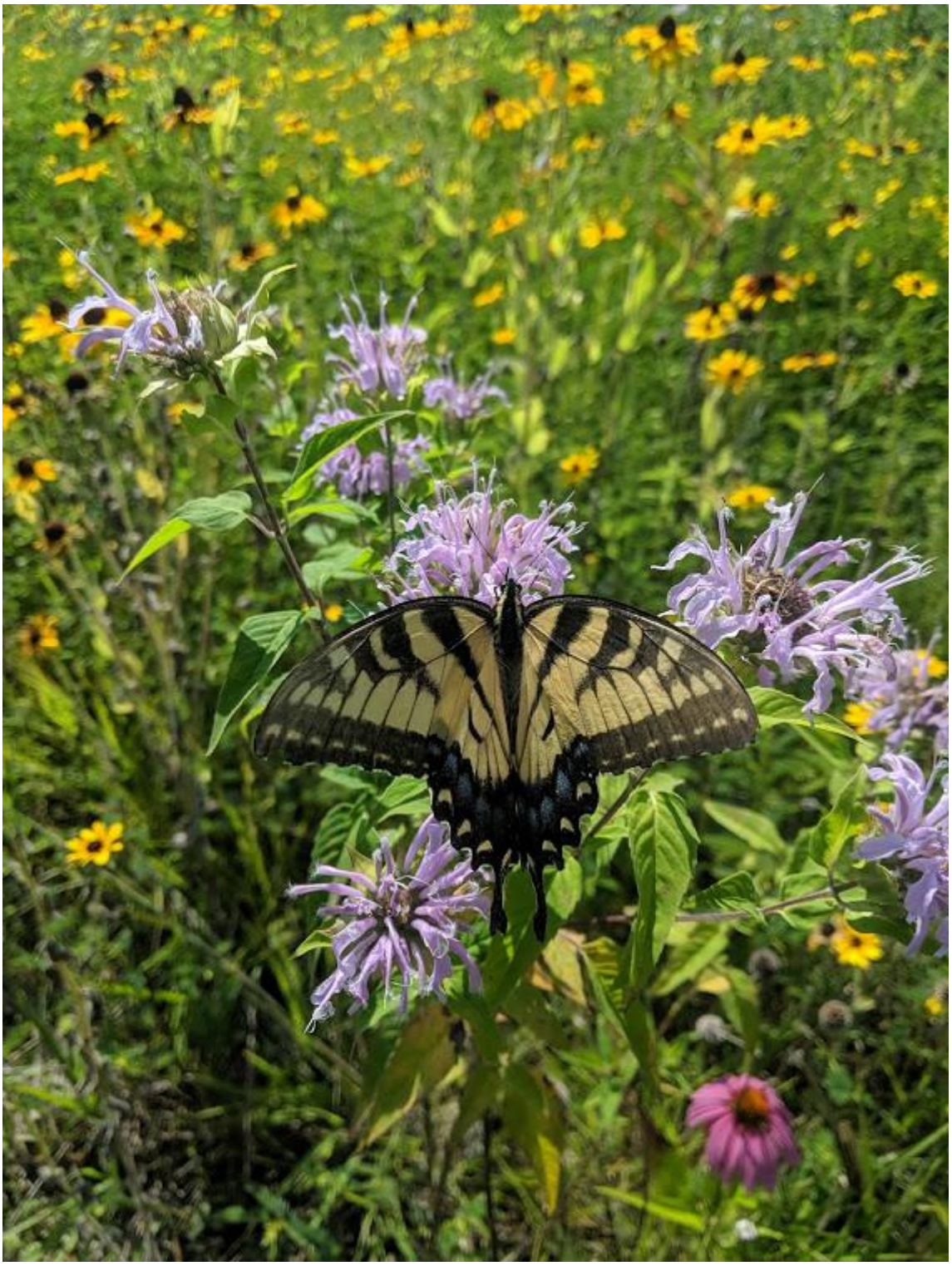
SUFFOLK COUNTY POLLINATOR PATHWAY TASK FORCE FINAL REPORT



REPORT TO THE SUFFOLK COUNTY LEGISLATURE

DECEMBER 2023 HAUPPAUGE, NEW YORK

Suffolk County Pollinator Pathway Task Force Report

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Introduction

Although great effort has been made to preserve and protect Long Island's environment[1], Long Island's pollinator habitat continues to be destroyed, fragmented, and degraded by human land use. Unfortunately, many of our wetlands, grasslands, and forests were destroyed to make way for industrial, commercial, and residential development.

