from these fields has polluted our waterways with excess fertilizers, and widespread applications of pesticides and insecticides have decimated the diversity of life above and below ground. Structural changes to the land due to the expansion of agriculture led to a simplification of landscapes and fewer species- loss of biodiversity, loss of natural pest control, pollination, and nutrient cycling. Pesticide use threatens beneficial insects, disrupting the food web (Krebs et al., 2018).

Because of the methods used on large commercial farms, soil health has suffered. Organic matter is lost through erosion, disturbances, harvesting, and compaction and requirement of fertilizer inputs. This upsets the soil nutrient balance as excess nitrogen and phosphorus runoff into the watershed and coastal waters, resulting in eutrophication of adjacent waters and toxic cyanobacterial blooms (Ibid). All these factors risk destroying vital functions of the ecosystem and threatening our human food supply. We must consider other options. With the collapse of the

ecosystem comes the collapse of agriculture. Agroecology principles rely on a diversified system with low external inputs. The five principles are as follows:

- Recycle biomass and optimize nutrient availability
- Manage organic matter, enhance soil biotic activity
- Microclimate management, water harvesting, soil management through increased ground cover
- Species and genetic diversification
- Enhance synergisms among components to promote ecological processes and services (Ibid).

A key technique is to "take full advantage of local knowledge and practices, including innovative approaches not yet fully understood by scientists but widely adopted by farmers and indigenous people." (Ibid). Agroecological practices such as crop rotation, intercropping, and organic farming are crucial in promoting biodiversity on small urban farms. These practices enhance soil health and provide habitat for a diverse range of organisms. (Clucas et al., 2018). Incorporating native plant species, particularly hostplants, and creating habitats for beneficial insects can further bolster biodiversity, leading to improved pollination and pest control within these agricultural systems (Ibid).

Permaculture is a holistic design system and best practices framework for creating and managing agroecosystems. The founders, Bill Mollison and David Holmgren, define it as "consciously designed landscapes which mimic the patterns and relationships found in nature while yielding an abundance of food, fiber, and energy for provision of local needs" (Krebs et al., 2018). The three guiding principles are:

1- care for the earth

2- care for people

3- set limits to consumption and reproduction and redistribute surplus

Principle	Approach	Relation	Examples with Evidence
I. Observe and Interact	bottom-up	Design process, management	Adaptive management
II. Catch and Store Energy	bottom-up	Agroecosystem structure	Organic mulch application Rainwater harvesting measures Woody elements in agriculture
III. Obtain a Yield	bottom-up	Design process, management	Emergy evaluation Ecosystem services concept
IV. Apply Self-Regulation and Accept Feedback	bottom-up	Agroecosystem structure	Enhancement of regulating ecosystem services Natural habitats in agricultural landscapes Wildflower strips
V. Use and Value Renewable Resources and Services	bottom-up	Agroecosystem structure	Legumes and animal manure as nutrient source Mycorrhizal fungi Animal manure
VI. Produce no Waste	bottom-up	Agroecosystem structure	Human excreta Waste products as animal feed
VII. Design from Patterns to Details	top-down	Agroecosystem structure, Design process	Natural ecosystem mimicry Use of grazing animals in cold and dry climates Structurally complex agroforests in tropical climates
VIII. Integrate Rather than Segregate	top-down	Agroecosystem structure	Integration of livestock in corn cropping Cereals and canola used for forage and grain harvest Integration of fish in rice cropping Polyculture (crops)
IX. Use Small and Slow Solutions	top-down	Agroecosystem structure	Inverse productivity-size relationship Agroforestry systems
X. Use and Value Diversity	top-down	Agroecosystem structure	Plant species diversity Pollinator diversity Habitat diversity Diversified farming systems
XI. Use Edges and Value the Marginal	top-down	Agroecosystem structure	High field border density Field margins Edges with forests
XII. Creatively Use and Respond to Change	top-down	Design process, management	Decision-making under uncertainty Increase ecological resilience Directed natural succession

*Figure 2.3: Summary of the 12 permaculture principles with corresponding approach (bottom-up or top-down), relation (design process, management, agroecosystem structure), and examples with scientific evidence.*

The above table illustrates the framework of permaculture principles more fully. Even though permaculture is not founded in research and science, the review by

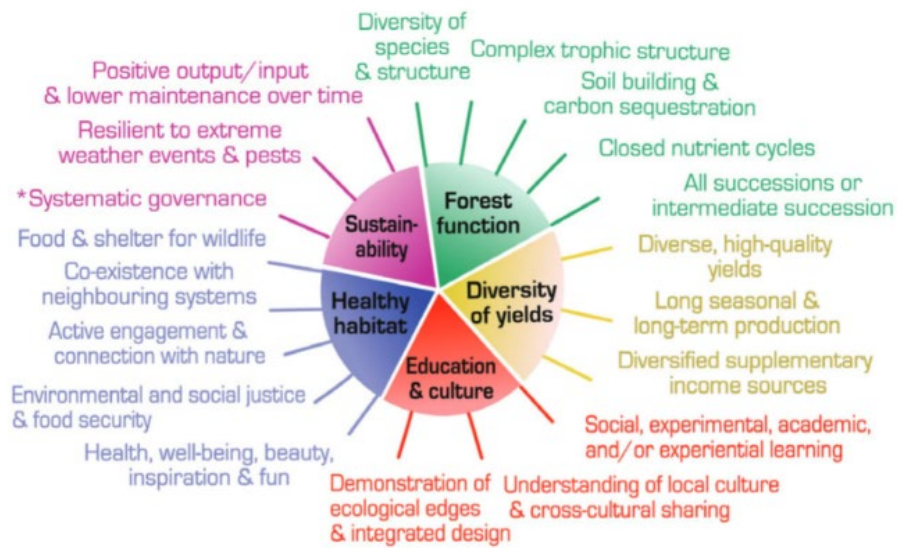
Krebs et al. highlighted that when taken one by one, each of the twelve principles significantly overlap when examined through the more scientific lens of agroecology.

### **Food forestry**

A food forest is a "multistory, perennial polyculture" designed and managed to function like a self-sustaining forest (Park et al., 2018). A high diversity of plants and structures are key ecological components. Building healthy soil and promoting diversity in soil biota. One food forest showed an increase in soil organic matter from 2.4% to 9.0% within 12 years (Ibid). There are five key goals for designing and managing a food forest:

- Education and Culture
- Forest function
- Diversity of yields
- Sustainability
- Healthy Habitat

Once established, food forests are regarded as low maintenance and require little external input. As perennials with formidable root systems, they can withstand weather events, pests, disease, and low maintenance. However, more input means higher yield. Compost is nearly always welcome in any plant during each growing season.



*Figure 2.4: Food forestry model: Key five goals and 19 essential attributes of food forestry identified by the food foresters in Canada, the United States, and the United Kingdom. (Park, et al, 2018)*

Food forests improve biodiversity and provide important ecosystem services. Trees and shrubs significantly contribute to carbon sequestration to help mitigate climate change. They also act as regulators due to their dynamic relationships with other plants, animals, and the soil, transferring nutrients between one another via the mycorrhizal fungi network present in a healthy and diverse soil web (Oncini et al., 2024).

### **Section 3: Food Equity**

Social justice in food systems addresses structural inequalities that affect access to healthy food. Urban agriculture serves as a platform for community empowerment. It can offer marginalized populations a voice in food production and distribution. This empowerment can improve health outcomes and a stronger sense of community as individuals work together to create sustainable food systems that reflect their needs and values. Integrating social justice principles into urban agriculture initiatives can help remove barriers that perpetuate food deserts and inequities in access to nutritious food. These initiatives can enhance community cohesion as residents collaborate to cultivate food and social ties that strengthen the neighborhood overall.

Urban agriculture is increasingly viewed through a food justice lens, focusing on who owns land, who benefits, and how communities can control their food systems (Siegener et al., 2018). When community-led, urban food forests and community farms supply food and empower residents to reclaim local food sovereignty. Nature-based urban farms also advance food equity by increasing access to diverse, nutritious, and culturally appropriate foods, especially in underserved neighborhoods:

- **Access:** Food forests can improve food availability, addressing urban food insecurity (Siegener et al., 2018). Crops grown in these dynamic settings are often unavailable in commercial markets, improving diet diversity, nutrition, and knowledge.
- **Production:** While urban farms cannot meet the caloric needs of residents in a densely populated urban area, studies suggest they can provide a meaningful

share. For example, modeling shows that a third of Berlin's residential green space could meet up to 80% of its vegetable demand (Pradhan et al., 2023).

- **Distribution:** Many food forests prioritize equitable sharing by donating harvests or offering free produce. Seasonal yields—greens in spring, berries in summer, nuts in fall—help meet year-round nutritional needs and will be able to supplement the existing CSA. Extra weekly produce is donated to local food banks, and CSA shares are offered to neighbors for a nominal fee or for free.

By incorporating nature-based solutions, small urban farms can increase food production while promoting social and environmental justice within communities (Cousins, 2021). Engagement with these initiatives can lead to greater awareness and increased support within urban environments (Kalmpourtzidou et al., 2024).

Community members can recognize the value in the development of multifunctional spaces that serve ecological and social purposes. By leveraging these nature-based solutions, urban areas can create a more equitable food system that prioritizes the needs of underserved communities. These initiatives can also facilitate partnerships between local governments, non-profits, and community members, fostering a collaborative approach to food security and environmental stewardship.

By promoting local food production, these farms can reduce reliance on distant supply chains and enhance community resilience, ultimately contributing to a more sustainable urban food system. Also, integrating educational programs within the food forest can help cultivate a food and environmental literacy culture, enabling residents to make informed dietary choices that align with their health needs and

cultural preferences while increasing their knowledge of the natural world. This holistic approach addresses immediate food insecurity and lays the groundwork for long-term social and ecological sustainability within urban environments.

#### **Section 4: Community Inclusion**

Implementing nature-based solutions on small urban farms can inspire intergenerational connections. Workshops and community events can engage a wide age range of residents and enhance social capital, promoting knowledge exchange and thereby reinforcing the community fabric. This interactivity enriches participants' understanding of agriculture and ecology and cultivates a collective identity that transcends demographic boundaries.

In addition to fostering intergenerational connections, these nature-based solutions provide educational opportunities for community members to engage with biodiversity conservation efforts, thus deepening their understanding of ecological interdependencies. As urban farms evolve into multifunctional spaces that value ecological health and social inclusion, they become instrumental in driving community-led initiatives that advocate for sustainable urban development and environmental stewardship, ultimately leading to more vibrant and cohesive communities.

Food forests can provide cultural and social habitats for plants, insects, animals, and humans. Woodland-based foods have advantages over typically treeless

agriculture regarding the provision of ecological and cultural ecosystem services (Oncini et al., 2024).

### **Section 5: Conclusion**

Food forestry is an effective way to incorporate beneficial social and ecological outcomes into our designs. Specific techniques include multistory planting, improved soil fertility through nitrogen-fixing species, construction of swales and berms to manage stormwater, and companion planting to promote symbiotic polycultures that maximize yield. Urban food forestry is a valuable strategy to address multiple sustainability challenges (e.g., biodiversity, food equity, and community inclusion). It also contributes to positive urban health outcomes by increasing public access to nutrient-dense, locally grown foods.

Urban agriculture represents a critical intersection of ecological diversity, community inclusion and empowerment, and food equity. As cities confront mounting environmental and social challenges, integrating nature-based solutions into urban food systems offers a path forward that honors tradition while embracing innovation. These practices demonstrate that urban green spaces can be an asset to any community as productive, regenerative, and inclusive places. While urban farming alone can't feed entire cities, its value lies in its multifunctionality—supporting biodiversity, climate resilience, food equity, and human well-being. We can cultivate a more resilient, just, and sustainable future through these practices.



This first case study is a good example of community engagement through children's education. Since my site hosts school-aged children on field trips regularly, I felt this was important to include. This is a 5000m<sup>2</sup> (1.23acre) forest garden in the southern Sweden town of Holma. It was designed to resemble a set of multi-layered forest edges. To maximize sunlight exposure, the concave sides of garden beds are oriented to the south. They considered both the direct and indirect functionality of the species they grew. The vegetation with direct functionality produces food for human consumption, whereas the indirect feeds pollinators and the soil via nitrogen fixation. The overarching aim of the Stinkbug project is to equip "children and young people to be active participants in building a sustainable society and creating a life of dignity" (Almers et al., 2018). The funding application describes the forest garden as "a pioneering project aiming to promote understanding that the foundation of our existence is synergy; interacting mechanisms, where the whole is something more than the sum of the parts." (Ibid).

This program was designed as an adjunct learning space for area school children to learn from their experience in a forest garden environment. After the three-year duration of this case study, the forest educators reported four main intertwined principles of their findings, which were to provide opportunities for the children to:

- feel a sense of belonging to a whole
- experience self-regulation and systemic dependence
- experience that they co-create together with non-human organisms
- imagine transformations of local places (Ibid).

The forest garden educators sought to connect the children to the forest garden through their experience with the garden, both through physical work and experientially. This helped to demystify concepts like biodiversity and ecosystem services, concepts that children may not fully comprehend. The aim was to guide children in recognizing that they are a part of the ecosystem, that they belong in nature, that they are nature. The forest garden, when it works best, "can give a concrete experience that we are part of an ecosystem that is useful to us and where our actions are important." (Ibid).

The diversity of the forest garden encourages children to recognize and experience the interconnected dynamism of the forest garden and those same qualities within and beyond themselves. This relates to the previous theme of belonging to a whole but introduces a larger theme built on understanding human dependence on other non-human organisms for survival. In addition, it encourages students to draw a parallel between themselves as a self-regulating organism and the forest garden as the same. Within a human are cells, organs, and systems in constant flux to self-regulate. This same principle applies to the forest garden, from the root systems communicating through mycorrhizae in the soil to the fruit produced by a pawpaw tree. Everything is connected and working in a cooperative way to flourish within the circular economy. These lessons are invaluable for students to learn early and often.

The third principle is one of co-creation, both with each other and with non-human organisms. Forest gardens require comparatively little human input regarding traditional gardens. It is essential to recognize that input is still needed in a more thoughtful and creative sense. In traditional gardens, control and management

elements are generally most prevalent. With a forest garden, the opportunity to influence and support processes comes through participation and creativity. For example, when designing a forest garden, one would consider the direction of sunlight, prevailing winds, and topography to create a microclimate that best supports the plant communities growing in that space. Designers should choose particular species with deep root systems to create an underground barrier for neighboring plants that tend to creep. A visitor can appreciate this sense of co-creation within the communities of plantings and the balance of the design.

Finally, the forest educators observed the garden as a place where children can widen their ideas about "what one might desire and demand from a neighborhood." It introduces "ways to positively influence and transform places and living conditions" (Ibid). Realizing that their actions and interactions impact their surroundings empowers children. It instills confidence in all of us, but especially in children, when we build and nurture our human communities and natural world connections.

Forest gardens are "an easily maintained and resource-efficient complement to a school vegetable garden." (Ibid). The study concludes with this thought, "In present times, when there is a global plea for the transition of society toward sustainability, resilience and climate adaptation, both the philosophical ideas articulated by the forest garden educators and the practical side of forest gardening with children are reasons for further exploration of forest gardening as an outdoor environmental education activity for children." (Ibid). This leads me to believe that this garden would be an ideal supplement to the existing vegetable gardens at Eco City Farms, Edmonston. It would support the already established relationships between ECO and

the neighboring schools that pass through for field trips. This case study has the potential to guide and offer arguments for programming that could supplement science curriculums, after-school programs, or even help secure funding for a food forest garden steward to remain on site until sundown to open this space for exploration as an adjunct to the neighboring park.

## **Case Study 2**

FORESTED, Bowie, MD (stewardship–community engagement)

Next, I decided to reach out to a local food forest to get an idea of how one was currently being run. I wanted to understand the plant choices and potential guild plantings that could offer great benefits to the food forest’s health. In my research, I had also read about the importance of connecting with other farmers to glean invaluable experiential information that might not be available in publications. So, on a Saturday morning in early April, I drove 20 minutes outside of Washington DC to the Forested farm in Bowie, Maryland. It’s a 10-acre forest garden that founder Lincoln Smith began nearly 15 years ago. What was once a mono-culture agricultural field has become a lush and verdant piece of land that thrives through the communities of plantings intended to mimic the symbiosis of forest ecosystems. From the Forested website: “Lincoln started Forested, LLC to develop and share research in forest gardening. He is a regular speaker on forest gardening at venues such as University of Maryland, the U.S. Botanic Garden, and the Maryland Master Gardeners' Conference.” (Forested, 2025).



Figure 3.2,3: Entrance gates to Forested. Photos by author

The vision for this project as shared on the website: “Our 50-year vision is for forest garden ecosystems to sustainably supply a large portion of all food and forest products people need and use for healthy living. We have a special focus on the eastern United States where the Forested research garden is located. We also offer education and services with worldwide application.” (Ibid).

The first challenge in the stewardship of this 10-acre parcel was to begin the slow process of rebuilding the soil. It had been a cornfield for decades and the soil health

suffered. He planted pioneer species like the native black locust (*Robinia pseudoacacia*).

These fast-growing trees help to fix atmospheric nitrogen

into the soil and can later be harvested as a rot-resistant building material for fence posts or other

farm structures. He also relied on ground covers like clover and vetch which do the same.

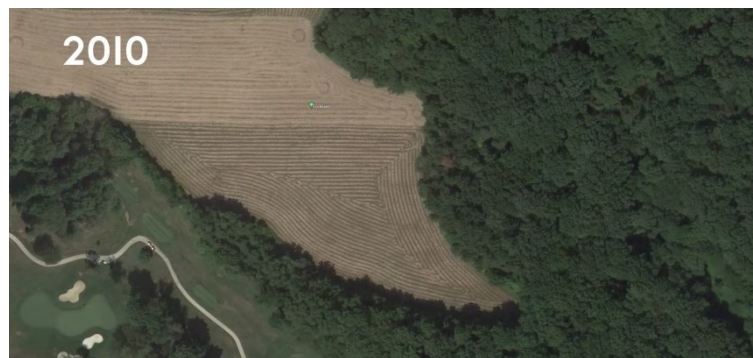


Figure 3.4: 2010 overhead photo of Forested Farm from Forested website.

After a few years, the diversity of insects, amphibians and other small mammals increased. The biomass produced by the perennials and shrubs provide habitat for creatures and nutrients for rebuilding the microorganism communities and improving diversity in the soil structure. Slowly the farm was taking shape.



Figure 3.5: 2016 overhead photo of Forested Farm from Forested website.



Figure 3.6: 2020 overhead photo of Forested Farm from Forested website.

Through trial and error along with Lincoln's expertise (he has a background in agronomic science and sustainable landscape

design) progress is made. He spoke of permaculture principles like planting in layers and working to mimic the structures of plant communities found

in nature: canopy trees with understory and shrub

layers followed by an herbaceous layer to best support the lifecycle of all organisms.

He includes species that act as host plants for insects which can work as natural pest managers and as food for birds making their homes nearby. He is a font of knowledge and passion for this lifelong research project.

Along with around 15 other curious visitors, I listened as Lincoln introduced edible groundcovers (both native and non) that were growing in and along the paths we

followed and encouraged us all to partake in sampling the tender spring greens and sweetly perfumed blossoms. There were two rambunctious young boys whose attention tumbled from a stack of debarked logs to a sun oven used to dehydrate fruit to a treetop platform overlooking the farm— except for when the samples were offered. Their ears pricked up when they learned they could nibble on the greens around their feet and tried to “out-silly” each other by jamming fistfuls of cutleaf coneflower (*Rudbeckia laciniata*) and violets into their mouths.

Lincoln mentioned that when he began this project, he had a loose plan for how he would guide the regenerative design of the forest edges. After clearing some spots for planting, he and his crew quickly recognized that the seedbank which had not been allowed to germinate held many secrets to what was here before the decades of agricultural suppression. Sprouts of persimmon trees (*Diospyros virginiana*) popped up readily. Although he had a different vision, he realized that he should honor what the land was telling him. The persimmons were left to grow. Another lesson he shared was that when he finds a plant growing wild, he introduces a cultivar of that species since the two would generally thrive under the same conditions. So much of this work is rooted in patient and thoughtful observation.

We ended the tour at the newly dug forest pond, rimmed with the unmistakable green feathery fronds and unfurling young shoots of ostrich fern (*Matteuccia struthiopteris*). After the ferns establish themselves in a lush and robust colony, he plans to harvest the young fiddleheads, a springtime delicacy. One of the young boys from earlier promptly sloshed into the pond in pursuit of a salamander, filling his boots to the top with water. I caught the tired but smiling eyes of his mom whose preparedness and

good humor served her well as she shrugged and pulled a pair of fresh socks and dry shoes from her backpack.