Much of the remaining public and private "open space" is characterized by vast expanses of ecologically lifeless lawn that is decorated by a handful of trees – many of which are non-native or invasive. Our increasingly urban environment bleeds into the remaining "wild lands" primarily through the proliferation of invasive plants and animals and the spread of foreign plant pathogens.

Moreover, all of these harmful human impacts are being exacerbated by climate change. What we are witnessing here locally on Long Island is part of a global crisis. As of June 2020, more than 70 species of pollinators were listed as endangered or threatened due to decades of habitat destruction and environmental degradation.[2] The rapid decline of many native pollinator species, now well documented, warns of a coming disaster for our ecosystems and for agriculture. Human life, natural life, lived without pollinators is not the life we would choose for ourselves, and it won't last.

The creation of native pollinator corridors, along with a focus on retaining biodiversity among the pollinators, is essential to creating a livable future. In a study conducted by the Center for Biological Diversity that evaluated the population rates of all 4,337 species of North American and Hawaiian native bees, more than half are declining and 1-in-4 are facing an increasing risk of extinction.[3]

Pollinator species not only provide essential ecosystem services by pollinating plants, but also provide pollination to an estimated 70% of our food supply, averaging about $20-$30 billion in revenue annually in the US.[4]

It is essential that our systems of government enact policies to restore and protect native pollinator species.

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[1] *See Central Pine Barrens Joint Planning & Policy Commission Overview,* New York State Central Pine Barrens Commission, https://pb.state.ny.us/about-us/overview/.
See also Long Island Nitrogen Action Plan, New York State Department of Environmental Conservation, https://www.dec.ny.gov/lands/103654.html.

[2] *See Threats To Pollinators,* U.S. Fish and Wildlife Service, https://www.fws.gov/initiative/pollinators/threats.

[3] Kelsey Kopec & Lori Ann Burd, *Pollinators in Peril,* Center For Biological Diversity, https://www.biologicaldiversity.org/campaigns/native_pollinators/pdfs/Pollinators_in_Peril

[4] *See Impacts on the Food Supply*, Center for Food Safety, https://www.centerforfoodsafety.org/issues/304/pollinator-protection/impacts-on-the-food-supply.

Executive Summary

Introduction:

In the shadow of relentless human progress, Long Island's once-vibrant pollinator habitats stand beleaguered. Wetlands, grasslands, and forests have bowed before bulldozers, making way for the march of industry, commerce, and suburban life. What remains of open spaces is often characterized by barren expanses of manicured lawns adorned with non-native, invasive trees. This assault on nature is compounded by the insidious advance of urbanization, aided and abetted by invasive species and alien pathogens, all while climate change looms as a dark specter, exacerbating the damage.

Yet, Long Island's struggle mirrors a global crisis. Over 70 pollinator species, vital to life as we know it, teeter on the precipice of extinction, victims of habitat destruction and environmental decay spanning decades. The perilous decline of native pollinators forewarns a grim future for ecosystems and agriculture. A world bereft of these essential creatures defies the harmony of the natural order, prompting us to weave native pollinator corridors, threads of biodiversity that are our lifeline.

Amidst this somber tableau, a glimmer of hope lies in nature's resilience and the guiding beacon of science. Effective public policy, sown from the seeds of scientific wisdom, can nurture a future where pollinators thrive, ecosystems flourish, and humanity coexists harmoniously with the intricate mosaic of life. Together, as stewards of this fragile planet, we can embark on a journey to restore the kingdom of the pollinators, weaving a vibrant and sustainable tapestry for generations yet unborn.

Task Force Creation:

In 2021, Suffolk County established the Pollinator Pathway Task Force charged with “developing a plan to be implemented jointly by the Department of Public Works and the Department of Parks, Recreation, and Conservation which would encourage pollinator migration to Suffolk County through the planting of indigenous plants along roadsides and in open green spaces on County property.”

The 21-member panel’s mission was to assist Suffolk County’s responds to a local decline in pollinators and their habitat by working with partners to create educational guidance that would provide information, resources, guidelines, regulations, and mapping of potential new pollinator habitats for the benefit of Long Island’s native ecosystems and biodiversity.

During the course of its work, the Pollinator Pathway Taskforce was segmented into three specialized working groups that focused on specific areas of contribution to address pollinator decline.

Education Subcommittee: *Cultivating Awareness for Change*

The Education Subcommittee spearheaded a vital endeavor to cultivate consciousness and inspire transformative action. Against the backdrop of a rapidly evolving ecological landscape, this subcommittee’s work focused on equipping Suffolk County residents with the knowledge and tools they need to become guardians of Long Island's delicate ecosystems.

The Education Subcommittee’s efforts focused on the creation of comprehensive educational guidelines. These guidelines provide a roadmap for designing, establishing, nurturing, and protecting pollinator-friendly landscapes. By breaking down the intricacies of these habitats, including diverse plant species, layout considerations, and long-term maintenance practices, the subcommittee’s work empowers individuals to make informed choices. The subcommittee also ensures the dissemination of resources that emphasize the significance of native plant species over invasive ones, and the role of these plants in supporting thousands of insect species, from bees and butterflies to beetles and birds.

Technical Subcommittee: *Mapping the Pathway to Pollinator Protection*

The Technical Subcommittee was focused on the development of a spatial mapping application for identifying current and potential priority pollinator projects across Suffolk County. The interactive mapping tool created through this effort identifies existing pollinator gardens, plot locations ripe for potential new projects, and underscores the critical importance of maintaining ecological connectivity.

Through the collaboration between members of the Technical Subcommittee and Suffolk County's Division of Geographic Information Services, this mapping tool will serve as a geographical reference. It provides a visual representation of pollinator-friendly landscapes, inspiring individuals and communities to partake in meaningful conservation efforts. By spotlighting areas of high ecological value, ownership considerations, and potential expansion corridors, the tool informs strategic decisions.

Legislative Subcommittee: *Growing Policies that Reverse Pollinator Decline*

The Legislative Subcommittee's efforts focused on driving the implementation of comprehensive policies aimed at the restoration and protection of native pollinator species. The interplay between legislative initiatives and grassroots engagement formed the bedrock of this subcommittee's strategy, ensuring that meaningful transformation occurs at multiple levels.

This subcommittee's work encompasses the development of guidelines, regulations, and incentives that underscore the importance of pollinator-friendly practices. By fostering an environment where native habitats thrive and pollinator populations rebound, the subcommittee ensures a legacy of ecological vitality for future generations.

Recommendations for a Pollinator-Friendly Suffolk County:

To nurture the growth of pollinator gardens across Suffolk County, we recommend ongoing networking and dialogue. Community participation in adding gardens to the GIS tool is encouraged, with the aim to expand involvement through local towns and New York State. Training is key, and while these recommendations are adaptable for homeowners and various institutions, we propose tailored guidance for county, state, and town highway departments. These protocols and management practices promote pollinator-friendly landscapes near government buildings and roadways, advocating for areas not to be mowed, taller grass, and designated wild spaces. Symposiums for employees can provide essential education and hands-on experience. Benefits include fiscal responsibility, reduced gasoline consumption, less equipment wear and tear, as well as decreased staff time on maintenance.

To enhance the GIS tool, we suggest adding layers for biodiversity and climate resilience, along with notifications highlighting areas lacking specific native plant species. To maximize outreach, the Suffolk County Legislature should promote the Pollinator Pathway initiative, encouraging residents to participate in nurturing pollinators. This can be achieved through active engagement on county social media platforms during National Pollinator Days, press releases to local news outlets, and presentations at civic association meetings, ensuring that the Pollinator Pathway report resonates with residents.

Members of the Pollinator Pathway Task Force

Appointing Authority	Appointee
The Presiding Officer of the County Legislature, or his or her designee	Kara Hahn
The County Executive, or his or her designee	Emily Dwyer
The Chair of the Environmental, Parks, and Agriculture Committee of the County Legislature, or his or her designee	Frank Piccininni
The Commissioner of the Department of Public Works, or his or her designee	Moses Cucura
The Commissioner of the Department of Parks, Recreation, and Conservation, or his or her designee	Christine Boelke
A representative from the Cornell Cooperative Extension	Mina Vescera
A representative from the Long Island Native Plant Initiative	Rusty Schmidt
A representative from the Audubon Society, to be appointed by the County Legislature	Brooke Bateman
A representative from The Nature Conservancy	Vacant
A representative from Vision Long Island, Inc.	Elissa Kyle
Three members of local gardening clubs in Suffolk County, to be appointed by the Legislature	Joy Flynn Susan Avery Vacant
A representative from Save the Great South Bay	Robyn Silvestri
A representative from the Suffolk County Town Supervisors Association	Vacant
A representative from the Suffolk County Village Officials Association	Vacant
A botanist or horticulturist, to be appointed by the Legislature	Alicia Whitaker
A representative from the Peconic Land Trust	Vacant
A representative from the Peconic Estuary Partnership	Joyce Novak