Lessons learned: Although I came into this site assuming I'd learn about various fool-proof planting combinations for this region and proven techniques for success, I realized that this sort of project is site specific. "The right plant for the right place" is something I've heard repeatedly from horticulture colleagues and something that many lament landscape architects fail to regard. This experience prompted me to revisit my working plant palette and make adjustments to honor that golden rule. I was also delighted to have encountered the youngest attendees out so early on a Saturday morning enjoying the fresh air, leafy greens, and tadpole pools. This served to underscore the importance of having spaces like this closer to the city limits where neighborhood kids can explore and discover a world filled with nourishment, adventure, curiosity and silliness.

I was grateful to have the opportunity to discuss my developing plant palette with Lincoln and pass a few ideas by him. The Forested project is also an excellent example of working with agroecological principles to rebuild habitat below and above ground. As mentioned, the soil at Forested had been severely degraded due to industrial agricultural practices. I was pleased to witness the progress made in around a decade. The soil at ECO has not suffered that fate but will require amendments to ensure the greatest success in the early years as we begin to rebuild the mycorrhizal soil network. The size of the food forest at ECO is much smaller (under 1 acre), so I am hopeful that we will be rewarded with noticeable habitat recovery, both soil health and biomass for habitat and carbon capture.

### Case study 3

BLISS MEADOWS - Baltimore Maryland (food security–community engagement)

Since I had investigated a well-studied and documented project in the Stinkbug, and a project of similar plantings at Forested, I sought then to visit one with a similar setting and similar programming. I wanted to find an urban farm run by a non-profit working in an underserved urban community who not only had a CSA component but also engagement with neighborhood children, direct relationships with area schools, and hopefully some components of food forestry. Fortunately, I didn't have to look far.

On a weekend in mid-January when most farmers have a brief respite from their fields, I attended the Future Harvest annual conference held in Silver Spring, MD. Future Harvest is a nonprofit organization (501c3) whose mission is “to advance agriculture that sustains farmers, communities and the environment”, within the tri-state area but with a special focus for areas within the Chesapeake Bay watershed. They offer farmer-in-training programs rooted in sustainable agriculture, always through the lens of protecting the Chesapeake Bay. They deeply value and prioritize “building community, awareness, and collaboration among farmers, food businesses, policy makers, and consumers.” (Chesapeake Alliance for Sustainable Agriculture, 2025).

One of my favorite sessions entitled, **Farm Community Engagement: Successes and Failures** was led by Atiya Wells, founder of Backyard Basecamp (Bliss Meadows) and Liz Lamb, Director of The 6th Branch, both urban agriculture, community garden operations in the city of Baltimore. The two shared stories of community engagement, participation, frustration and setbacks. They ended their presentation with an open invitation to visit their farms in Baltimore.



*Figure 3.7: Plan view of Bliss Meadows from their website*

Bliss Meadows is a land-reclamation project by Backyard Basecamp. Located in northeast Baltimore, the project knits together 3 connected spaces through public and private partnerships to form one uninterrupted 10-acre space. The founder and executive director, Atiya Wells envisions a space for community gardens and outdoor

dinners, culturally relevant environmental education, and equitable access to nature and safe play spaces. Along with many seasonal community events and outreach, current programming includes educational opportunities and certificate programs: Youth camps, Habitat Discovery, Animal Tracking, Naturalist Training, Urban Farming Certificate program, Outdoor Preschool (Backyard Basecamp, 2025).

According to Atiya Wells, since founding this ambitious project nearly a decade ago, the vision and scope have expanded in unanticipated ways. For instance, the lack of affordable summer camps and daycare for neighborhood children inspired Backyard Bliss to develop a wildly popular sliding-scale program of spring and summer break camps along with their outdoor preschool. Further expansion is planned as supplemental funding is secured.

I met with the Garden Educator, Lucia, at the once vacant, now newly renovated farmhouse at 5105 Plainfield Avenue. She walked me through the crowd-source funded space with a kitchen, classrooms, meeting spaces and administrative offices. We toured the outdoor areas that are currently programmed, like the fenced in production gardens where I spoke with the Production Manager, Jordan who was hard at work turning the compost near the main garden while directing a crew prepping beds nearby. They use all organic methods of growing and maintenance to increase soil health and fertility and have seen an increase in yields with each passing season. They sell their produce at weekly farmers' markets and supply a local CSA co-op in addition to offering the produce to neighbors.



Figure 3.8: Masterplan of Bliss Meadows, Envirocollab (Backyard basecamp, 2025)

The master plan from their website (Figure 3.8) illustrates a loose vision for their future development. They based this design on the natural flow of rainwater through the site, attempting to subvert some to the orchards and other tributaries to the naturally occurring ponds on the south side of the property. It struck me as a perfect metaphor for not only the ebb and flow of their seasonal work but also for how their resources are allocated based on the needs of their community. Only after we observe and listen to what is present and what is missing can we thoughtfully and respectfully respond.

Lessons learned: I was struck by their commitment to the iterative process that formed the core of their values. As some ideas fizzled, others caught fire. Throughout, they shift their focus, energy and intentions to best serve the needs and

interests of their community. As a designer, I have noticed that we sometimes hold attachments to a preconceived vision for a space, when it would better serve a client and/or community to maintain openness throughout the design process. The rigidity sometimes inherent in decision making can hinder this iterative process- which always works best as a function of co-creation. During my visit, the production manager mentioned that he'd recently visited ECO farms in Edmonston. It speaks to the cooperative aspect of this work. Everyone seems eager to share their successes and failures and encourage others to do the same so they may all learn together.

#### **Case study 4**

##### DENNIS AVENUE STORMWATER RETROFIT, Montgomery County, MD

Finally, I want to mention this case study that sparked my interest as I was developing an idea for a thesis over a year ago. On my very first visit to ECO, I noticed the drainage channel that runs behind the property. The farm manager, Thomas Fazio groaned and shook his head, "It never drains," he said. "Even during the drought last summer, never drained... just got more and more smelly." I hated to think of the farmers working next to that fetid water all year round, but even more so, hated to think of the neighbors who were living with it in their backyards. This retrofit project in Montgomery County came to mind and I thought it was important to include it as a possibility for Edmonston's administrators to consider as they rework the city's stormwater management strategies.

One rainy day last spring, our Urban Design studio ventured out into the elements to investigate some stream restoration work in Montgomery County. While I appreciated the inspiring work done at Evans Parkway Park by Oculus Studios, my attention was pulled more strongly elsewhere. As we motored through the neighborhoods along the Sligo creek, I noticed the abundance of native plantings in raingardens incorporated into sidewalk garden beds. It was far more compelling than the usual scruffs of grass I am accustomed to seeing in these conditions.



*Figure 3.9: Dennis Avenue stormwater intervention, Google maps*

We passed over a deep swale that divided the traffic directions of Dennis Avenue. Professor Sullivan stopped the van, and we popped out for a closer look. The rain had begun to fall harder so we had the opportunity to admire this installation fully activated. It was reminiscent of a gentle forest stream. Absolutely beautiful. The

sides were planted with thirsty *Salix* varieties and *Betula nigra*. There were hints of deep-rooted perennials that were hibernating beneath the early spring terrain.

Although this appeared to be a low-impact solution to the problem of our urban landscapes filled with these aging concrete channels, I suspected it was likely far more complicated than it seemed that afternoon.

After sending a few emails, I was referred to the Department of Environmental Protection of Montgomery County, who were able to answer some of my questions and provide a detailed engineering document, Appendix 4. This installation was a major stormwater retrofit that took place over many years in that Sligo Creek area which included this section. This particular swale was a retrofit of an existing conveyance system that provided an opportunity to try a relatively new design approach, at the time it was constructed around 2012, called a Step Pool Storm Conveyance (SPSC) system. The design consists of a series of step pools that step the conveyance down the channel to dissipate energy, reduce velocity, and provide water quality benefits through a media of sand and wood chips to filter the conveyance, promote an increase in the flow path, provide storage volume and recharge groundwater.



*Figure 3.10: Dennis Avenue stormwater intervention, activated. Photo by author*

This project made me wonder if there might be an even simpler way to implement a strategy loosely inspired by this installation to address the aging concrete channels throughout our cities. Could we strategically drill through and introduce some thirsty vegetation? Could freeze/thaw cycles along with some strong and persistent roots do some of the hard labor of concrete busting to slow down the water flow and allow for

more recharge of groundwater? Or in the case of Eco city, simply encourage the stagnant water to drain. I could sense my questions would need to remain purely speculative for now as my thesis time and scope was limited.

## **Chapter 4: Site Inventory**

### **Section 1: Context**

I was approached in August of 2024 and asked to join a team of community activists, the Community Native Planting Project, who had recently excavated an overgrown area of a small urban farm. The vision was to repurpose this space as a mini food forest to help bolster the farm's CSA offerings and expand on-site educational opportunities. They were already in the process of applying for a Keep Maryland Beautiful Community Stewardship Grant. From the KMB website, this funding is granted to "schools, nonprofits, and other community organizations that are working to eliminate local environmental problems, encourage stewardship of the environment, and educate community members." (Appendix 1)

Before I had the opportunity to do a thorough investigation into site inventory and analysis, they requested I send a planting plan with quantities and species that they could include in their application which was approaching the deadline. I visited the site, met with the staff, reviewed the grant application and put together a quick plan. (Appendix 2) And then began working backward to research the site and modify my design and plant communities before we broke ground in the spring.

ECO City Farms is a nonprofit organization that specializes in urban farming and community outreach. From their website: “We envision a just, vigorous and sustainable food system in the Chesapeake foodshed with ample fertile soil, quality environments, livable incomes and decent working conditions for farmers and food workers, and nutritious high-quality food for all.” ECO City strives to “protect, restore and sustain the natural environment and the health of local communities.” There are three locations located northeast of Washington DC, within Prince George’s County, Maryland: two sites in Hyattsville and one in Upper Marlboro.

(Figure 4.1)

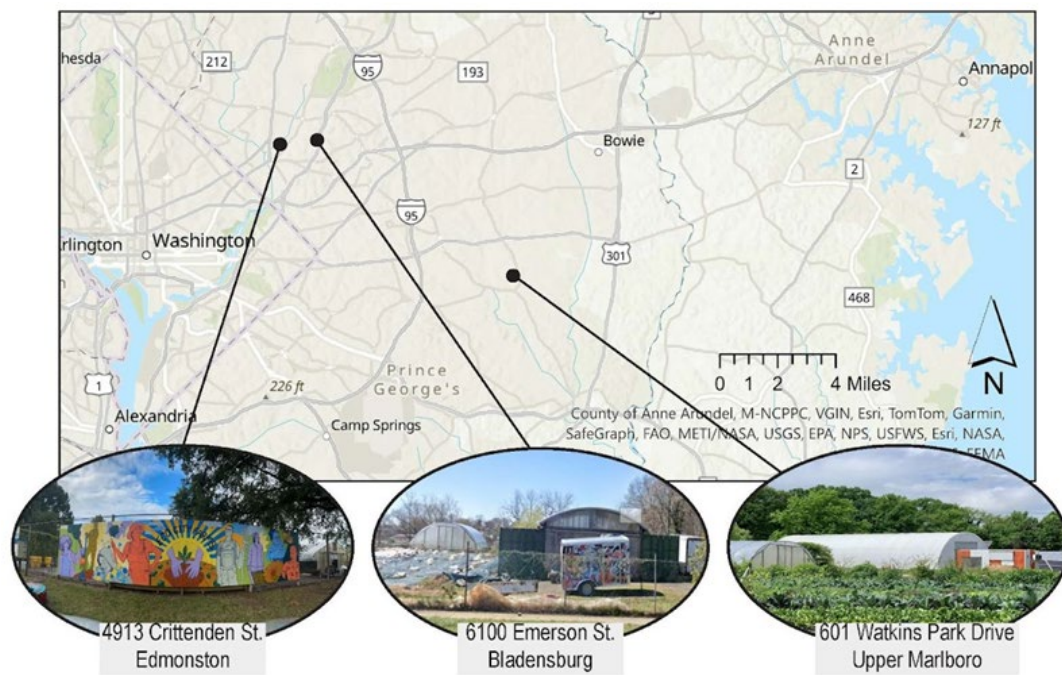


Figure 4.1: Map of 3 ECO City Farms locations

Their mission is to provide their working-class communities with locally grown, nutrient-rich vegetables and herbs while striving to eliminate racial and

socioeconomic inequalities in health. Per their website, ECO City is a “cornerstone of the Port Towns’ Community Health Partnership, a collaborative effort to ensure that local area residents have full access to healthy food and enhanced opportunities for active living.” (Eco City Farms, 2025).

The Edmonston site was the first to be established in 2010 on a 1.5-acre piece of land with a 15-year lease from The Maryland-National Capital Park and Planning Commission (M-NCPPC) (Eco City Farms, 2025). The space sits nestled between the NE branch of the Anacostia River levee to the northwest, a non-residential industrial zone across the shared channelized drainage ditch to the south and residential surrounding otherwise. (Figure 4.2) This farm serves as the anchor for many of ECO

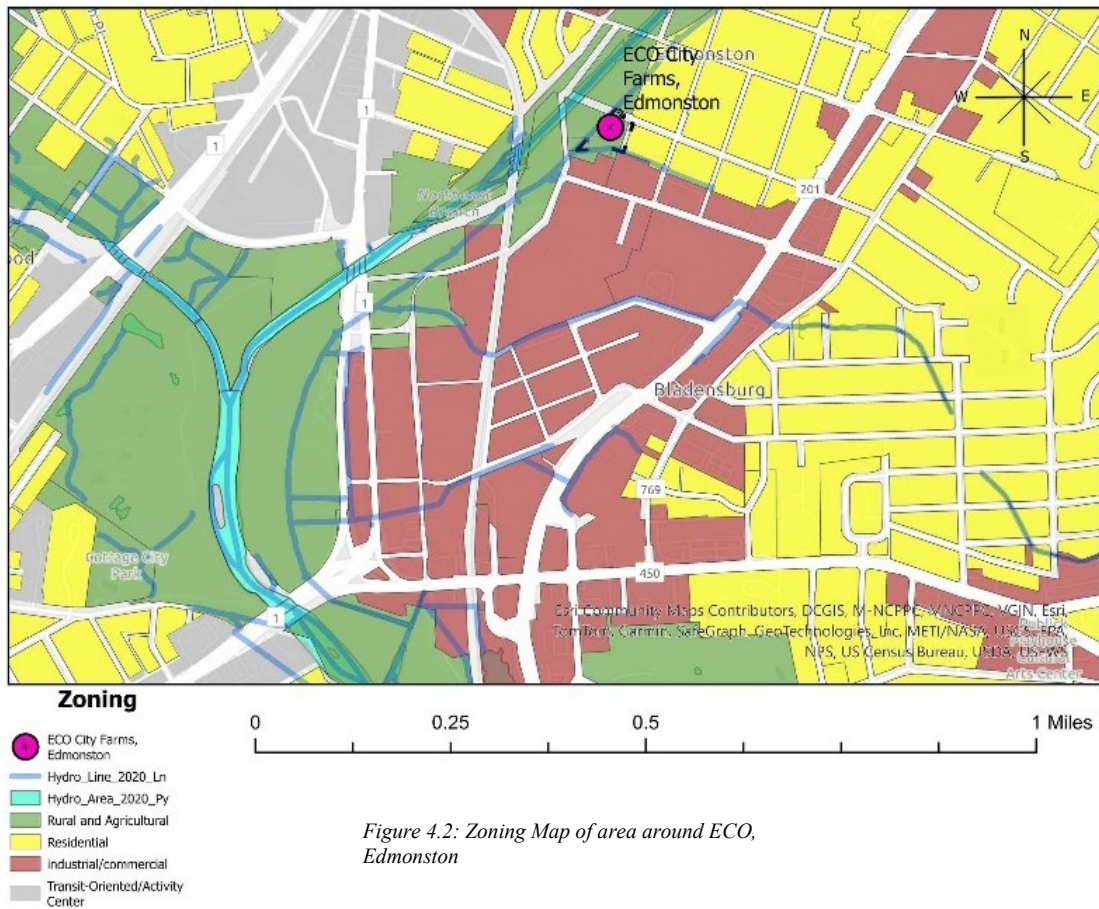


Figure 4.2: Zoning Map of area around ECO, Edmonston

City's programs: summer youth programs, farmer in training, Community Supported Agriculture (CSA) pickup and community hub. The farm uses converted shipping containers as a processing kitchen, a classroom and vegetable storage. They grow organic vegetables, fruits and herbs year-round in hoop houses. In addition to these production hoop houses, another is used as a nursery to raise seedlings for the farm and to share with growers in the community. This space is shared with Chesapeake Native, Inc., a local ecotype nursery seeking to preserve and distribute native plants with provenance in the Chesapeake Bay Watershed.

The 3.5-acre farm at the Bladensburg site was acquired next. Permaculture techniques and use of high tunnels extend the growing season and vastly improve production potential. This site is also the location of the Compost Outpost, where they produce all the soil-building organic compost used on-farm (Bladensburg and Edmonston), community growing plots, Beginning Farmer Training Program growing tunnel, beehives, an orchard and a young food forest (Ibid).

The third site, in Upper Marlboro, The Urban Farm Incubator at Watkins Regional Park is a collaboration between the following entities: ECO City Farms, The Prince George's Soil Conservation District (PGSCD), Prince George's Food Equity Council (FEC), The Capital Market of 20743, and M-NCPPC. They accommodate multiple beginning farmers and provide support through infrastructure, equipment, mentoring and technical assistance to help those who are just starting out and seeking to test the viability of their business plans (Ibid).

The Edmonston site is the focus of this study.

Edmonston lies along my route to and from the university. I've driven through there often in the last three years. When travelling along Decatur Street, my eye is drawn to a public mural that spans both sides of a thin strip of the sidewalk guardrail on the bridge over the northeast branch of the Anacostia River. One side reads: "Different individuals valuing each other regardless of skin, intellect, talents or years". The other says: "Diversity without Division Creates Harmony". The dancing block letters are interspersed with flags shaped like the countries they represent, calling out the cultural diversity of the community's present and history. The colors are vibrant and the biophilic patterns and skewed fonts suggest movement, appropriate for a small port town which inhabits two sides of this Anacostia tributary (Figures 4.3-5). It speaks not only to the social and economic makeup of this community but also to the ecological diversity that is key to maintaining the health of the riparian zones of this town's location.



Figure 4.3,4,5: Photos of bridge over NE branch of the Anacostia River, connecting two sides of Edmonston.



The 250-acre town of Edmonston (*Figure 4.6*), incorporated in 1924, refers to itself as a “bridging community”. Perhaps the most remarkable story from Edmonston’s past is that of Adam Francis Plummer and his wife Emily Saunders Arnold Plummer (“Edmonston, Maryland”, 2025). After the end of the Civil War, the Plummers were freed from enslavement at the nearby Riversdale plantation and purchased 10 acres of land in the area that is now Edmonston (*Ibid*). They proceeded to seek out and reunite with family members who’d been sold into slavery in the deep south. They named their new settlement Mt. Rose after the many rose gardens Adam Plummer cultivated as a skilled plantsman. He also had kept a diary from his years of enslavement which is a featured exhibit at the Smithsonian’s Anacostia Community Museum (*Ibid*).