A representative from the Group for the East End, Inc.	Taralynn Reynolds
A representative from New York State Parks, Recreation, and Historic Preservation	Vacant

Education Subcommittee Members

Rusty Schmidt - Long Island Native Plant Initiative (Education Subcommittee lead)
Emily Dwyer – Suffolk County Executive's Office
Jared Dyer
Joy Flynn
Kara Hahn – Former Suffolk County Legislator
Maggie Muzante
Kevin Munroe
Luke Ormand
Jay Ortiz – Kara Hahn's Office
Robyn Silvestri – Save the Great South Bay
Taralynn Reynolds - The Group for the East End, Inc.
Alyssa Turano – Kara Hahn's Office
Mina Vescera - Cornell Cooperative Extension
Alicia Whitaker - Horticultural Alliance of the Hamptons

Technical Subcommittee Members

Brooke Bateman - National Audubon Society, Four Harbors Audubon Society (Technical Subcommittee lead)
Sue Avery – Garden Clubs of Suffolk County
Christine Boelke - Suffolk County Parks
Eric Lawler – Suffolk County GIS (mapping tool coleader)
Shannon Veraldi – Suffolk County GIS (mapping tool coleader)
Alicia Whitaker – Horticultural Alliance of the Hamptons

Legislative Subcommittee Members

Frank Piccininni - President Spadefoot Design and Construction, LLC (Legislative Subcommittee lead)
Marshall Brown - The Long Island Conservancy
Chris Cole - Cole Environmental Services
Kaitlynn Dixon – JD candidate, Elisabeth Haub School of Law at Pace
Mark Murray - Spadefoot Design and Construction
Susan Paik
Kate Rummel - Cole Environmental Services
Mina Vescera – Cornell Cooperative Extension

Former Suffolk County Legislator Kara Hahn's Staff

Seth Squicciarino – Senior Legislative Assistant
Catherine Green – Legislative Aide
Alyssa Turano - Legislative Aide
Rita J. Egan – Legislative Aide
Kim Bryant – Legislative Aide
Jay Ortiz - Intern

Education Subcommittee

MISSION STATEMENT: Suffolk County is responding to a local decline of **pollinators** and their habitat by working with our local partners to create educational guidelines for all of Suffolk County by providing education, resources, instructions, regulations, and mapping of potential new **pollinator** habitat for the benefit of Long Island native **ecosystems** and biodiversity.

1.0 Introduction

Monarch Butterfly on Agastache

What is a pollinator-friendly landscape?

It is a landscape rich in the diversity of flowering plants, from trees and shrubs, but also grasses (not lawn), herbs, and of course flowers! These beautiful landscapes can be rewarding to you aesthetically, but they are vital in helping support the life cycle and provide habitat for the thousands of species of insects, specifically bees, butterflies, moths, beetles, and birds such as hummingbirds that we have as visitors to Long Island.

The pollinator-friendly landscape doesn't start and stop with a good list of plants, but needs to be thought out, a garden design considered, and the long-term maintenance practices factored into the design.

To **pollinators**, native plant species are the most beneficial. Non-native, exotic, alien and introduced plants should be strictly limited. Most importantly, do not plant and try to remove all **invasive species**. Consider host plants, diversify bloom times, and plant a variety of flower shapes, colors, and sizes. Be cautious of cultivars (cultivated varieties of plants). Plant in masses; enhance nesting opportunities. Create microclimates (local climate conditions). Minimize lawn. Provide other habitat necessities like water.

In order to begin, we must take a step back and understand some of the terminology associated with **pollinator** gardening. See a list of definitions that are located at the end of the report on page 28.

1.1 Why is pollinator habitat important?

Due to the increased use of pesticides, our landscape practices, and the loss of habitat, we are losing many of our **native plant species** and habitat for insects. We are seeing global decline in insect populations with a noticeable local impact.

Without **pollinators**, we lose the ability for our plants to reproduce, produce fruit and vegetables, and provide an important food source for food chains, especially terrestrial birds. Native insects depend on native plants, in fact, nearly 90% of native insects require a specific host plant at some point in their life cycle to develop. For example, the monarch butterfly (Danus plexippus), needs native milkweed plants to lay their eggs on and for the caterpillars to eat to create their chrysalis in the **'Host Species'** (see definition for a host plant). The typical suburban landscape which includes expansive lawn spaces, some foundation plantings and a few, mostly non-native flowers, is becoming the dominant **ecosystem** available to **pollinators**, and it's not enough for them to survive.

In addition to loss of habitat, insects in our garden spaces are often viewed as pests. According to surveys by the U.S. Environmental Protection Agency (EPA)[5], more than three quarters of U.S. households use pesticides, with 66% treating major living areas in and around the home multiple times per year most commonly targeting cockroaches, ticks, ants, and mosquitoes. Those unwanted insects are a small percentage of the insect population, less than one percent; however they encourage the high use of pesticides. These pesticides are not species specific and have harmed large populations of other insects, including many beneficial species, especially our **pollinators**.

The impact on insects has had a synergistic impact on terrestrial birds, many of your backyard favorites included. These species require insects, in particular caterpillars, which are rich in fat and protein, to rear their young. In fact, one brood of birds eats around 6,000 caterpillars and insects, and 90% of our birds require insects to raise their young[6]. Many of our bird species can raise two broods per year, which is a whopping 12,000 insects per family! Fewer insects means fewer birds. According to Cornell Ornithology Lab[7], in North America, there has been a drop of nearly 30% of the birds since 1970, which is nearly three billion birds gone from our forests, grasslands, coastal beaches, and backyards. A frightening statistic and one that we all can help with by planting a pollinator-friendly landscape, reducing our lawn space and pesticide use.

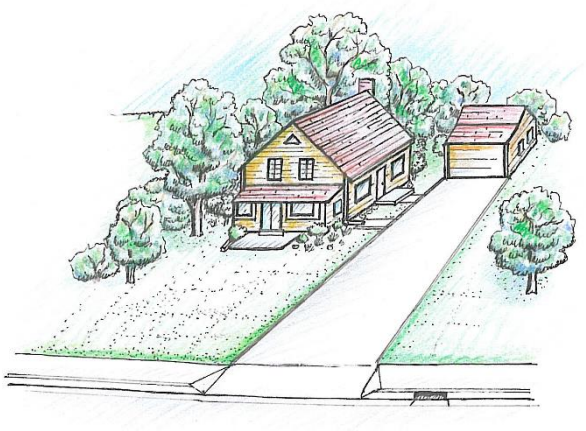
1.2 Definitions (see page 28)

1. *Pollinator*
2. *Native Species*
3. *Pollinator Garden*
4. *Habitat Garden*
5. *Ecosystem*
6. *Introduced Species/Non-native Species/Alien Species*
7. *Invasive Species*
8. *Restoration*
9. *Plant Cultivar and Hybrid*
10. *Host Species*
11. *Keystone Plant*

Wild columbine flower, important for hummingbirds

2.0. Step by Step Guide to design and build a pollinator-friendly landscape

2.1. Where to Start



The best place to start is transform unused lawn spaces into pollinator-friendly landscapes, if you feel you are ready to reduce your lawn, skip to page 11. Many of us have an existing garden and landscape, and this may be the space you choose to enhance or redefine. Some of these plantings will be wonderful old friends, but some may be invasive plants or of little value to wildlife. Depending on the size of

[5] Pesticides' Impact on Indoor Air Quality | US EPA: survey and research provided here. https://www.epa.gov/indoor-air-quality-iaq/pesticides-impact-indoor-air-quality#SnippetTab

[6] Tallamy, Douglas W., 2007, "Bringing Nature Home".

[7] https://www.birds.cornell.edu/home/bring-birds-back. Cornell Lab study.

your space for gardens, you may be able to add additional beds for **pollinator** plants or add **pollinator** plants to existing beds.