As the town of Edmonston moved into the 21st century, the real estate at the river’s edge struggled to stay dry after seasonal rains. The edges of the Anacostia had been buttressed by levees built by the Army Corps of Engineers. This kept the swelling river from spilling into the developed areas. But the pumping stations that were intended to move water from the “bowl” of the city up and over the levees to join the river and flow downstream failed to do so. After decades of development, the

increased impermeable surfaces (Figure 4.8) yielded greater amounts of stormwater runoff in

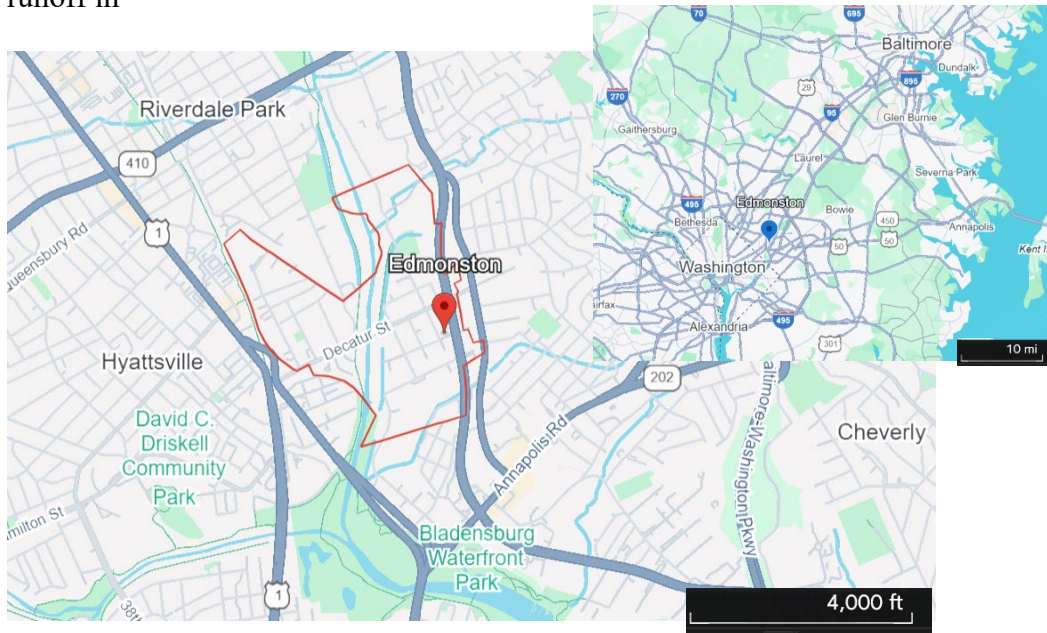


Figure 4.6: Contextual maps of Edmonston, MD

amounts that the outdated pumping stations could not reliably process. In the early 2000s, residents struggled to recover after a series of floods. The town received funding from the county to install a new pumping facility that used three massive Archimedes' screws, a flood pumping technology often used in the Netherlands but rarely in the US (Ibid).

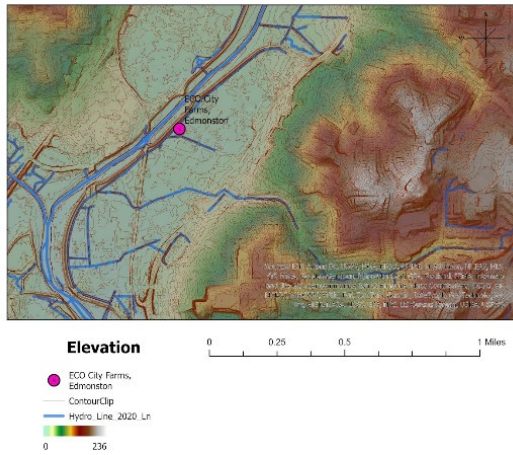


Figure 4.7: Elevation map of Edmonston, MD

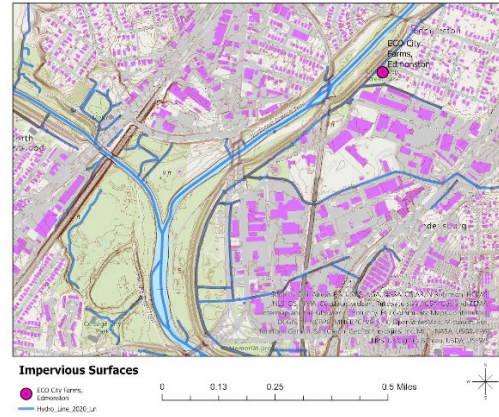


Figure 4.8: Impervious surface map of Edmonston, MD

Although this decreased the threat of flooding tremendously, town administrators still felt they could do better. They designated the major road, Decatur Street, as an area for improvement (Town of Edmonston, 2025). After securing a grant from the Chesapeake Bay Trust for \$25,000 and subsequent federal stimulus money totaling \$1.3 million they began a plan to reimagine Decatur Street as a greenway. From the Washington Post, (Kravitz, 2010) “Running three-fourths of a mile, it is now lined with about 30 maple, elm, sycamore and oak trees and energy-efficient, wind-powered streetlights. Crews installed a bike lane and narrowed the roadway by about eight feet, reducing the amount of pavement. The new sidewalks are made of permeable concrete blocks and landscaped areas, or "rain gardens," that filter water naturally through the ground.” The new stormwater system filters 90 percent of annual rainfall. "We never once flooded from the Anacostia," Ortiz (then mayor) said. "We flooded from the runoff of parking lots and shopping centers, roofs, buildings and streets from the areas around us." (Ibid).

With the addition of a new “green street”, Edmonston’s reputation as a working-class neighborhood gained a new facet as a place with a forward thinking and inclusive vision for the future. Simple as the interventions may have been, historically they’d been reserved for areas of greater socio-economic resources. This project was one of the first of its kind to be implemented in the country.

### **Section 2: Demographics**

As of the census of 2020, there were 1,617 people. The majority racial/ethnic makeup of the town is Hispanic (56.8%), Black (27.6%) and White (8.9%). There were 382 households with the average family size at 4.25 people: Married-couple family households were 42.4%, male householders 16.2% and female householders were 33.2%. There were 481 total housing units. Homeownership rate is 54.7% with nearly 70% of units valued at \$300,000 to 500,000. Owner occupied housing units were primarily married couples (109) with 25 households owned and occupied by a female head of house.

The median age is 29.7 making Edmonston a young place, 32.3% of the residents are under 18 years old. Nearly 60% of households are Spanish speaking. 40% of the population is born outside of the United States, 38% of whom are naturalized US citizens with 62% of the foreign-born population without citizenship status.

The median income for a household is \$82,431, and the median income for a family is \$90,313. Married couple families reported an average income of \$106,389 while the average for nonfamily households was \$66,250. It is reported that 7.5% of the

population lives on or below the poverty line. 22.1% of residents are without health insurance. (All data from US census bureau site).

**Section 3: Watershed-EcoRegions**



Figure 4.9: Chesapeake Bay Watershed, (ICPRB, 2025)

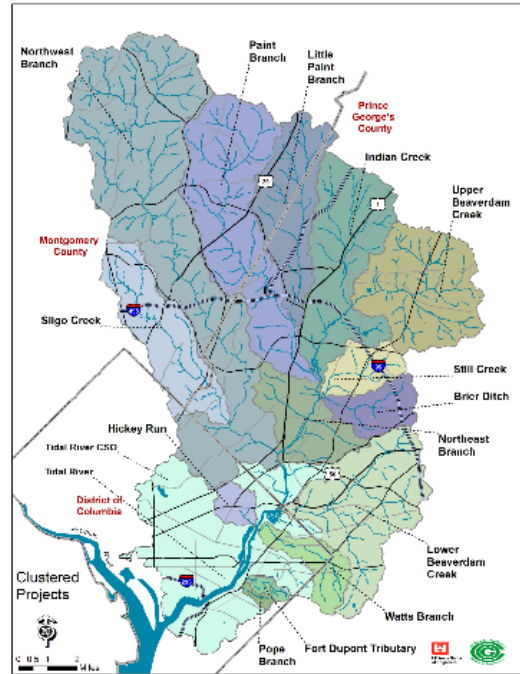


Figure 4.10: Potomac River Watershed (US Army Corps of Engineers, 2023)

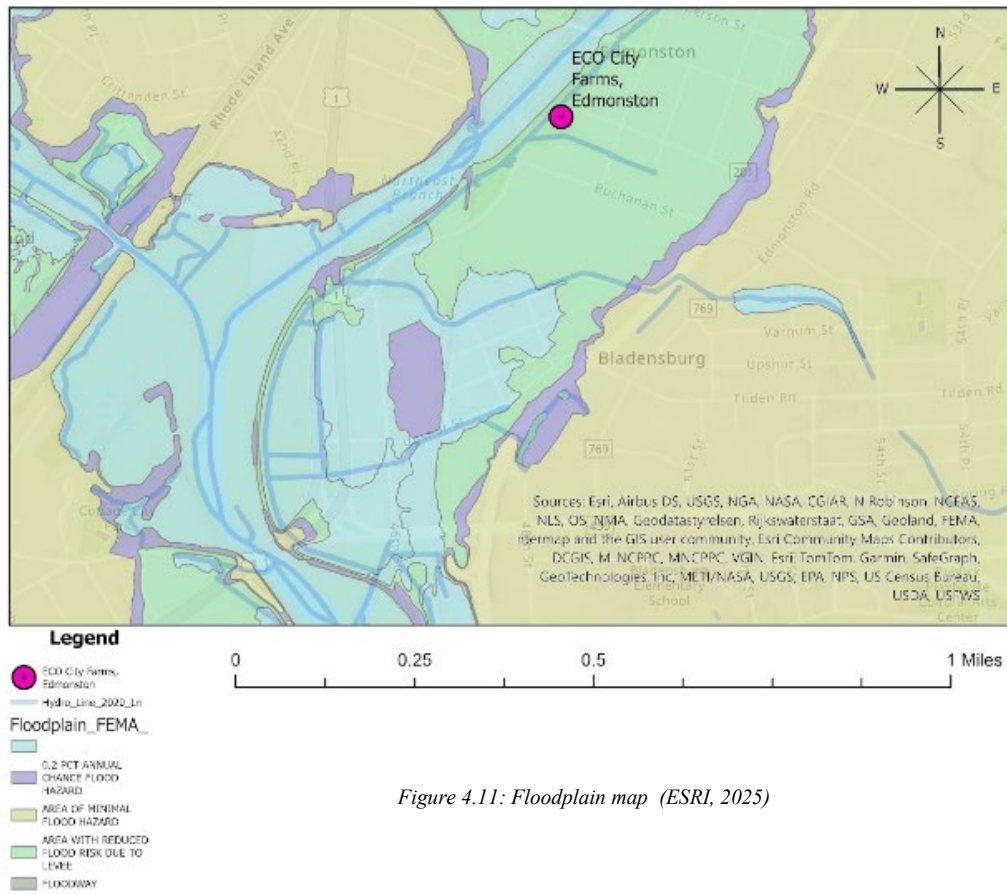
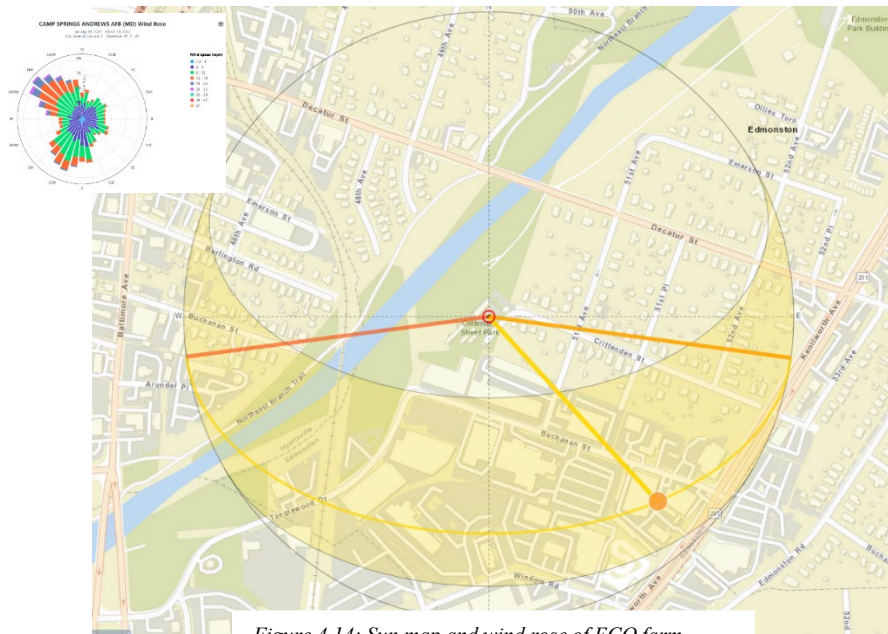
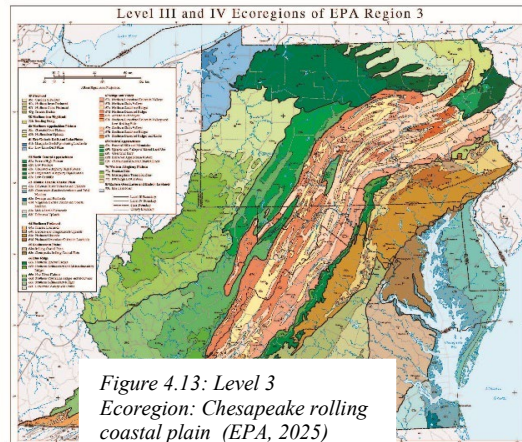
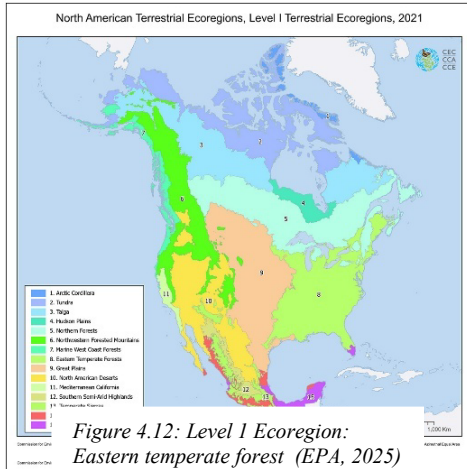


Figure 4.11: Floodplain map (ESRI, 2025)

Edmonston is located within the massive watershed of the Chesapeake Bay which spans over 64,000 square miles along the NE coast of the continent (ICPRB, 2025). More specifically, it is a part of the Potomac River watershed which innervates 14,179 square miles of the District of Columbia, Virginia, Pennsylvania and Maryland area (ICPRB, 2025). Further, it is a part of the Anacostia River watershed which accounts for 174 square miles of the Potomac watershed (US Army Corps of Engineers, 2023).

The project site, Eco City Farms is in a flood plain, directly adjacent to the levee built along the NE branch of the Anacostia. It is classified as an area of reduced risk due to the presence of the levee.

This area is in USDA plant hardiness zone 7b. The Level 1 ecoregion is classified as Eastern temperate forests and the Level 3 as Chesapeake rolling coastal plain. The site gets full sun except for the area along the drainage channel and south side where the neighbors have full-grown canopy trees casting a shadow. Prevailing winds are out of the NW though semi-protected since this is the side where the levee runs, protecting the farm from some of that wind.



#### Section 4: Existing conditions

Every other Thursday, between the hours of 3-6, I pull into the Edmonston Farm site to collect my CSA share. The idea that most of my family’s produce can be grown within a mile of my home in the industrial Maryland suburbs on the

Northeastern edge of DC never fails to delight me. The bundles of greens are held together with a simple twine band and the root veggies are loosely contained in a crate; the members weigh out their allotted portion on a nearby scale and gather them into their grocery tote. A typical haul includes a generous bunch of swiss chard, baby spinach, beets, sweet potatoes, carrots, dill, parsley. I greet Helen, the Eco farm attendant, as we gush over the impossibly deep green of the dinosaur kale and exchange recipe ideas for collard greens. It feels more like a sacred ritual than an errand and I look forward to it all week.



*Figure 4.15, 16: semi-weekly Winter CSA share from ECO farms. Photos by author.*

The price structure of a membership is based on a sliding scale, as low as \$15 and up to \$45 per share. Any leftovers or unclaimed shares from each week are donated to a local food bank.

When I was contacted about this project, the farm managers told me that a priority in this redesigned space was to bolster this already thriving CSA within the guidelines of the grant. A native food poly-culture forest seemed like a good place to begin the investigation. Whatever design emerged, it would also need to add value,

depth and perhaps expansion to the community education component of Eco's outreach and connection to the local schools and beyond.

The topography of the site is primarily flat, aside from a small swale and berm on the southeastern side, where the food forest will be installed. There's a large, paved area which once served as a tennis court. This spot supports three repurposed freight cars: one is used as cold storage, the other is a prep station for washing and bundling produce, and the third has a demonstration cooking counter with tables and chairs for administrative duties and classroom space. (Figure 4.17)



Figure 4.17: site inventory map with zoning

The farm manager, Thomas Fazio reported that they experienced fewer incidents with flooding since they installed stormwater management measures about a decade back. The production side of the farm where the vegetable beds and hoop houses are located used to experience heavy saturation after rains with stormwater running directly into the concrete drainage channel behind the site. However, in 2015,

ECO was awarded a grant through Prince George’s County Stormwater Stewardship Grant Program to install a system designed to help mitigate this issue.

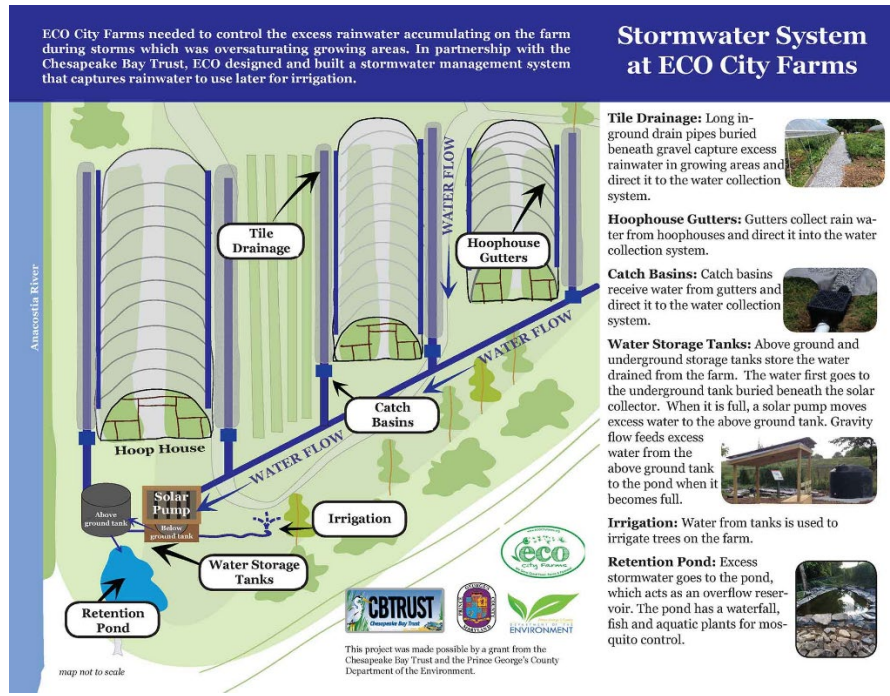


Figure 4.18: Existing stormwater management installation (“ECO City Farms Helps Improve Water Quality for the Anacostia River”, 2019)

The system uses gutters, tile drainage, catch basins, under and above ground water storage tanks and a run-off retention pond. (“ECO City Farms Helps Improve Water Quality for the Anacostia River”, 2019) These elements work together to slow down and capture rainwater as it flows through the site. They can use the stored water to irrigate the nearby fruit orchard. (Figure 4.18)





In the food forest area are three sturdy existing posts which could be repurposed as a trellis. The client expressed a preference to leave them in place and use them to support a vining plant.

At the far side of the property is a concrete drainage channel that was built to manage stormwater before standards shifted to the current, more ecologically sound methods of treating as much rainwater as possible on site. The water in the channel is stagnant and at times emits a fetid odor during the summer months according to staff I interviewed. Along with the questionable trash and dumping practices by automotive repair shops on the other side of the channel, this area would benefit from some



53 *Figure 4.21: Existing trellis. Photo by author*

plant material screening until it can be addressed more comprehensively.



Figure 4.22: Stormwater drain channel current conditions. Photos by author.

Existing vegetation, beyond the clusters of fruit trees (multiple cultivars of apple, plum, pear, apricot and cherry) that are planted throughout the farm is noted as self-sewn black cherries (*Prunus serotina*) along the channel edge and one atop the food forest berm. What these species lack in grandeur, they make up for in ecological value as a keystone species, working as a host plant, providing food, pollinator support and shelter for hundreds of species. A tulip tree (*Liriodendron tulipifera*) also grows near the back of the site. There is one grand and healthy willow oak (*Quercus phellos*) that generously shades the cars parking on the street side of the farm.

## SITE LOCATION-EXISTING CONDITIONS



Figure 4.23: Existing conditions. Photos by author.

## Chapter 5: Site analysis

With the information gathered from the research methods I used (literature review, case studies, and site inventory) I began to develop the answers to my research question: How can nature-based interventions best support ecological diversity, food equity and yields, and community inclusion of a small urban farm?