Even if your space is limited, there are some simple things you can do to add or make room for **pollinator** plants by removing plants that aren't thriving, or by expanding current garden beds. Many people have beloved plants that may not be especially valuable for **pollinators** but hold some sort of sentimental value or you just like the way they look. There's no need to remove them unless they're invasive – add **pollinator** plants and over time, your garden will shift the balance to a critical mass of pollinator-friendly plantings. The goal is to provide sustenance for many types of **pollinators** – nectar and pollen -- as well as host plants for eggs, larvae, and caterpillars.

Mix of native and non-native shade plants.

2.1.1. Goal of the project

Determining what you are hoping to achieve is a great place to start but it's likely your goals will change as the garden develops. As your gardens mature, so will your goals. Every gardener has BIG dreams but starting small while thinking big ensures success and fun along your journey to create a more pollinator-friendly space. Consider phased starter goals of pollinator-friendly pots for the patio, window boxes, or natives around the vegetable garden. Add a soft-landing area around your trees; a planted bed under your tree instead of lawn. Soft landings provide at set of plants that insects, baby birds, and animals will land in if falling from the tree but will also prevent damage to the base of the tree from lawn mowing and weed whips as well as retain moisture for the tree and other plants. Converting more and more lawn to natives is an option or maybe a **pollinator garden** for a specific species, maybe your favorite butterfly or other **pollinator**. There are many, many options and there's so much to learn and explore but remember, enjoy the process.

2.1.2. Suitability in Context

Suffolk County is the second largest county in New York State with residents living in a variety of home types. Pollinator-friendly plantings can be adapted across home types, from apartment patios or balconies, more dense suburban lots to larger lots of land. There are ways to garden for **pollinators** no matter where you live.

Salt and pollution tolerance is something to think about when choosing your plants. Road salt is great for icy roads but can kill or weaken salt intolerant species.

We also have several miles of coastline and some of us may be gardening in these areas. Limiting pesticides, especially near water bodies, is crucially important. Coastal area plantings must be able to tolerate salty air and occasional flooding.

In areas close to woodlands or other natural areas, you should be more careful about what you plant in your yard. In these areas, stick to straight species of native plants rather than cultivars, exotic species capable of escaping garden areas and any plant species on the invasive plant lists.

Removing invasive plant species identified in your yard can be as important as planting native plants (see LIISMA.org).

Native plants within a freshwater pond

2.2. Dealing with Existing Vegetation and Installing a Pollinator Garden

2.2.1 Site the Garden

A good first step is to understand what you have in the yard and determine what is important to you, what is important to **pollinators** and what is there just because.

It can seem overwhelming trying to figure out what is native, what is non-native, a cultivar, is it invasive? This is where technology comes in handy! Of course, if you can bring in a professional landscape ecologist or local native plant organization, please do so.

Some applications (apps), like iNaturalist, help you identify the plant by species, but have the added benefit of other enthusiasts and professionals checking the accuracy of the identification.

Check out National Audubon Society's excellent resource on creating the most bird-friendly yard possible: https://www.audubon.org/news/how-make-your-yard-bird-friendly-0

Remember, what's good for the birds is good for the insects!

Native plants along a roadside.

2.2.2. Where to Site Your Pollinator Plants

Many of our sun loving flowering plants that most people associate with a **pollinator garden** are essential for providing nectar and pollen, and most flowering plants thrive in areas of the garden that have a minimum of six hours of sun a day, preferably more. Consider places in your landscape that receive full sun. These sun-loving flowering plants don't do well if there is competition from tree roots, so try to source your garden bed at some distance from trees and large shrubs. You will be watering new plantings frequently, so choose a site that is close to a water source. In addition to traditional garden beds, consider the following for **pollinator** plantings:

- The "hell strip" between the sidewalk and the street
- Areas that adjoin your driveway
- Containers that can be positioned in full sun
- Window boxes
- Areas in front of a boundary fence or hedge
- Areas of lawn that can be turned into a "no mow" or mini-meadow.

Hell strip planted with moss phlox

Pollinator gardens and natural habitat transcend the necessity of full sun. Shady areas, wet areas, a forgotten part of the yard, or partial shady location by the shed are all potential locations for pollinator-friendly gardens. These gardens require a different palette of species, but learning how to shade garden is just as much fun and a great learning experience. Did you know that blueberries and huckleberries are Long Island **native species** that thrive in shady conditions?