I also needed to consider the qualifications for the grant (100% native plants-straight species, when possible, community outreach and stewardship, rooting out environmental challenges and addressing in place), the requests from the client (food forest, outdoor education area, CSA supplementation), and input from my committee. I put together the following “SWOT analysis chart” to help organize my priorities and come up with design goals and program. (Figure 5.1)

## STRENGTH-WEAKNESS-OPPORTUNITY-THREAT

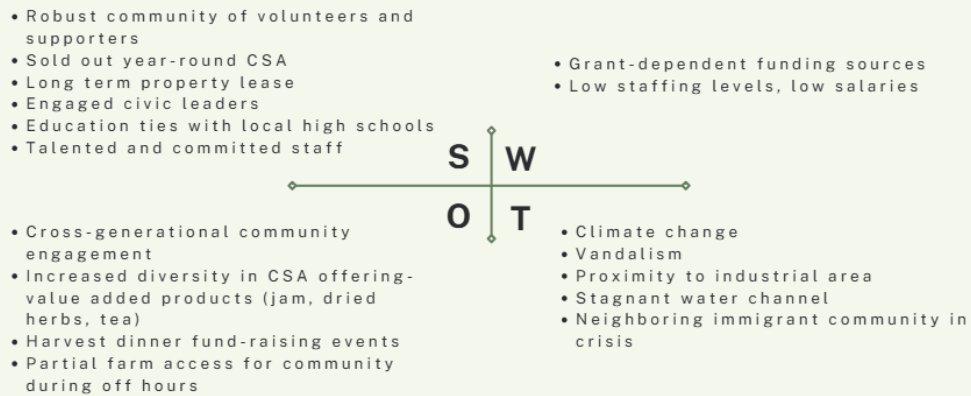


Figure 5.1: SWOT analysis chart

### **Section 1: Strengths**

Eco City Farms has a robust community of volunteers and supporters. Their CSA is consistently sold out each season with sliding scale memberships that allow them to offer shares at extremely low cost to their neighboring communities. They also have excellent collaborative connections with other groups in the area, like the Community Native Planting Project who brought the volunteer groups to remove the invasive shrubs and vines from the future food forest site and linked me into this project. They have a strong relationship with the owners of the property, MNCPPC which affords them a long-term lease as stewards of this land. The presence of Eco City Farms in Edmonston and nearby Bladensburg has also helped the city of Edmonston secure their own grants by highlighting the work that Eco City does in the area, helping to

underscore the town's desire to be regarded as a forward-thinking ecologically considerate community who values nature-based solutions. This symbiotic relationship has been fruitful for both parties.

Eco also has strong connections with the surrounding schools and helps to support their science curriculums through field trips and summer camp programs. The staff at Eco City Farms is a group of hard-working, inclusive and committed people with a deep base of practical knowledge, cultural sensitivity and personal integrity. From what I saw, they have a deep connection to and pride in the work they do.

### **Section 2: Weaknesses**

Even though the employees are strongly committed to their work and mission, their salaries are not representative of the critical nature of their work. Eco's budget is grant-funded, and they are always searching for new and innovative ways to expand their potential in this area. CSA shares aren't an appreciable source of revenue, as they mostly just break even. Finally, the high rate of undocumented workers living in the area is a source of stress and anxiety for this community.

### **Section 3: Opportunities**

Although ECO does a commendable job with outreach to the next and current generation of stewards, I believe there is an opportunity for engagement with the elderly population as well. Cross-generational friendships enhance our lives in

countless ways by sharing knowledge and perspectives which leads to greater compassion and stronger communities. Raised beds could be added for demonstration and teaching purposes and to provide accessibility for differently abled individuals to experience the joyful benefits of gardening.

With the addition of a food forest, there is opportunity for a somewhat “passive” addition to the CSA offerings. Using low-maintenance perennials can provide the inventory with a greater diversity of fresh and dried herbs, fresh fruit and calorie dense nuts. In addition, workshops could be held not only to teach community members how to make jam or dry herbs, but these value-added items could then be sold as CSA add-ons.

Endless opportunities abound for future fundraising events. At Forested in Bowie they host an annual harvest dinner using only ingredients they’ve grown on their forest farm. A local chef volunteers their time and expertise while attendees delight in the open air, seated at long tables filled with like-minded individuals eager to expand their palates, knowledge and networks. With the demonstration and processing facilities on-site, Eco City could develop their own version of this popular event.

The addition of lighting and cameras could help to deter vandalism and present the opportunity for community members to be able to access some areas of the farm in the off hours. The more neighbor engagement, the fewer instances of vandalism will occur.

#### **Section 4: Threats**

Climate change looms as a threat for all in the agricultural industry though small farms may fare marginally better if only due to their ability to adapt more quickly to mitigate drought, deluge and heat damage. Even so, funding for upkeep, expansion and development will always be a challenge.

On a recent visit to the farm, I noticed the glass front of the Free Little Library installed at the foot of the driveway had been smashed. Toxic smoke billowed over the fence line from the neighbor's yard where plastic was smoldering in a backyard bin. My eyes burned as I stood in the area of the future food forest. Two young children played in the yard, oblivious. The industrial automotive businesses appear to engage in irresponsible dumping into the shared drainage channel. Further, the channel itself poses a threat as a stagnant body of water, breeding ground for mosquitoes and other pathogens.

## **Chapter 6: Design Goals and Program**

#### **Section 1: Design Goals**

As mentioned, I needed to prioritize the specifications of the KMB grant since this project was slated to happen once the funding was secured. Since these guidelines are nicely connected with my own ethos as a landscape designer, that was easy. It was key to integrate native plantings and habitat features to support local wildlife and

strengthen urban biodiversity and resilience. Among these features will be pollinator patches which are groupings of flowering plants that offer nectar sources to bees and other insects throughout the growing season.

I also needed to create multifunctional spaces for gathering, education, and collaboration. Done well, the food forest has the potential to engage with visitors in a much more resonant way than previously experienced with the classic row gardening. This recalled that elusive and inspiring aspect of Elizabeth Meyer's essay, *Beyond Sustaining Beauty* (Deming, 2015) when she spoke of our responsibility as designers to create work that is not just beautiful but work that inspires stewardship and personal growth. Design that has the potential to shift our public discourse and personal behavior toward a more regenerative path.

I also knew it was important to encourage more diverse volunteer opportunities to reach a greater demographic of people and deepen connections with land and food. I wanted to ensure accessibility for diverse users across age, ability, and culture. I wanted to design productive growing spaces using regenerative agriculture techniques that prioritize accessibility and affordability for underserved communities.

Referring to my initial question of : How can nature-based interventions best support ecological diversity, food equity and yields, and community inclusion of a small urban farm? I categorized the interventions into the three main themes and wrote my design goals centered around those themes.

- 1. Ecological Diversity (ED)** - Integrate native plantings, pollinator patches, and habitat features to support local wildlife and strengthen urban biodiversity and resilience.
- 2. Community Inclusion (CI)** - Create multifunctional spaces for gathering, education, and collaboration, with volunteer opportunities to deepen connection with land and food. Promote inclusion and accessibility for diverse users across age, ability, and culture.
- 3. Food Equity (FE)**- Design productive growing spaces using regenerative agriculture techniques that prioritize accessibility and affordability for underserved communities and complement the CSA.

## **Section 2: Design Program**

The aspects that I intend to incorporate into the design as guided by my design goals are as follows:

### **Additional Seating/Outdoor Classroom (CI)**

The staff at ECO expressed a need for more seating outdoors, not only for their lunch breaks or outdoor meetings, but a space for the visiting classes to gather for outdoor classroom opportunities. We decided together that an ideal spot was in the heart of the food forest which once matured would encapsulate the area in a very satisfying and comforting way.

### **Manage Stormwater (ED)**

The majority of the site's stormwater is currently being managed by a system of stormwater management that was installed with a grant from the Chesapeake Bay Foundation which collects most of the water in tanks and a pond on the NW side of the property. The area near the food forest has a swale that runs along side the driveway and ends at a natural depression just before hitting the drainage channel. Because the channel does not successfully pull water away and flush it down river as it was meant to, I figured it would be best to treat as much water on site as possible to minimize any contribution to the stagnant pool.

#### **Provide Shade (CI, ED, FE)**

The addition of the food forest will eventually add shade to the southern side of the property. The paved area remains a challenge in the summertime as heat reflects from the hard black surface and makes it an unpleasant space to spend time. The removal of some concrete along with the addition of a large shade tree would help tremendously. I chose a Shumard Oak which not only supports the food forest ethos with its generous supply of highly-caloric acorns but also is one of the more rapidly growing oaks which has a high tolerance for urban conditions and compacted soils.

#### **100% Native Plants (ED)**

One of the grant requirements is that recipients use a 100% native plant palette. I researched and consulted both horticulturists and urban farmers to compile the plant list. I decided to make one exception--which would be for future work, not included in this grant's funding-- to include a few low-maintenance rose bushes as a nod to Mr. Adam Francis Plummer, an accomplished rose gardener and the first documented settler of this area.

### **Passive Educational Features (CI)**

As I documented in the Stinkbug project case study, the importance of empowering children to realize that their actions and interactions have an impact on their surroundings cannot be overstated. Time spent in an environment like a food forest offers access they may not have to lush natural spaces, introducing the vital experience of the calming and regenerative effects this sort of synergistic environment has on all living organisms. We can hope that this concept of cooperative growth rather than fierce competition will have a deeply resonant effect.

### **Keep low maintenance (ED)**

Trees, shrubs and perennials all produce biomass that will be left in place for the most part. “Leave the leaves” throughout the forest garden to provide natural, soil-building mulch and a place for insects to overwinter. The only aspect that requires some maintenance will be keeping the path cleared from debris and overhanging branches. Also, staff are advised to be vigilant regarding the resprouting of invasives from the seedbank and remnant roots until the ground layer is strongly established.

### **Permeable pathways and accessibility (CI)**

A three-foot-wide path circles through the food forest, leading to an outdoor classroom toward the back of the property. At the start and end of the path are colorful portal trellises to create a vibrant sense of curiosity and welcoming. A small bridge eases visitors over the swale and rain garden area offering a chance to stop and appreciate the plantings and acting as an entrance to the classroom area. In addition, 5 raised bed planters will be installed near the nursery hoop house. There’s a water source nearby and they are fully on a paved surface, plenty of space around each bed

to allow for easy maneuverability. These beds could also be used as demonstration gardens or teaching spaces for visiting school children.

### **Improved spatial flow (CI)**

To expand the food forest more fully and create a sense of immersion, I moved the storage containers that are currently at the end of the driveway to the hoop house nursery area. This allowed for more screening from the channel and industrial neighbors. I also removed the chain link fence that was between the driveway and the pedestrian entrance to improve the flow between these two areas. A path through the pollinator bed along that perimeter pulls visitors in the direction of one of the food forest portal trellises. I also included a service pathway for seasonal deliveries of compost and access to the stormwater channel.

## Chapter 7: Design

### Section 1: Concept Diagram

The site is just over an acre and most of it is already programmed in a way that makes good sense for its purpose. For instance, the hoop houses and garden beds (*Figure 7.1 highlighted in blue*) are positioned in the sunniest spots, away from the southern border where there is more shade. The community spaces (in pink) offer opportunities for interventions; it could use some shade and a sense of welcoming at the main entrance. The driveway is wider than necessary and could be hemmed in on the sides and at the far end to further extend the food forest and give a feeling of favoring pedestrians over vehicles. *Figure 7.2* shows a quick sketch of movement in and around the farm by service vehicles, farmers and visitors. I used this schematic to help improve the flow of the space.



**Section 2: Site Plan**



*Figure 7.3: Plan diagram imposed on surrounding existing map*



*Figure 7.4: Masterplan – design overview*

In the above diagram of the design overview, (*Figure 7.4*) I've used color coding to categorize each element of the design programming with the design goal(s) it corresponds to. Green is ecological diversity; purple is food equity and pink is community inclusion. As I proceed with an explanation of each feature, I'll do so within each of the three categories, beginning with Ecological Diversity.

### **Ecological Diversity**

How can nature based solutions impact ecological diversity?



## DESIGN: ECOLOGICAL DIVERSITY

**Ecological Diversity**- Integrate native plantings, pollinator patches, and habitat features to support local wildlife and strengthen urban **biodiversity** and **resilience**.

### LEGEND

- 1 Food Forest
- 2 Stormwater Management
- 3 Pollinator Patches
- 4 Shady Native Edible Groundcovers
- 5 Sunny Native Edible Groundcovers
- 6 Shade



Figure 7.5: Masterplan – Ecological diversity

Ecological diversity and resilience will increase due to the 100% native plant palette in the food forest canopy, understory, shrub layer and perennial ground covers. This layered planting mimics the natural ecology of a forest edge and supports these symbiotic communities both above and below ground. This attracts birds, insects and improves the soil structure. Many of the selected species were chosen due to their multi-functionality as host plants for insects and lepidoptera during their larval stages. (Figures 7.9-11) In addition, the low maintenance approach keeps leaves and other biomass on site to serve as habitat for overwintering insects and small mammals and carbon sequestration. Native bees burrow into the ground and hibernate in the hollow stalks of dried perennials. Leaving these on site helps to support these species.



Figure 7.6: Section 1: Cut across food forest, bridge and into farm production area

This section (Figure 7.6) illustrates a cut through the food forest and how it integrates to the working farm area. The outdoor classroom is surrounded by a ring of *Lindera benzoin* with other understory tree/shrubs flanking the 3' wide accessible path of decomposed granite.

Continuing from left to right, the bridge passes over the swale which empties into the raingarden. The addition of a rain garden functions to treat stormwater runoff from the south side of the site and relieve that burden from the non-functioning drainage channel on the back edge of the property. Existing mature trees were left in place not only for the benefits they offer as habitat, host plants and shade, but also for screening the adjacent industrial area. Inoculated mushroom logs rest beneath the mature Tulip tree (*Liriodendron tulipifera*), hemmed in by an elderberry grove. To

ensure access to the back area of the farm, I recommend installing reinforced pavers for occasional trucks to pass with compost or other service needs.

The removal of approximately 28 square feet of concrete near the main entrance (6-foot diameter) decreases the amount of impermeable surfaces on the site. A Shumard oak (*Quercus shumardii*) will be planted in this spot. With a growth rate of 1-2 feet per year, a welcome shady spot will develop within a decade. Acorn production adds another potential element to teaching about foraging wild foods, this one being particularly high in calories.

As time passes and the food forest continues to mature, diversity will increase and along with it, an affirming sense of actions and consequences. Visitors will be impacted by the transformation that is possible when we all work together to affect positive change.

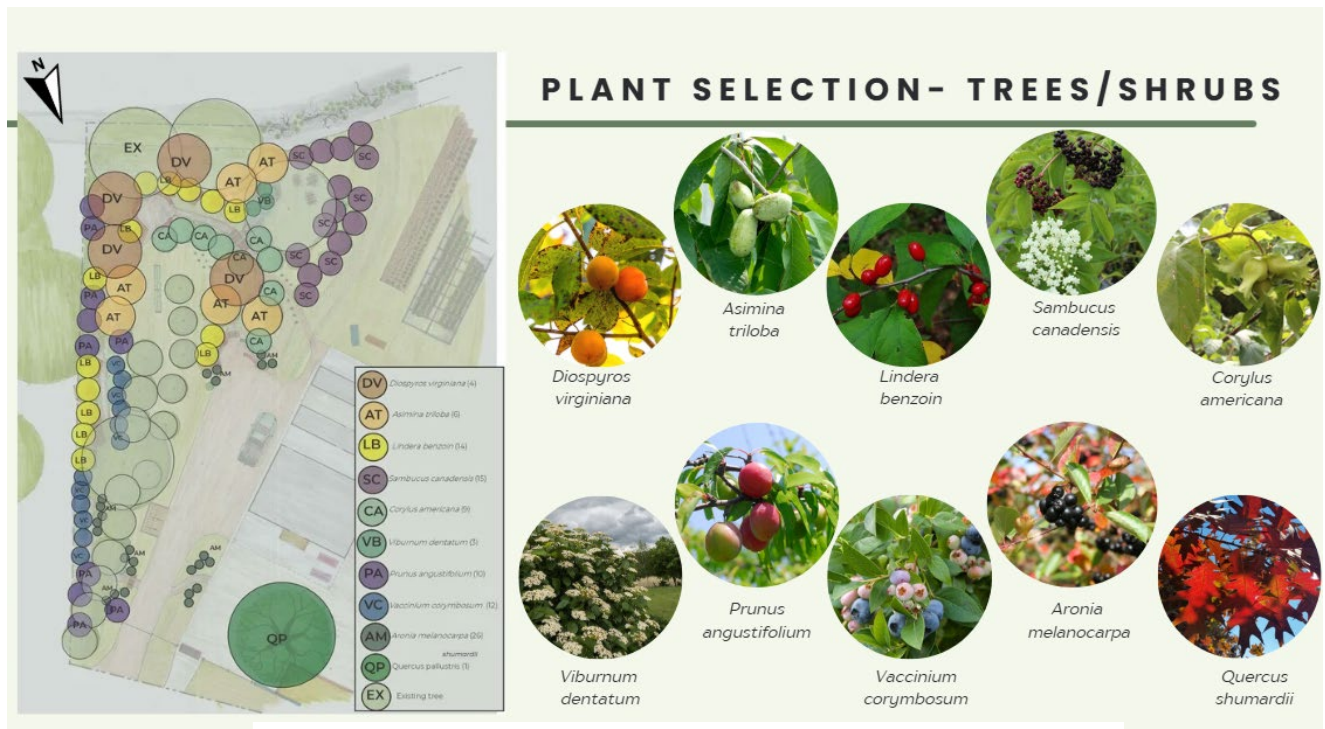


Figure 7.7: Tree/shrub planting plan and palette



one that sits atop the berm. These are keystone species which means they act as host plants for many insects and lepidoptera who depend on them for larval support of their young. I also added 10 Chickasaw plums (*Prunus angustifolium*) which as members of the Prunus family have an outsized impact on the ecosystems as well. The following diagrams highlight some of the supporting roles these trees, shrubs and vines play.

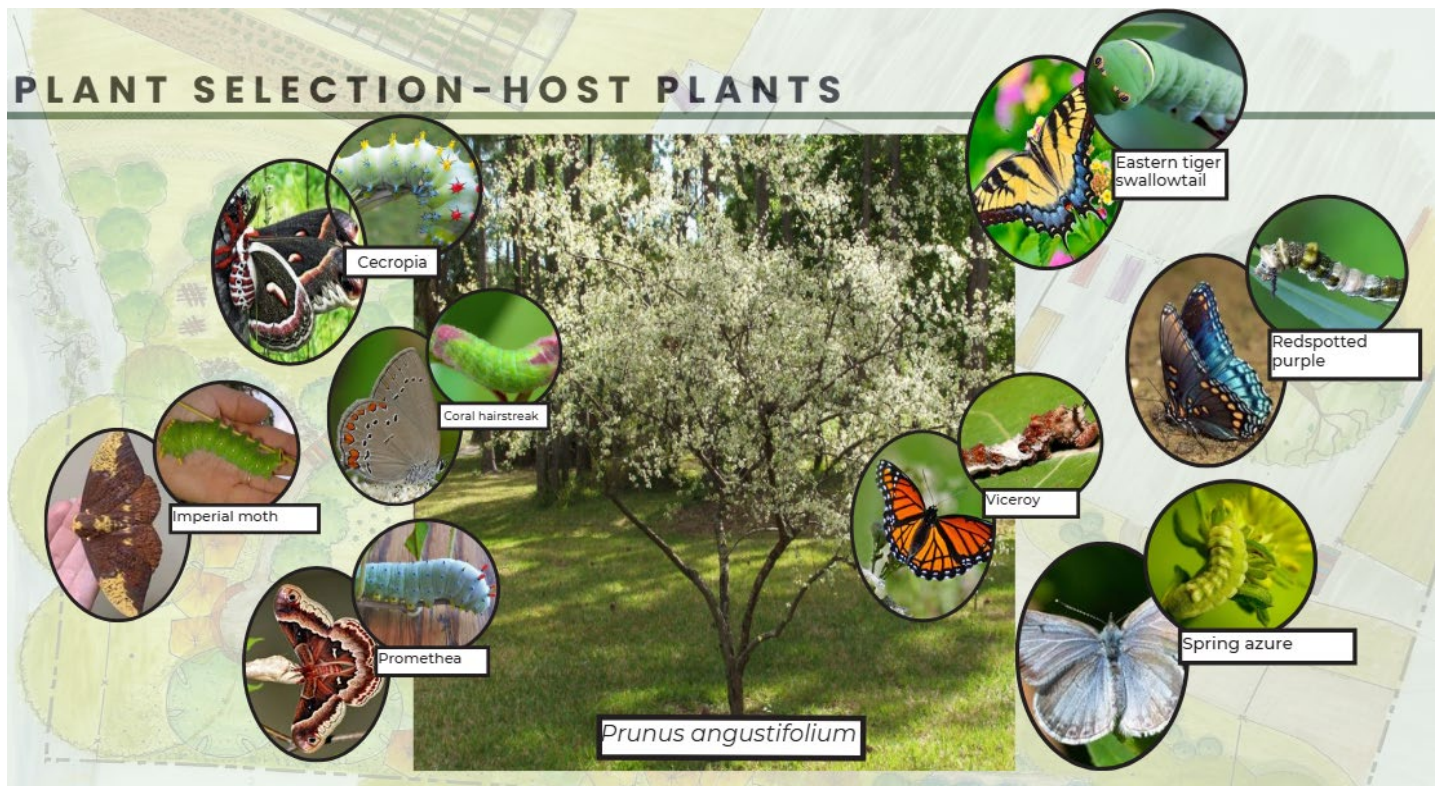


Figure 7.9: *Prunus angustifolium* host support

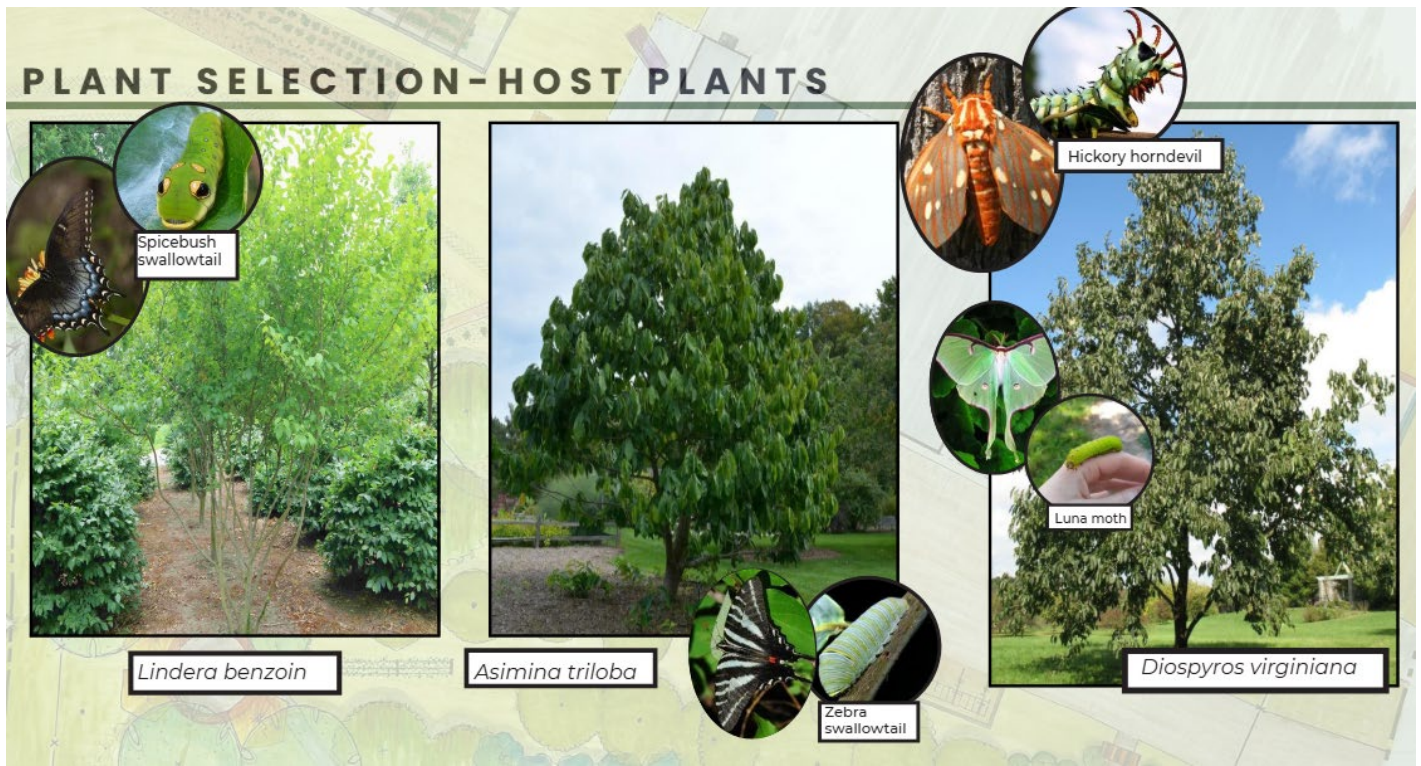


Figure 7.10: Host support from trees.

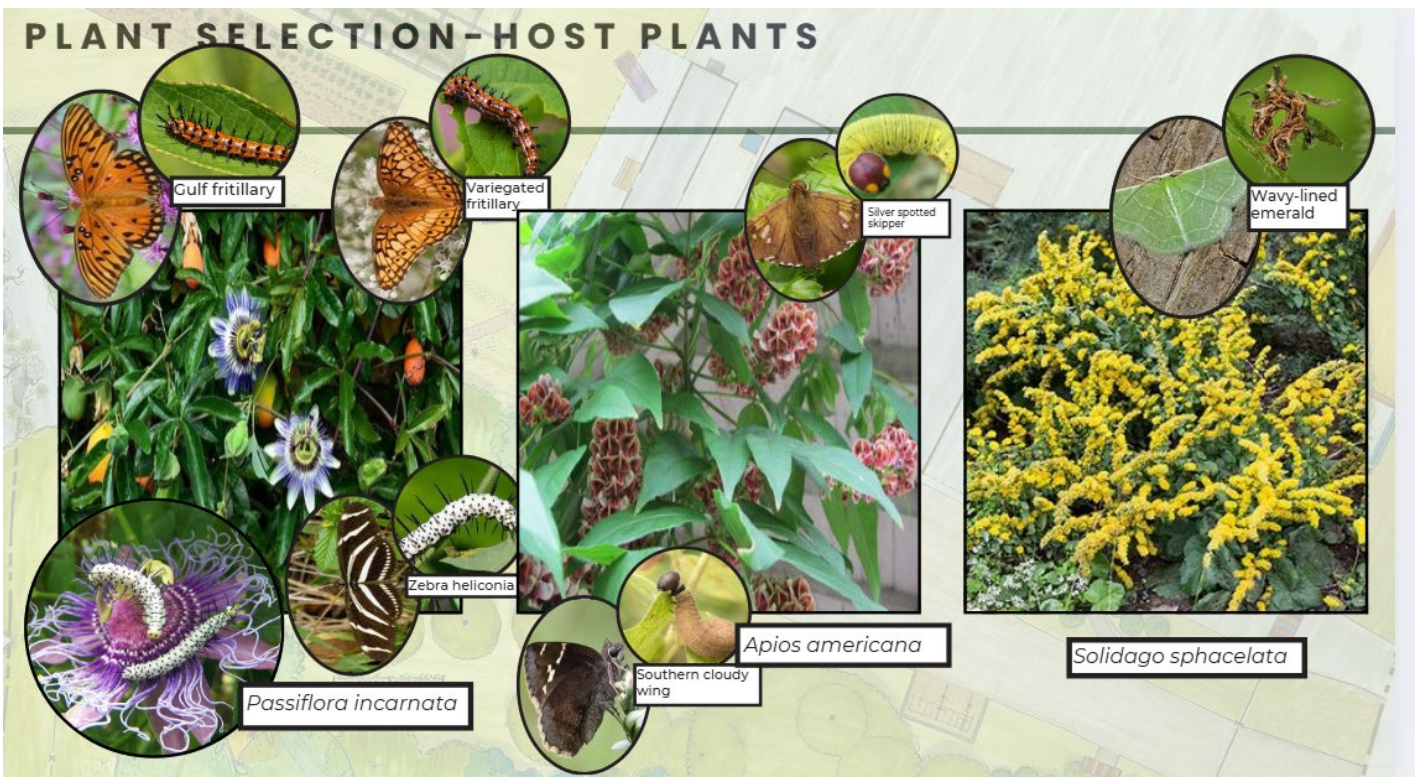


Figure 7.11: Host support from perennials.

In addition to larval support from the host plants, I also wanted to include a diverse and broadly blooming array of flowering plants for the pollinators. The blooms start early with all the fruit trees coming into bloom in March and April along with the *Tradescantia* and *Chrysogonum*. Blooms open throughout the summer, ending with the *Achillea*, *Asters* and *Solidago* in the fall. (Figure 7.12)

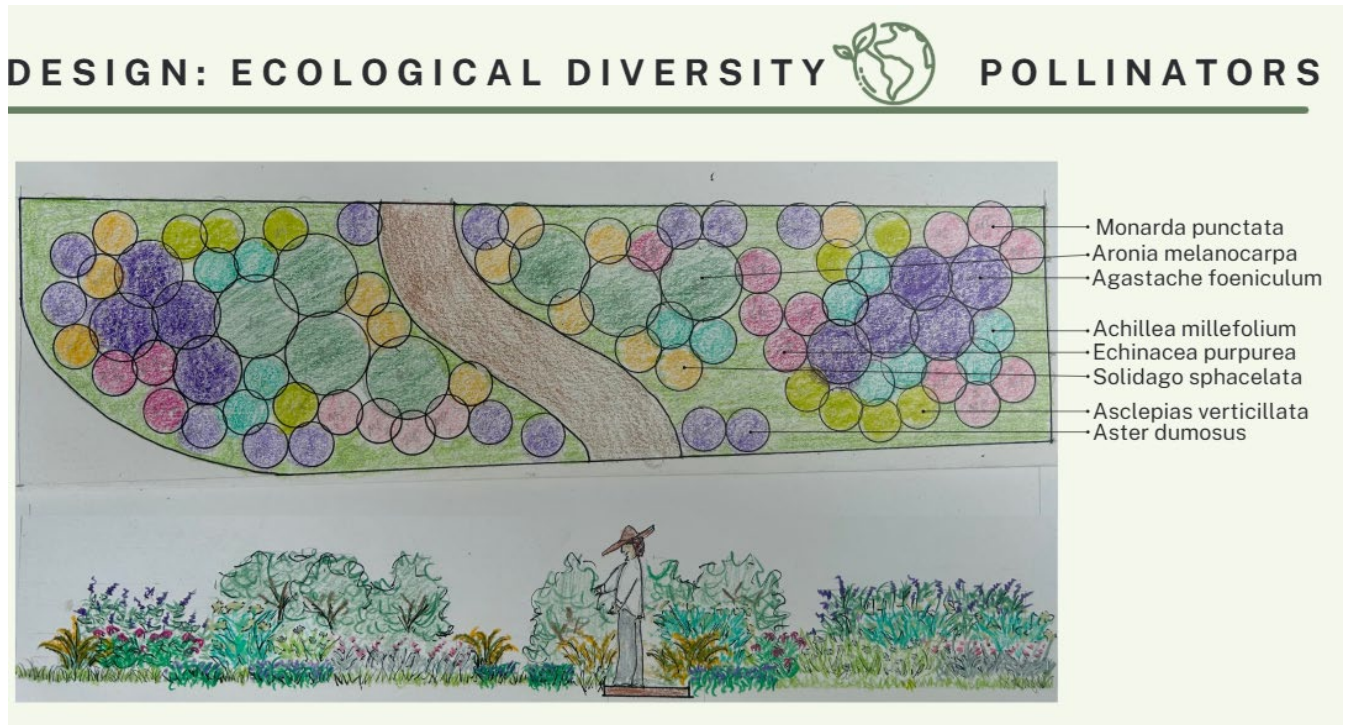


Figure 7.12: Pollinator garden palette

Ecological diversity is clearly and directly impacted by the installation of a food forest. This design introduces 25 new botanical varieties into this space and has the potential to increase the diversity of insect, amphibian and small mammal life as well. It will offer host plants, nectar producers, biomass generators and carbon sequestration. This food forest will make this space more resilient to adverse weather conditions by slowing and capturing rainwater, increasing the evapotranspiration of

the area, and with dense, perennial plantings have more tolerance when faced with periods of drought.

### Food Security and Equity

How can nature-based solutions (like a food forest) impact food security and equity?

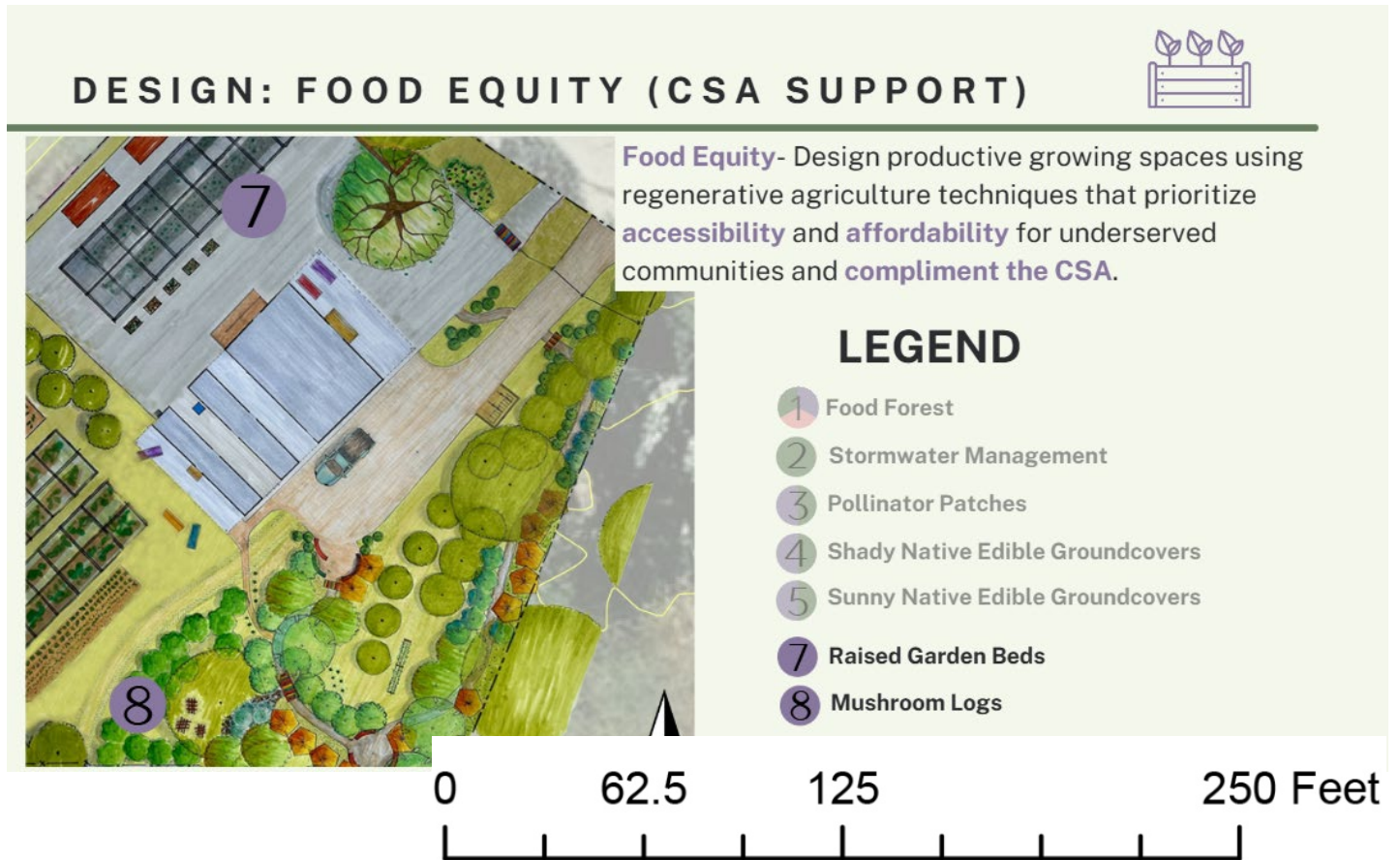


Figure 7.13: Masterplan- Food Equity

ECO is a leader in food equity since the pricing structure of the CSA offers low to no-cost shares to members of their immediate community. Anything the design can do to increase yields from the existing production area will be an effective way to continue to support this important mission. It follows that by increasing the

biodiversity of the space- we are already helping to increase farm yields, which in turn keeps prices low for those who cannot afford to pay for a full-priced share.

The main element of the design that supports the goal of Food Security and Equity is the food forest itself. Once mature and working within the circular economy of nature, it has the potential to enhance the CSA with minimal labor costs or inputs. The food forest harvests like delicate springtime fiddleheads, hazelnuts, persimmon or black chokeberry jam, pawpaw quick bread- could be sold at weekly CSA pickups or farmers markets. In addition, the specialty crops like the vines (passion fruit, and ground nuts) and the mushrooms could be sold at markets or to local restaurants.

On another note, I've suggested adding some raised garden beds on the hard surface area that could be easily accessed by people with compromised mobility- and used for planting demos with visiting school kids. These simple interventions could encourage a greater diversity of the neighborhood population to participate in outreach events and activities.



Mushroom growing from log inoculations



Demonstration gardens and accessible opportunities for elderly or mobility challenged community members

Figure 7.14: Mushroom logs and sample accessible garden bed

Food security and equity are indirectly and directly impacted by nature-based solutions at this small urban farm. These aspects are directly impacted by the increased varieties of crops being offered to human consumers. The non-human members of this community are also directly benefited since the food forest offers a greater variety of nectars and increased space for habitat and host plants for their young. The food forest design offers indirect benefits to the community by increasing the health of the farms ecosystem resulting in greater crop yields, thereby allowing ECO to continue their generous CSA payment schedules. Another indirect benefit happens when the space is opened to explore, expand and share knowledge, showing people how their actions of stewardship are directly linked to our environment and our food security and equity. This leads nicely to the final aspect of my design goals.

## Community Accessibility and Inclusion

How can nature-based solutions (like a food forest) impact community accessibility and inclusion?

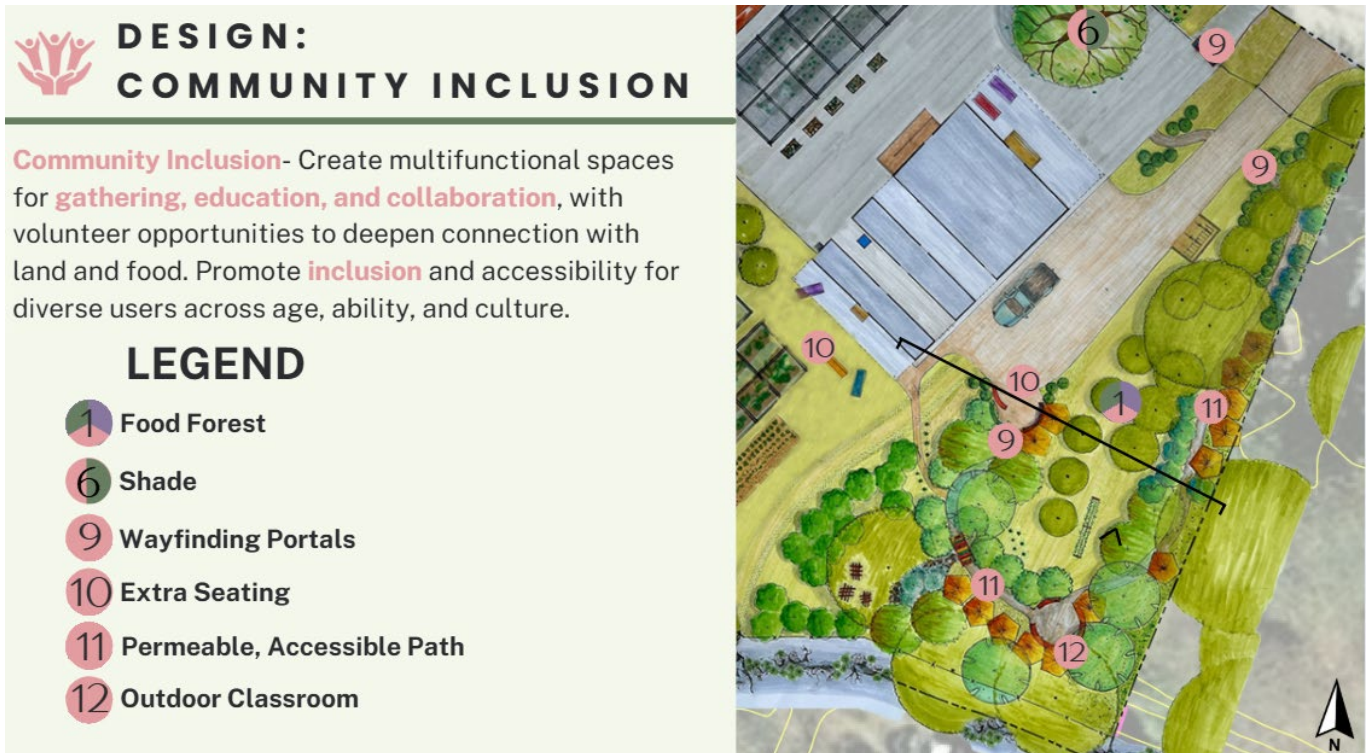


Figure 7.15: Masterplan Community Inclusion

The food forest supports the design goal of community inclusion by providing spaces for gathering and accessible pathways to encourage exploration and curiosity. I've added 3 way-finding portals, one at the main entrance, one near the foot of the driveway and another further in which is encircled by seating for visitors to meet up before entering the food forest.

The shade of the oak tree welcomes visitors into the newly amplified and colorful entrance. To the right, a permeable and fully accessible 3' wide pathway meanders through a pollinator garden (*Figure 7.12*) toward the lower food forest portal and

beckons onward into the outdoor classroom with plenty of seating and space to rest. The generous path continues over a gently sloped bridge and through the other food forest portal, completing the journey with another area to gather and teach or just to relax. I moved the existing storage containers over to the far side of the paved area, beyond the hoophouse nursery, adjacent to the levee so all tools were in one place and out of view from the visiting public. I also suggested installing some reinforced turf pavers to allow for vehicle access to the farming area for compost deliveries or maintenance of the water channel.



Figure 7.16: Section 2- Through the food forest and into processing shed.

The section cut through the food forest shows the 3' path on the far side of the property followed by the passionfruit vine on the existing trellis- with the apios vine draped on supports. The landscape dips at the swale before leveling out at the brightly colored portal with seating at either side. From here the food forest merges into the production area of the farm, buffered by a colony of elderberry trees. The far right side of the section, offers a glimpse into the interior space of one of the shipping containers which stores some produce and acts as a prepping area for produce.

The outdoor classroom beckons visitors to the far corner of the property via the accessible pathway. Surrounded by a thick lush colony of ostrich ferns the seating area welcomes this group of visitors passing through to collect their weekly CSA share and encourages them to linger with their neighbors.

## DESIGN: COMMUNITY INCLUSION



Figure 7.17: Perspective of outdoor classroom in food forest

This space can be used for visiting field trips and on off days, offers a quiet spot for staff to enjoy their lunch.

The addition of educational signage would also support community inclusion. Bilingual signs about the benefits of native plantings, nature-based interventions like food forests and raingardens, host plants and the insects they support would all help to educate visitors and spark curiosity and biophilia in the next and current generations.



Figure 7.18: Examples of educational signage.

## WHERE TO FIND WILDLIFE

The animal kingdom needs a diverse, healthy, and layered ecosystem. Look high, low, in, out, under, over and through for wildlife and in all kinds of habitats—leafy, hollow, muddy, rocky, woody, sunny, shady, wet, and dry.

## ¿DONDE ENCONTRAR VIDA SILVESTRE

El reino animal necesita un ecosistema diverso, saludable y en capas. Mire alto, bajo, adentro, afuera, debajo, por encima y a través de la vida silvestre y en todo tipo de hábitat: frondosos, huecos, fangosos, rocosos, boscosos, soleados, sombreados, húmedos y secos.

**OVERSTORY CANOPY**  
DOISEL DE DOS PISOS

**UNDERSTORY CANOPY**  
DOISEL DEL SOTOBOSQUE

**SHRUBS**  
ARBUSTOS

**HERBACEOUS PLANTS AND GROUNDCOVER**  
PLANTAS HERBÁCEAS Y CUBIERTAS VEGETALES

Native oaks are ecosystem superstars. They feed and shelter a vast array of wildlife, sequester carbon, manage stormwater and host more than 500 species of caterpillar, essential baby food for many birds.

Los robles nativos son superestrellas del ecosistema. Alimentan y albergan una gran variedad de vida silvestre, secuestran carbono, gestionan las aguas pluviales y albergan más de 500 especies de orugas, alimento esencial para los bebés de muchas aves.

**HABITAT LAYERS / CAPAS DEL HÁBITAT**

## WHY ARE LOCAL NATIVE PLANTS IMPORTANT FOR WILDLIFE? ¿POR QUÉ LAS PLANTAS NATIVAS LOCALES SON IMPORTANTES PARA LA VIDA SILVESTRE?

Native plants and wildlife have been evolving together for thousands of years. They have formed complex relationships critical to the web of life, among them specialization and pollination.

Like 90% of plant-eating insects, the spicebush swallowtail butterfly has evolved to live on a specific native plant genus. Its caterpillars depend on the spicebush to survive and, in turn, many of those caterpillars become food for baby birds.

Al igual que el 90% de los insectos herbívoros, la mariposa cola de golondrina del arbusto especiado ha evolucionado para vivir en un género de plantas nativo específico. Sus orugas dependen del arbusto de especies para sobrevivir y, a su vez, muchas de esas orugas se convierten en alimento.

Las plantas nativas y la vida silvestre han evolucionado juntas durante miles de años. Han formado relaciones complejas que son críticas para la red de la vida, entre ellas la especialización y la polinización.

Native pollinators—ants, bees, beetles, birds, butterflies, moths, flies, and wasps—all need native plants to survive. And it works both ways—without the pollinators, plants won't survive.

Los polinizadores (hormigas, abejas, escarabajos, aves, mariposas y moscas) necesitan plantas nativas para sobrevivir. Y funciona en ambos sentidos: sin los polinizadores, las plantas no sobrevivirán.

**Butterfly**  
MARIPOSA

**Caterpillar**  
ORUGA

**Pupa**  
CRISÁLIDA

### WHITE WOOD ASTER

*EURYBIA DIVARICATA*

HOSTS PEARL CRESCENT BUTTERFLIES

Community inclusion is directly impacted by the addition of the food forest and the supporting design elements by providing more seating, shade, biodiversity, and educational signage. These spaces will encourage the visitors to linger and connect with other members of the community working to strengthen the ties to one another and to the ecosystem at large.

### **Section 3: Plant lists**

Planting plan for trees/shrubs:

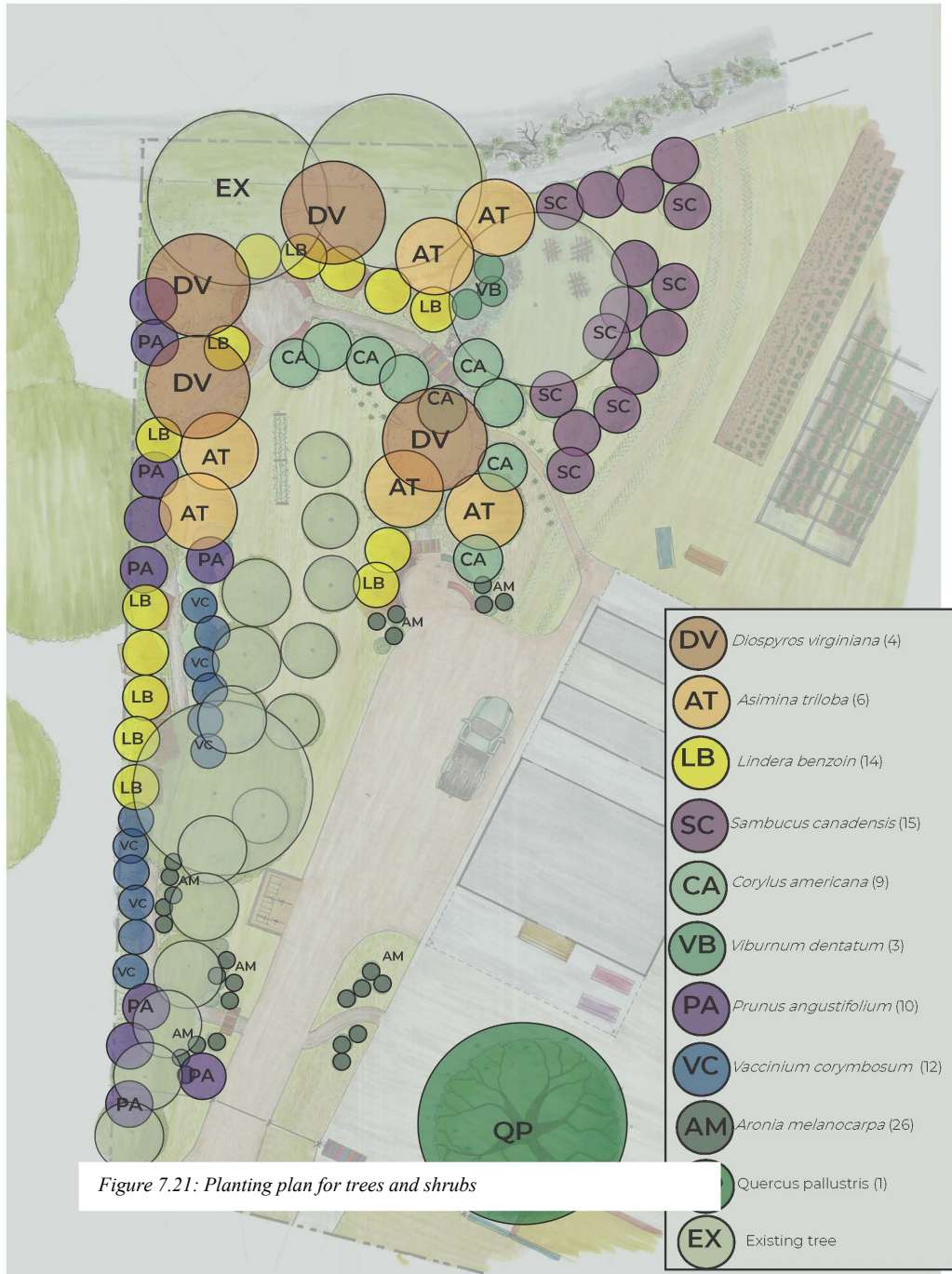


Figure 7.21: Planting plan for trees and shrubs

Subsection 1: Food forest trees and shrubs

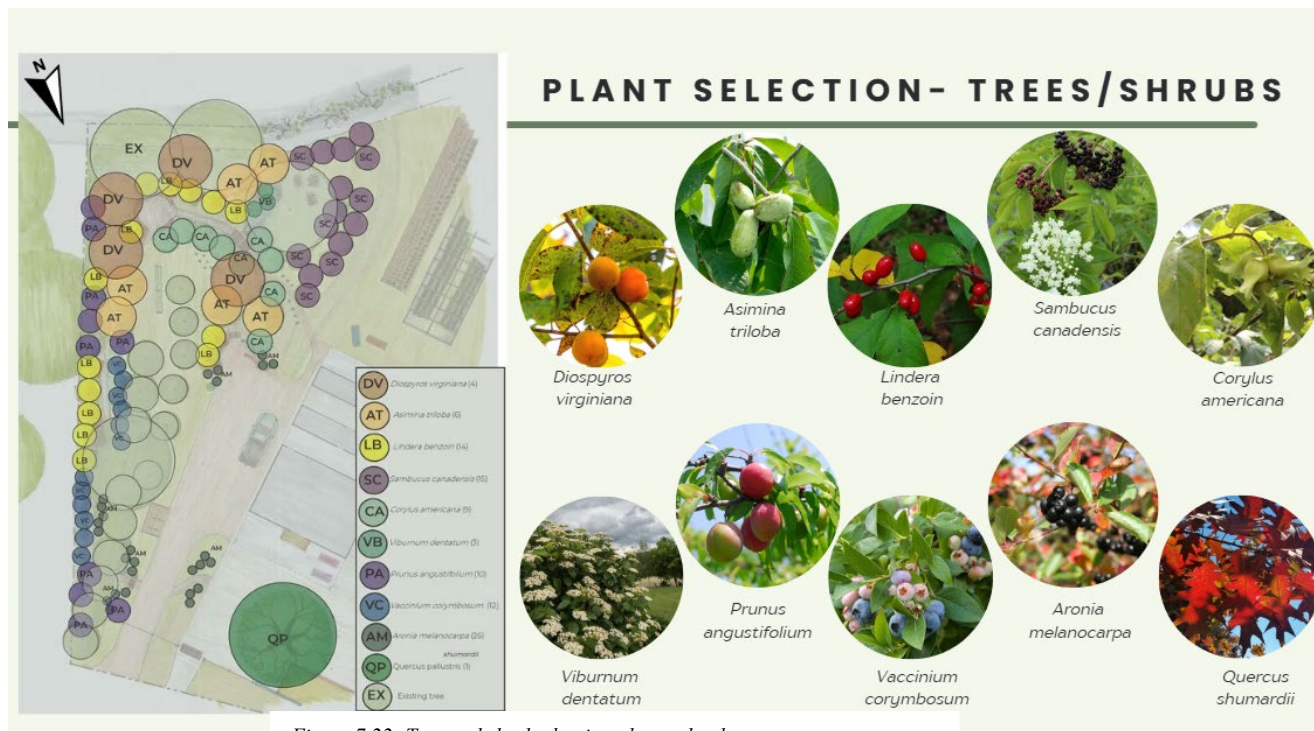


Figure 7.22: Tree and shrub planting plan and palette

*Diospyros virginiana* (persimmon) As one of the largest trees in the food forest (30-50' high with a 30' mature canopy), this specimen will provide shade, habitat and once established, a generous crop of tasty persimmons to harvest in October.

Persimmon trees are a larval host plant of the Luna moth and Hickory Horndevil larvae. The fruit is a food source for birds, small mammals, white-tailed deer, foxes, and raccoons. Deer browse the leaves and twigs.

*Asimina triloba* (pawpaw) Pawpaw trees grow around 20' high and wide. They tend to form colonies so if this is not desired, cut back the root suckers when they appear. Although they are monoecious, two separate genetic strains are necessary for pollination and fruit production. They produce large custardy fruit that are enjoyed by birds, small mammals and humans. The fetid odor of their early spring flowers attract

flies and beetles as pollinators. Pawpaw is a host plant for zebra swallowtail butterflies.

*Lindera benzoin* (spice bush) This dioecious shrub grows 10' tall and wide. Both male and female bloom in early spring before the foliage emerges. Once pollinated, the female plant produces deep red berries that are loved by birds. These drupes can be picked, and used dried or fresh as a spicy citrus seasoning. All parts of this plant are edible, the leaves are perfect for tea. This is the host plant for Palamedes Swallowtail and the Spicebush Swallowtail.

*Sambucus canadensis* (elderberry) This grove forming shrub grows around 10' tall and wide. They bloom profusely on second year wood in June with fragrant creamy little blossoms held upright on a flat structure called a corymb. It provides excellent pollinator support for butterflies and other insects which are attracted to the sweet-smelling blooms. The clusters of berries are eaten by mammals and many species of songbirds. Cooked berries are edible and can be used in pies, jams and syrups, medicinal value of elderberry syrup is regarded as a powerful immune support.

*Corylus americana* (hazelnut) A suckering shrub that grows around 10' tall and wide. Though plants have both male and female flower parts, they cannot self-pollinate so require nearby plants to produce the nuts. They are fast growing and begin producing fruit after around 3-4 years. The nuts can be roasted and eaten or ground into flour. It is also the host plant for caterpillars of the stunning Saturniidae moth.

*Viburnum dentatum* (arrowwood viburnum) The 6' tall and wide shrub blooms early spring with white clusters of flowers in flat-topped corymbs up to 4 inches across. Pollinated, these produce a bluish-black drupe that matures in late summer and early

fall. Its fruits are eaten by songbirds and squirrels. As with many of the others, more than one genetic strain is needed for fruit set. Spring Azure butterflies rely on this plant as a host plant.

*Prunus angustifolia* (Chickasaw plum) This shrub grows around 12' tall and 10' wide and after flowering in early spring, produces a small plum that can be consumed fresh, dried or processed into jams. This shrub really shines as a host plant for the larvae of many butterflies and moths including Coral hairstreak, Eastern tiger swallowtail, Spring azure, Viceroy, Red-spotted purple, Promethea silkworm, Imperial Polyphemus and the Cecropia.

*Vaccinium corymbosum* (high-bush blueberry) An ericaceous plant that requires acidic well-drained soils. It grows around 10' tall and wide with best berry production occurring with multiple cultivars that bloom at the same time. These bushes have stunning fall colors. Flowers provide pollinator support. But it is an ecosystem powerhouse, working as the host plant of Brown Elfin larvae. Its fruit attracts songbirds, including American Robin, Eastern Bluebird, Scarlet Tanager, Eastern and Spotted Towhees, Gray Catbird, Northern Mockingbird, Brown Thrasher, and Northern Cardinal. Members of the genus *Vaccinium* support the following specialized bees: *Andrena* (*Conandrena*) *bradleyi*, *Andrena* (*Andrena*) *carolina*, *Panurginus atramontensis*, *Habropoda laboriosa*, *Colletes productus*, *Colletes validus*, and *Osmia* (*Melanosmia*) *virga*.

*Aronia melanocarpa* (black chokeberry) A tough and adaptable suckering shrub that grows to around 6' tall and 4' wide. Offers pollinator support when in bloom, followed by prolific berries for songbirds and humans. Extremely astringent when

berries first appear and turn black but mellowing after the first frost for an anti-oxidant powerhouse of a fruit. They persist for a long while on the branch.

Subsection 2: Shady herbaceous layer



Figure 7.23: Herbaceous layer planting plan and palette

Both herbaceous layers, the shady and sunny were chosen due to their ability to spread and create dense mats to keep out weed pressure. I focused on keeping this area as maintenance free as I could and I'm hopeful that with relatively little input, these native species can get established and fill in the ground cover area with a nice lush green layer. While a few of the species can be used to supplement the CSA, many are intended to offer pollinator support and host plants for larval stage insects.

*Carex laxiculmis* 'Hobb' (Bunny Blue spreading sedge) Densely spreading sedge, attractive blue/green spikes of slender semi-evergreen foliage. Provides habitat and burrowing/nesting ground cover for native bees. Flourishes in dry shade.

*Eurybia macrophyllus* (Bigleaf aster) Ground cover, large, lush green leaves, blooming clusters of white flowers from August-October. Great for late pollinator support. Works in deep shade.

*Onoclea (Matteuccia) struthiopteris* (Ostrich fern) Easily grown in average, medium to wet soils in part shade to full shade. This plant will create dense colonies by underground rhizomes. I wanted to choose ground covers that would help with weed suppression to make the maintenance of this space less demanding. Once these are fully established, the farmers can harvest the springtime fiddleheads which could be a special add on to the CSA shares.

*Tradescantia virginiana* (Virginia Spiderwort) Clump-forming perennial, leaves, flowers can be eaten raw mixed into salads. Stalks can be eaten as one would asparagus. This plant has a habit of wandering through planting beds, spreading easily through seed. Flowers in spring, dies back in the heat of summer, reblooms in the fall.

### Subsection 3: Sunny herbaceous layer

*Agastache Foeniculum* (anise hyssop) Plants will spread by rhizomes and will easily self-seed in optimum growing conditions. Flowers are attractive to bees (good nectar plant), hummingbirds and butterflies. Aromatic leaves can be used to make herbal teas or jellies. Seeds can be added to cookies or muffins.

*Apios americana* (potato bean) A vining plant in the Fabaceae family. The tubers are edible and similar to potatoes. The seeds are also edible and can be cooked and used

like other legumes. The blooms are attractive to bees and other insect pollinators, and the foliage is a larval food source for several insects including the southern cloudywing and silver-spotted skipper.

*Asclepias verticillata* (whorled milkweed) This is a small milkweed variety that will spread via rhizomes and seed dispersal. It is a necessary host plant for Monarch butterflies and one that is easier than most milkweeds to incorporate into an urban landscape due to its smaller size.

*Aster dumosus* ‘Woods purple’ (woods purple aster) A smaller, more manageable aster cultivar that offers late summer, early fall blooms to support late pollinators and add color to the landscape. Forms thick mats to suppress weeds.

*Echinacea purpurea* ‘Pica Bella’ (PicaBella coneflower) An adaptable plant that is tolerant of drought, heat, humidity and poor soil. Long blooming flower June-Sept offers pollinator support. Freely self-seeds if heads are left in place. Seed heads are beloved by finches and other songbirds.

*Monarda punctata* (horsemint) Tolerates somewhat poor soils and drought. Spreads by runners to form large clumps but is not considered to be too aggressive. Short-lived but will self-seed if spent flower heads are left in place.

*Passiflora incarnata* (passion flower vine) This is a rapid-growing, tendril-climbing vine which is herbaceous (dies to the ground) in our Maryland climate. The roots can spread aggressively. The flowers are edible as well as the fruit. Ripened passion fruit can be eaten fresh, made into jams and baked into baked goods. This plant provides nectar for pollinators and is a larval host Gulf Fritillary, Variegated Fritillary, and the

Zebra Heliconian. Hummingbirds and butterflies nectar from the flowers in the summer.

*Solidago sphacelata* 'Golden Fleece' (golden fleece goldenrod) Tolerates poor, dry soils This is a rhizomatous, somewhat weedy species that can rapidly colonize an area by creeping rhizomes and self-seeding. Excellent source of support for late season pollinators. Host plant to the wavylined emerald moth.

All plant information from  
<https://www.missouribotanicalgarden.org/plantfinder/plantfindersearch.aspx>

See Appendix 5 for a plant quantities chart provided to the client.

## **Chapter 8: Conclusion**

### **Section 1: Evaluating the Design**

So, how can nature based solutions like a food forest enhance ecological diversity, food equity and community inclusion at a small urban farm?



Figure 8.1: Masterplan with sections and perspective

This design enhances biodiversity by introducing 25 different understory, shrub, and herbaceous layer plants with special attention paid to selecting native host plants. This design has the potential to increase the diversity of insects, amphibian and small mammal life as well. It will offer host plants, nectar producers, biomass generators and carbon sequestration. This space will be more resilient to adverse weather conditions by slowing and capturing rainwater, increasing the evapotranspiration of the site, and with dense, perennial plantings have more tolerance when faced with periods of drought.

This design supports food equity by increasing the health of the farms ecosystem resulting in greater crop yields, thereby allowing ECO to continue their generous CSA payment schedules. The food forest also offers greater diversity of locally grown nourishment not only to the human population, but also to non-human members of the community.

The additions of nature-based design elements encourage visitors to linger and connect with other members of the community, helping to strengthen the ties to one another and to the ecosystem at large. The outdoor seating areas for teaching, gathering, exploring, and communing with nature enhance social connection and ecological awareness thereby leaving visitors with a sense of connection to themselves, their community and their place in the ecosystem as a steward of their environment.

## **Section 2: Implementation**

In early spring I received the news that ECO had been awarded the full amount of the grant. Although the amount awarded was for \$5000, that will only purchase plant material. Funding for the portals, seating and expanded pollinator gardens will be projects for another time. In the interim, ECO has a neighbor in the industrial zone, Community Forklift who recycles old furniture and building materials. They've reached out to request that any appropriate heavy-duty outdoor furniture could be donated to the new neighborhood food forest. In addition, a boy scout group has offered to build the bridge over the swale as a community service project.

ECO will rely on community support from volunteers to install and water the plants as they get established, yet another opportunity for community engagement. Through this process, they've strengthened ties with the Community Native Planting Project who spearheaded the weed warrior efforts over the past year. They also received support from Joe's Movement Emporium in Mount Rainier, who donated

around a dozen trees and shrubs for this project. It is in building this web of community support and connections that projects like this will continue to thrive.

As of this writing, we have installed around 20 of the trees with flats of hundreds of herbaceous layer plugs waiting for the volunteer groups to organize a good planting time. I am hopeful that with this thesis nearing completion I will be able to join them in the field where I am most happy—among my community with my hands in the dirt.

A positive thing about this experience was the feedback I've received from the people at the non-profits I've been working with. They were delighted with the personal quality of the hand-drawn designs and immediately put me in touch with a handful of other agencies and private parties who are applying for beautification and improvement grants and looking for a way to stand out from the rest of the applicants. I am hopeful that I might be able to cobble a path forward for myself that does not involve as much time indoors, removed from the landscapes and community I love.

# Appendix 1

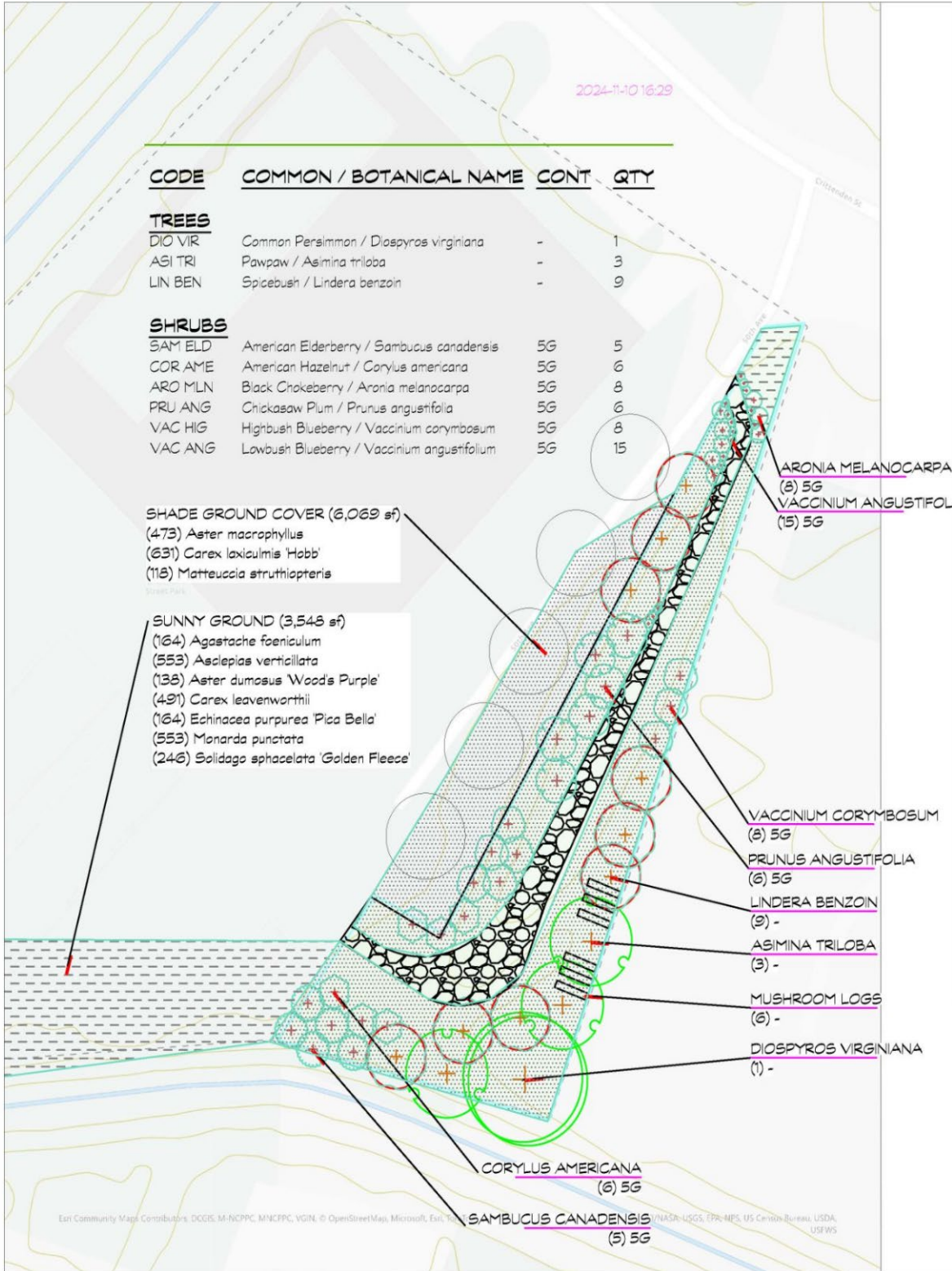
## Community Stewardship Grant

Open spaces, engaged citizens, and healthy environments in our communities increase the quality of life for all. Recognizing this, Maryland Environmental Trust, Forever Maryland and the Maryland Department of Transportation annually award Keep Maryland Beautiful Community Stewardship Grants to schools, nonprofits, and other community organizations that are working to eliminate local environmental problems, encourage stewardship of the environment, and educate community members. The Community Stewardship Grants honor the legacy of [Bill James](#), who drafted the legislation that founded Maryland Environmental Trust, and [Margaret Rosch Jones](#), former executive director of the Keep Maryland Beautiful Program. Community Stewardship Grants of up to \$5,000 are awarded to schools, nonprofits and other community organizations whose missions are centered upon directly engaging community members (especially children and young adults) in environmental education and stewardship. These grants also support organizations that are demonstrating active engagement as defenders of the environment by developing innovative solutions to local environmental problems. Proposed projects should activate citizens and encourage stewardship through education and outreach while elevating awareness of local environmental problems and working to reduce them.

The objectives of the grants are:

- To inspire and empower young people to become caretakers of their local environment and community through hands-on, project-based learning
- To support and encourage the ongoing work of organizations that have been active in educating fellow community members about environmental issues such as litter prevention, local stewardship and beautification, or other local and statewide environmental issues
- To help community organizations identify and eliminate the root causes of local environmental issues, rather than just their consequences
- To encourage thoughtful consideration of local land use and development that preserves natural capital
- To preserve natural areas and create a sense of place in communities

# Appendix 2



# Appendix 3

**SOIL TEST REPORT**  
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**BACKGROUND INFORMATION:** Grower copy

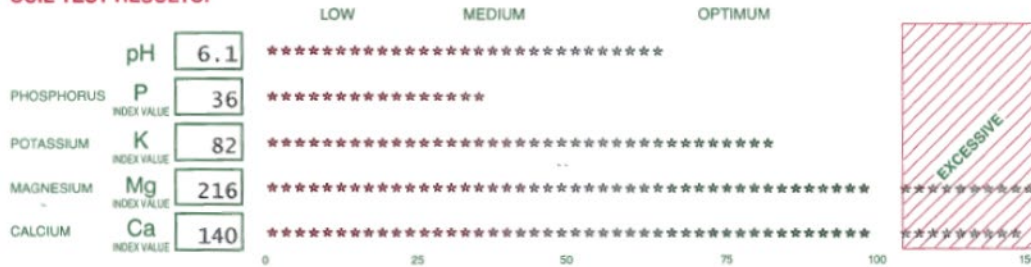
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<b>SOIL TEST FOR: GROWER</b>	<b>ADDITIONAL COPY TO:</b>	<b>COUNTY AGENT</b>
EVE JOSAR 5835 DEWEY ST CHEVERLY MD	20785	

ZEKIAH U	WELL	NORMALLO SA	6- 8	NO TILL		TRKL	NO
SOIL NAME	SOIL DRAINAGE	SOIL COLOR	SOIL TEXTURE	SAMPLE DEPTH	TILLAGE	PRESENT COVER	IRRIGATION INJ. PUMP

						UNKN	0.0	UNK	
LAST CROP	YIELD OF LAST CROP	TYPE	T/A WHEN MANURE	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	MOS. AGO LAST FERTILIZER	T/A LAST LIME	TYPE OTHER NUTRIENTS

**SOIL TEST RESULTS:**



1.4	94.7	57.3	15.5	6.0		7.60	17.4	12.9	75.3	1,18
B	Mn	Zn	SO <sub>4</sub> -S	% ORGANIC MATTER	SOL. SALTS MMHOS/CM	BUFFER pH	% Phosphorus Saturation	CEC meq/100gm	% Base Saturation	ENCLOSURES

**SUGGESTED FERTILIZER PROGRAM:**

**CROP:** DECIDUOUS SHRUBS

0.0						
T/A LIME	TYPE	N LBS/A	P <sub>2</sub> O <sub>5</sub> LBS/A	K <sub>2</sub> O LBS/	S LBS/A	B LBS/A

**YIELD GOAL:**

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**BACKGROUND INFORMATION:** Grower copy

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<b>SOIL TEST FOR: GROWER</b>	<b>ADDITIONAL COPY TO:</b>	<b>COUNTY AGENT</b>
EVE JOSAR 5835 DEWEY ST CHEVERLY MD	20785	

ZEKIAH U	WELL	NORMAL	6- 8	NO TILL		TRKL	NO
SOIL NAME	SOIL DRAINAGE	SOIL COLOR	SOIL TEXTURE	SAMPLE DEPTH	TILLAGE	PRESENT COVER	IRRIGATION INJ. PUMP

						UNKN	0.0	UNK	
LAST CROP	YIELD OF LAST CROP	TYPE	T/A WHEN MANURE	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	MOS. AGO	T/A LAST LIME	OTHER NUTRIENTS

**SOIL TEST RESULTS:**



1.3	97.6	47.1	16.8	4.0		7.75	12.6	11.3	82.3	1,18
B	Mn	Zn	SO <sub>4</sub> -S	% ORGANIC MATTER	SOL. SALTS MMHOS/CM	BUFFER pH	% Phosphorus Saturation	CEC meq/100gm	% Base Saturation	ENCLOSURES

**SUGGESTED FERTILIZER PROGRAM:**

**CROP:** DECIDUOUS SHRUBS

**YIELD GOAL:**

0.0					
T/A	TYPE	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	S
LIME		LBS/A	LBS/A	LBS/A	LBS/A

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**BACKGROUND INFORMATION:**

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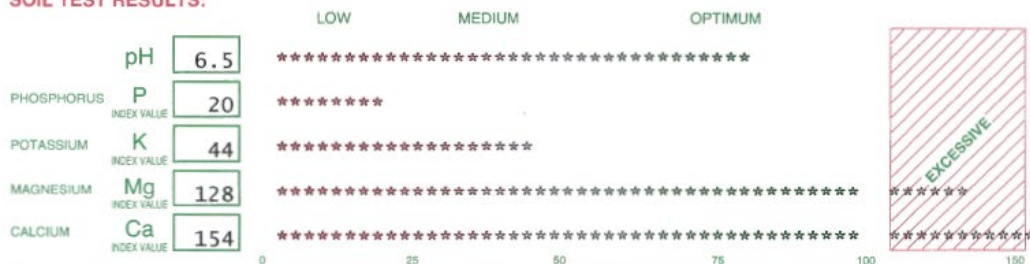
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SOIL TEST FOR: <b>GROWER</b>	ADDITIONAL COPY TO:	COUNTY AGENT
EVE JOSAR 5835 DEWEY ST CHEVERLY MD 20785		

ZEKIAH U	WELL	NORMAL	6- 8	NO TILL		TRKL	NO
SOIL NAME	SOIL DRAINAGE	SOIL COLOR	SOIL TEXTURE	SAMPLE DEPTH	TILLAGE	PRESENT COVER	IRRIGATION INJ. PUMP

						UNKN	0.0	UNK	
LAST CROP	YIELD OF LAST CROP	TYPE MANURE	T/A WHEN	N LAST FERTILIZER	P <sub>2</sub> O <sub>5</sub> K <sub>2</sub> O	MOS. AGO LAST LIME	T/A LAST LIME	TYPE	OTHER NUTRIENTS

**SOIL TEST RESULTS:**



1.3	97.6	47.1	16.8	4.0		7.75	12.6	11.3	82.3	1,18
B	Mn	Zn	SO <sub>4</sub> -S	% ORGANIC MATTER	SOL. SALTS MMHOS/CM	BUFFER pH	% Phosphorus Saturation	CEC meq/100gm	% Base Saturation	ENCLOSURES

**SUGGESTED FERTILIZER PROGRAM:**

**CROP:** DECIDUOUS SHRUBS

0.0					
T/A LIME	TYPE	N LBS/A	P <sub>2</sub> O <sub>5</sub> LBS/A	K <sub>2</sub> O LBS/	S LBS/A B LBS/A

**YIELD GOAL:**

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**BACKGROUND INFORMATION:** Grower copy

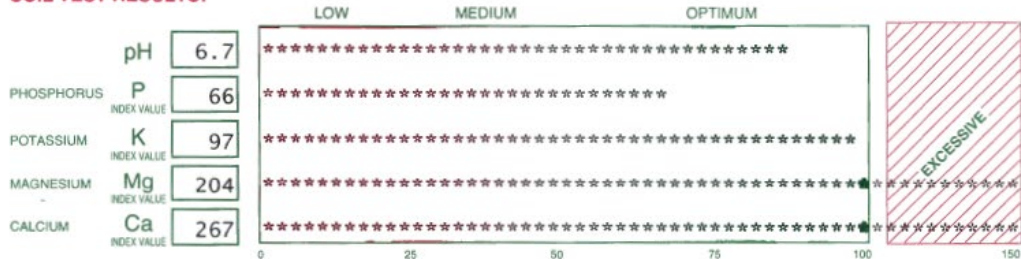
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FIELD NAME OR NO.	ACRES	COUNTY	DATE SAMPLED	DATE RECEIVED	DATE COMPLETE	LAB NO.	BAG NO.

<b>SOIL TEST FOR: GROWER</b>	<b>ADDITIONAL COPY TO:</b>	<b>COUNTY AGENT</b>
EVE JOSAR 5835 DEWEY ST CHEVERLY MD	20785	

ZEKIAH U	MOD WELL	NORMALSA	LO	0- 6	NO TILL		TRKL	NO
SOIL NAME	SOIL DRAINAGE	SOIL COLOR	SOIL TEXTURE	SAMPLE DEPTH	TILLAGE	PRESENT COVER	IRRIGATION	INJ PUMP

						UNKN	0.0	UNK	
LAST CROP	YIELD OF LAST CROP	TYPE	T/A WHEN MANURE	N LAST FERTILIZER	P <sub>2</sub> O <sub>5</sub> LAST FERTILIZER	K <sub>2</sub> O LAST FERTILIZER	MOS. AGO LAST LIME	T/A LAST LIME	OTHER NUTRIENTS

**SOIL TEST RESULTS:**



3.0	89.3	53.7	13.2	8.9		7.82	40.7	17.5	91.8	1,4,5,7,18
B	Mn LBS/ACRE	Zn	SO <sub>4</sub> -S	% ORGANIC MATTER	SOL. SALTS MMHOS/CM	BUFFER pH	% Phosphorus Saturation	CEC meq/100gm	% Base Saturation	ENCLOSURES

**SUGGESTED FERTILIZER PROGRAM:**

**CROP:** STRAWBERRIES

0.0		90-120	40	65		1-2
T/A LIME	TYPE	N LBS/A	P <sub>2</sub> O <sub>5</sub> LBS/A	K <sub>2</sub> O LBS/A	S LBS/A	B LBS/A

**YIELD GOAL:**

- Broadcast an disk in 60-75 lbs N/ac at or prior to planting. Inject 15-25 lbs N/ac through drip at first flowering in the Spring. Inject an additional 15-25 lbs N/ac through the drip at fruit enlargement, about 2 weeks after the first flower.
- Phosphate should be broadcast and disked in at or prior to planting.
- Potash should be broadcast and disked in at or prior to planting.
- Apply boron at a rate of 1.0 to 2.0 lbs/ac.
- To avoid possible boron toxicity damage to crops, apply boron in broadcast fertilizer rather than in bands or as a sidedressing. Boron may be broadcast preplant as a soluble spray alone or with other compatible chemicals.
- Manganese level in the soil at this pH is adequate.
- Zinc deficiency is unlikely at this pH, soil zinc and soil phosphorus levels.
- For plasticulture production, fertilization rates are based on a standard row spacing of 5 feet.
- For further guidance on nutrient management, see Extension Bulletin 137: Commercial Vegetable Production Recommendations for Delaware.

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**BACKGROUND INFORMATION:** Grower copy

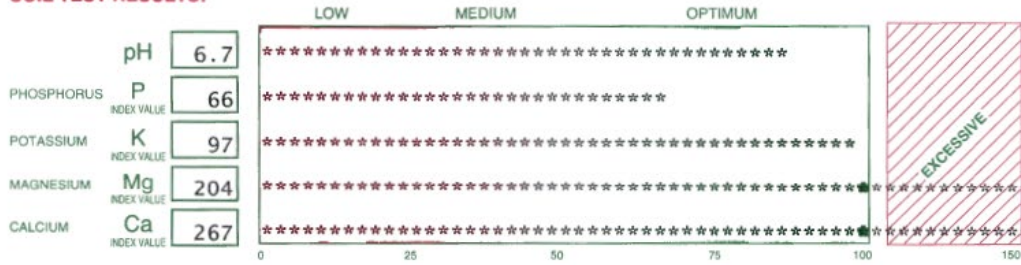
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FIELD NAME OR NO.	ACRES	COUNTY	DATE SAMPLED	DATE RECEIVED	DATE COMPLETE	LAB NO.	BAG NO.

<b>SOIL TEST FOR: GROWER</b>	<b>ADDITIONAL COPY TO:</b>	<b>COUNTY AGENT</b>
EVE JOSAR 5835 DEWEY ST CHEVERLY MD	20785	

ZEKIAH U	MOD WELL	NORMAL SA LO	0- 6	NO TILL		TRKL	NO
SOIL NAME	SOIL DRAINAGE	SOIL COLOR	SOIL TEXTURE	SAMPLE DEPTH	TILLAGE	PRESENT COVER	IRRIGATION INJ. PUMP

						UNKN	0.0	UNK	
LAST CROP	YIELD OF LAST CROP	TYPE	T/A WHEN MANURE	N	P <sub>2</sub> O <sub>5</sub> LAST FERTILIZER	K <sub>2</sub> O	MOS. AGO LAST LIME	T/A TYPE	OTHER NUTRIENTS

**SOIL TEST RESULTS:**



3.0	89.3	53.7	13.2	8.9		7.82	40.7	17.5	91.8	1,4,5,7,18
B	Mn LBS/ACRE	Zn	SO <sub>4</sub> -S	% ORGANIC MATTER	SOL. SALTS MMHOS/CM	BUFFER pH	% Phosphorus Saturation	CEC meq/100gm	% Base Saturation	ENCLOSURES

**SUGGESTED FERTILIZER PROGRAM:**

<b>CROP:</b> MIXED VEGETABLES	0.0	100-125	50	50	1-2		
<b>YIELD GOAL:</b>	T/A LIME	TYPE	N LBS/A	P <sub>2</sub> O <sub>5</sub> LBS/A	K <sub>2</sub> O LBS/A	S LBS/A	B LBS/A

- These are general recommendations designed to cover a variety of vegetable crops. More specific recommendations can be provided by identifying the actual vegetables that will be grown.
- Broadcast and disk in 50-75 lbs N/ac at or prior to planting. Sidedress an additional 25-50 lbs N/ac 3 to 4 weeks after planting, if needed.
- Phosphate should be broadcast and disked in at or prior to planting.
- Potash should be broadcast and disked in at or prior to planting.
- Boron needs depend upon the vegetables being grown. See Soil Test Note 4 or Extension Bulletin No. 137 -- Commercial Vegetable Production Recommendations for Delaware for more information.
- To avoid possible boron toxicity damage to crops, apply boron in broadcast fertilizer rather than in bands or as a sidedressing. Boron may be broadcast preplant as a soluble spray alone or with other compatible chemicals.
- Manganese level in the soil at this pH is adequate.
- Zinc deficiency is unlikely at this pH, soil zinc and soil phosphorus levels.
- For further guidance on nutrient management, see Extension Bulletin 137: Commercial Vegetable Production Recommendations for Delaware.

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**BACKGROUND INFORMATION:** Grower copy

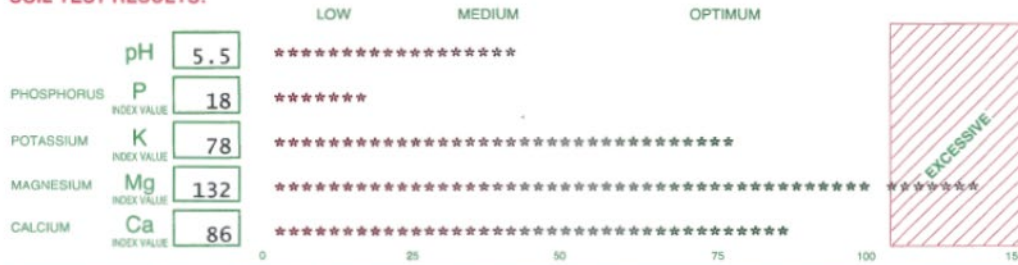
SOUTHEDGE	1	OUT OF STATE	3/12/25	3/18/25	04/08/25	2078	172091
FIELD NAME OR NO.	ACRES	COUNTY	DATE SAMPLED	DATE RECEIVED	DATE COMPLETE	LAB NO.	BAG NO.

SOIL TEST FOR: GROWER	ADDITIONAL COPY TO:	COUNTY AGENT
EVE JOSAR 5835 DEWEY ST CHEVERLY MD	20785	

ZEKIAH U	MOD WELL	NORMAL	SA LO	5- 8	NO TILL		NO	NO
SOIL NAME	SOIL DRAINAGE	SOIL COLOR	SOIL TEXTURE	SAMPLE DEPTH	TILLAGE	PRESENT COVER	IRRIGATION	INJ. PUMP

						UNKN	0.0	UNK		
LAST CROP	YIELD OF LAST CROP	TYPE	T/A WHEN MANURE	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	MOS. AGO	T/A	TYPE	OTHER NUTRIENTS

**SOIL TEST RESULTS:**



0.9	108.4	51.1	24.0	4.4		7.58	10.9	9.5	64.5	1,5,7,18
B	Mn	Zn	SO <sub>4</sub> -S	% ORGANIC MATTER	SOL. SALTS MMHOS/CM	BUFFER pH	% Phosphorus Saturation	CEC meq/100gm	% Base Saturation	ENCLOSURES

**SUGGESTED FERTILIZER PROGRAM:**

**CROP:** LETTUCE

1.5		100-125	200	100			
T/A	LIME	TYPE	N LBS/A	P <sub>2</sub> O <sub>5</sub> LBS/A	K <sub>2</sub> O LBS/A	S LBS/A	B LBS/A

**YIELD GOAL:**

1. Surface application of limestone will not adequately raise the pH of this field. Limestone should be incorporated and thoroughly mixed to a depth of at least 6 inches.
2. Broadcast 25-50 lbs N/ac for iceberg lettuce or 50-75 lbs N/ac for leaf lettuce, endive or escarole. Sidedress and additional 25-50 lbs N/ac 3-5 weeks after planting.
3. Phosphate should be broadcast and disked in at or prior to planting.
4. Potash should be broadcast and disked in at or prior to planting.
5. Manganese level in the soil at this pH is adequate.
6. Zinc deficiency is unlikely at this pH, soil zinc and soil phosphorus levels.
7. For further guidance on nutrient management, see Extension Bulletin 137: Commercial Vegetable Production Recommendations for Delaware.

**SOIL TEST REPORT**  
 UNIVERSITY OF DELAWARE — SOIL TESTING PROGRAM  
 NEWARK, DELAWARE 19716-2170



**BACKGROUND INFORMATION:** Grower copy

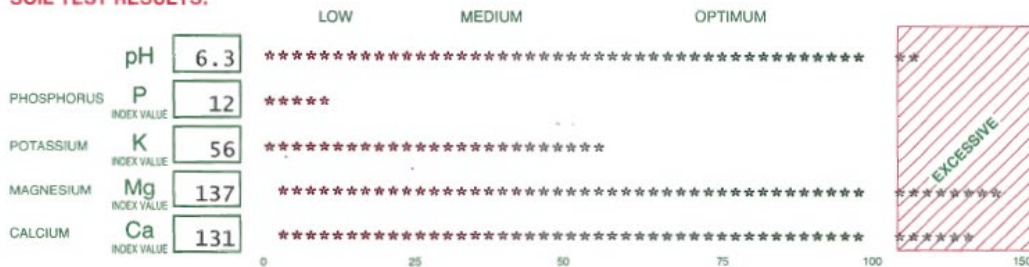
BANK	1	OUT OF STATE	3/12/25	3/17/25	04/07/25	2004	172092
FIELD NAME OR NO.	ACRES	COUNTY	DATE SAMPLED	DATE RECEIVED	DATE COMPLETE	LAB NO.	BAG NO.

<b>SOIL TEST FOR: GROWER</b>	<b>ADDITIONAL COPY TO:</b>	<b>COUNTY AGENT</b>
EVE JOSAR 5835 DEWEY ST CHEVERLY MD	20785	

ZEKIAH U	WELL	NORMAL	SA LO	6- 8	NO TILL		TRKL	NO
SOIL NAME	SOIL DRAINAGE	SOIL COLOR	SOIL TEXTURE	SAMPLE DEPTH	TILLAGE	PRESENT COVER	IRRIGATION	INJ. PUMP

							UNKN	0.0	UNK
LAST CROP	YIELD OF LAST CROP	TYPE	T/A WHEN MANURE	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	MOS. AGO	T/A	TYPE

**SOIL TEST RESULTS:**



1.5	88.8	73.5	12.6	5.1		7.71	9.2	10.6	78.2	1,18
B	Mn	Zn	SO <sub>4</sub> -S	% ORGANIC MATTER	SOL. SALTS MMHOS/CM	BUFFER pH	% Phosphorus Saturation	CEC meq/100gm	% Base Saturation	ENCLOSURES

**SUGGESTED FERTILIZER PROGRAM:**

**CROP:** COMMERCIAL BLUEBERRIES

0.0		*****	*****	SEE BELOW	*****	*****
T/A LIME	TYPE	N LBS/A	P <sub>2</sub> O <sub>5</sub> LBS/A	K <sub>2</sub> O LBS/	S LBS/A	B LBS/A

**YIELD GOAL:**

- Recommended soil pH range for blueberries is 4.5 to 5.0. when soil pH is higher than 5.0, adjust soil pH to bring it into that range. See the enclosed handout for guidance on lowering ph / acidifying your soil.
- Nutrient requirements for commercial blueberry plantings are dependent upon the size and maturity of individual bushes. To determine the nutrient recommendation for this field, follow the guidelines in the enclosed section entitled "Commercial Blueberry Production" taken from Cooperative Bulletin No. 59 - The Nutrient Management Handbook for Delaware.

**SOIL TEST REPORT**  
 UNIVERSITY OF DELAWARE – SOIL TESTING PROGRAM  
 NEWARK, DELAWARE 19716-2170



**BACKGROUND INFORMATION:**

Grower copy

BANK	1	OUT OF STATE	3/12/25	3/17/25	04/07/25	2004	172092
FIELD NAME OR NO.	ACRES	COUNTY	DATE SAMPLED	DATE RECEIVED	DATE COMPLETE	LAB NO.	BAG NO.

SOIL TEST FOR: **GROWER**                      ADDITIONAL COPY TO:                      COUNTY AGENT

EVE JOSAR 5835 DEWEY ST CHEVERLY MD	20785	
---	-------	--

ZEKIAH U	WELL	NORMAL	SA LO	6- 8	NO TILL		TRKL	NO
SOIL NAME	SOIL DRAINAGE	SOIL COLOR	SOIL TEXTURE	SAMPLE DEPTH	TILLAGE	PRESENT COVER	IRRIGATION	INJ. PUMP

						UNKN	0.0	UNK	
LAST CROP	YIELD OF LAST CROP	TYPE	T/A WHEN MANURE	N LAST FERTILIZER	P <sub>2</sub> O <sub>5</sub> K <sub>2</sub> O	MOS. AGO	T/A LAST LIME	TYPE	OTHER NUTRIENTS

**SOIL TEST RESULTS:**



1.5	88.8	73.5	12.6	5.1		7.71	9.2	10.6	78.2	1,18
B	Mn	Zn	SO <sub>4</sub> -S	% ORGANIC MATTER	SOL. SALTS MMHOS/CM	BUFFER pH	% Phosphorus Saturation	CEC meq/100gm	% Base Saturation	ENCLOSURES

**SUGGESTED FERTILIZER PROGRAM:**

**CROP:** DECIDUOUS SHRUBS

0.0					
T/A LIME	TYPE	N LBS/A	P <sub>2</sub> O <sub>5</sub> LBS/A	K <sub>2</sub> O LBS/	S LBS/A B LBS/A

**YIELD GOAL:**

## Appendix 4

**DENNIS AVENUE LID IMPROVEMENT PHASES 1 & 5**  
GPI JOB # 2008037 TASKS 107 & 120

# **LOW IMPACT STORMWATER MANAGEMENT COMPUTATION REPORT**

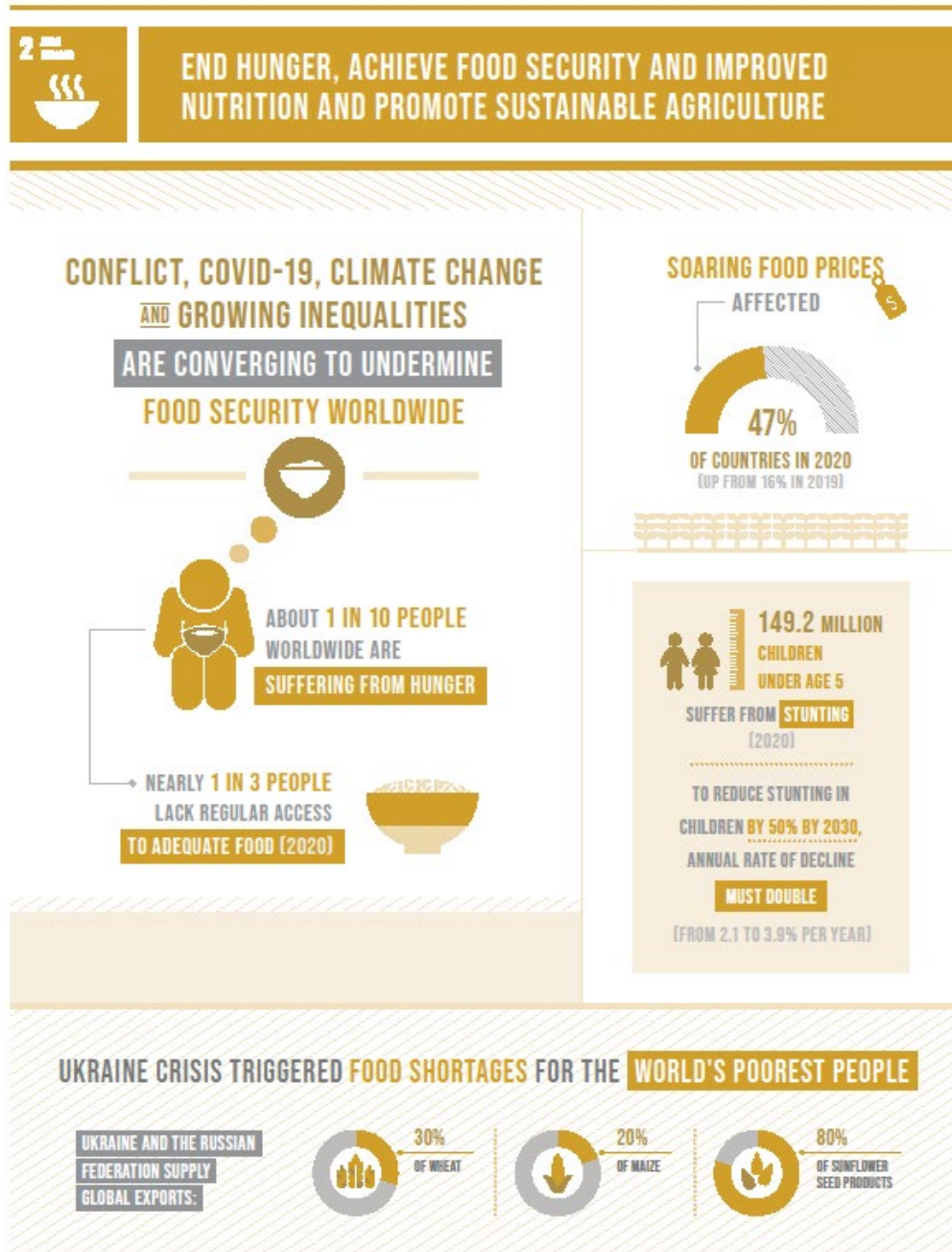
May, 2016

**Owner /Developer**  
Montgomery County Department of Transportation  
Gaithersburg, MD

**Prepared by:**

**GPI**  
Greenman-Pedersen, Inc.  
10977 Guilford Road,  
Annapolis Junction, MD 20794  
(301) 470-2772

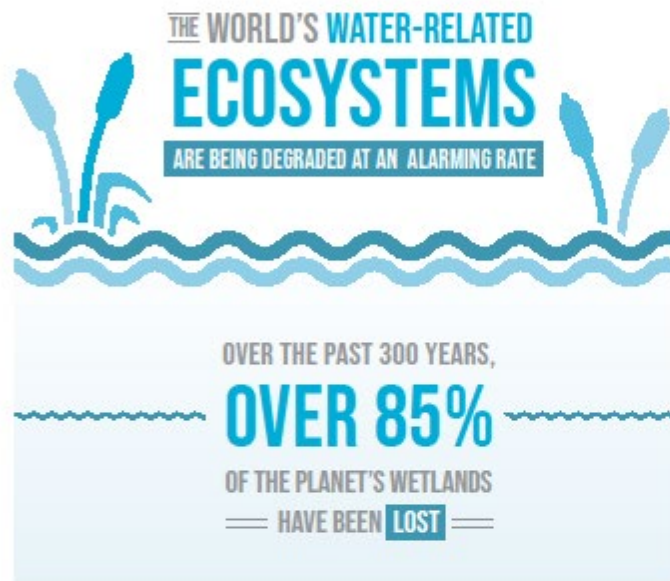
## Appendix 5- United Nations Sustainability Goals



THE SUSTAINABLE DEVELOPMENT GOALS REPORT 2022: [UNSTATS.UN.ORG/SDGS/REPORT/2022/](https://unstats.un.org/sdgs/report/2022/)



## ENSURE AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL



FOR AT LEAST **3 BILLION PEOPLE**, THE QUALITY OF THE WATER THEY DEPEND ON IS UNKNOWN DUE TO A LACK OF MONITORING

**733+** MILLION PEOPLE



LIVE IN COUNTRIES WITH HIGH AND CRITICAL LEVELS OF WATER STRESS (2019)

MEETING **DRINKING WATER, SANITATION AND HYGIENE** TARGETS BY 2030 REQUIRES A **4X** INCREASE IN THE PACE OF PROGRESS



**ONLY ONE QUARTER**

OF REPORTING COUNTRIES HAVE >90% OF THEIR **TRANSBOUNDARY WATERS** COVERED BY **OPERATIONAL ARRANGEMENTS** (2020)



# MAKE CITIES AND HUMAN SETTLEMENTS INCLUSIVE, SAFE, RESILIENT AND SUSTAINABLE



LEAVING NO ONE BEHIND WILL REQUIRE AN INTENSIFIED FOCUS ON **1 BILLION SLUM DWELLERS**



AS CITIES GROW, MUNICIPAL SOLID WASTE PROBLEMS MOUNT



IN SUB-SAHARAN AFRICA, LESS THAN 1/3 OF CITY DWELLERS HAVE CONVENIENT ACCESS TO PUBLIC TRANSPORTATION



**99%**

OF THE WORLD'S URBAN POPULATION BREATHE POLLUTED AIR

ACCORDING TO NEW WORLD HEALTH ORGANIZATION AIR QUALITY GUIDELINES OF PM<sub>2.5</sub> < 5 US/MP

## ENSURE SUSTAINABLE CONSUMPTION AND PRODUCTION PATTERNS

### UNSUSTAINABLE PATTERNS

OF CONSUMPTION AND PRODUCTION ARE ROOT CAUSE OF

#### TRIPLE PLANETARY CRISES



CLIMATE CHANGE



BIODIVERSITY LOSS



POLLUTION

### OUR RELIANCE ON NATURAL RESOURCES IS INCREASING

RISING OVER  
**65% GLOBALLY**  
FROM  
2000 TO 2019



### TOO MUCH FOOD IS BEING LOST OR WASTED IN EVERY COUNTRY EVERY DAY



HARVESTING



TRANSPORT



STORAGE



PROCESSING

**13.3%**

OF THE WORLD'S FOOD IS LOST AFTER HARVESTING AND BEFORE REACHING RETAIL MARKETS



HOUSE



GROCERY STORE



HOUSEHOLD



RESTAURANT

**17%**

OF TOTAL FOOD IS WASTED AT THE CONSUMER LEVEL

### VAST MAJORITY OF THE WORLD'S ELECTRONIC WASTE IS NOT BEING SAFELY MANAGED

#### E-WASTE COLLECTION RATES (2019)



LATIN AMERICA AND THE CARIBBEAN



SUB-SAHARAN AFRICA



EUROPE AND NORTHERN AMERICA



GLOBAL AVERAGE

## Appendix 6- Plant quantities

CODE	BOTANICAL / COMMON NAME	CONT		QTY	UNIT
TREES					
ASI TRI	Asimina triloba / Pawpaw	-		5	ea
CORAM2	Corylus americana / American Hazelnut	-		7	ea
DIO VIR	Diospyros virginiana / Common Persimmon	-		3	ea
LIN BEN	Lindera benzoin / Spicebush	-		11	ea
SAM EL2	Sambucus canadensis / American Elderberry	-		*15*	ea
SHRUBS					
ARO MLN	Aronia melanocarpa / Black Chokeberry	5G		17	ea
VACANG	Vaccinium angustifolium / Lowbush Blueberry	5G		21	ea
VACHIG	Vaccinium corymbosum / Highbush Blueberry	5G		11	ea
ANNUALS/PERENNIALS					
API AME	Apios americana / Potato Bean	quart		5	ea
CODE	BOTANICAL / COMMON NAME	CONT	SPACING	QTY	UNIT
SHRUB AREAS					
MAT ST3	Matteuccia struthiopteris / Ostrich Fern	flat	36" o.c.	50	pl
PAS IN2	Passiflora incarnata / Passion Flower Vine	quart	18" o.c.	20	ea
	SUNNY MIX	492			
A102-DOTS-L	PLUGS				
	Asclepias verticillata / Whorled Milkweed	1 flat			
	Aster dumosus 'Wood's Purple' / Woods Purple /	1 ea			
	Echinacea purpurea 'Pica Bella' / Pica Bella Con	1 ea			
	Monarda punctata / Spotted Horsemint	1 flat			
	Solidago sphacelata 'Golden Fleece' / Autumn G	1 flat			
	SHADY MIX	1382			
A115-STIPPLE					
	Aster macrophyllus / Bigleaf Aster	2 flat			
	Carex laxiculmis 'Hobb' / Bunny Blue Spreading S	2 flat			
	Tradescantia virginiana / Virginia Spiderwort	2 flat			

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