Consider looking for places in your landscape that you can see from the house or patio so that you can enjoy the wildlife that will visit your plants. Even a small planting, such as a container, makes a difference for

pollinators that are foraging for sustenance. Start small, learn about the plants and the **pollinators** they support, and expand your plantings in the future. When in doubt, and if you have the space, choose a native tree with high wildlife value, like our native white oaks (Quercus alba) that support hundreds of species of wildlife.

Native plants in a pot

2.2.3. Existing Lawn Areas – Biological Deserts

In most of suburbia, the dominant plant is lawn. These large expanses on non-native turf grasses don't provide high wildlife value. In fact, there is research that suggests they are "biological deserts."

As homeowners, we have an opportunity to decrease areas of our lawn that are not used. We're not saying get rid of it all, but can you reduce it? Can you allow clover and dandelions to flower in the spring to support the bees?

What parts of the lawn are only walked on when it is mowed? Then ask, those areas that are not utilized, can it be transformed into a **pollinator** habitat? If you opt to replace the lawn, a number of techniques can be used.

Mechanical:

- Cutting and rolling up the sod, loosening the soil and preparing a bed for planting. This is a very good option and the standard one most people think about, not inexpensive, but effective, timing can be done throughout the growing season.

- Another mechanical option is to till the new bed and rake out the grass, more time is required, you keep the topsoil on site, and you have a soft bed to work within (Please see below on soil preparation). This is best conducted in the spring or fall to allow for planting pretty close to finishing the planting bed.

Sod cutting for a garden

- Smothering is an option that is becoming more popular, especially with homeowners. No chemicals are needed, so the **pollinators** like it too!

There are a few ways you can effectively smother and kill the lawn in your chosen area.

- Lay a tarp or two as necessary, over the site you have chosen to rid of lawn. Weigh it down with medium sized rocks so it won't get blown away by any windy conditions or stake down the edges. Approximately one to two months later, remove the tarp and prepare to plant! Best time is to do this early in the spring, to allow for planting in late May or mid-summer for a fall planting.

- Another method that is used is taking leftover newspaper, at least an inch thick, and laying that out on the site. You can add a layer of mulch about an inch to 3 inches thick, over the top. A slightly easier method is to use cardboard. Free cardboard is typically easy to get and once placed in the yard, a couple of inches of mulch spread over the top will keep the cardboard in place. Large box stores, grocery stores, etc. may have cardboard for the taking. If there is tape on it, you'll want to remove that first.

Mulch being placed on top of cardboard to smother

- A couple of weeks later after the cardboard or newspaper is spread, you can plant right through the cardboard, just be sure to move the mulch away from the hole. The rain will soften the cardboard; however, the cardboard will continue weed prevention after planting. Similar to the tarp, plan accordingly, prior to planting, allowing planting to be conducted in the spring or fall.

2.2.4. Existing Garden Edits

Existing gardens may have a number of pollinator-friendly plants and some that don't provide any benefit to wildlife and may even be invasive. An easy way to start to make your yard a pollinator-friendly landscape is to "edit" within the gardens you have. Remove plants that you no longer want in your landscape. As long as they are not invasive, you may want to plant-swap with other gardeners. Replace these plants with species that have high wildlife value. A non-native rose that you love, can be surrounded by native shrubs and perennials that may also be host plants and have big impact on your garden.

Removing plants seems very straightforward, but using the correct tool will make it easier. Look for a tool called a "Pulaski," a pick-ax handle with a wide hoe blade on one side and an ax head on the other. The hoe end is great to get under the root zone of the plants you want to remove, and the ax head will cut larger roots to get the plant out. Once you have the plant removed, shake off as much soil as possible and replant with something new in the hole left behind.

2.2.5. Right Plant for the Right Place

Plants can do well in a wide range of conditions – the goal is to match the plants to your specific site conditions. Note the soil condition and the degree of moisture in the soil, as there are **pollinator** plants that will thrive in very dry conditions as well as those that like "wet feet." Remember that irrigation, particularly drip hoses, can make a huge difference in the success of your plantings, especially in the first year. A drip or soaker hose is a hose that allows water to come out along the entire length of the hose and not just at the end, allowing to water a large area without overhead spraying. Overhead spraying usually evaporates large portions of the water instead of watering what you need. And while it may be true that native plants, once established, require less water than non-natives, all plants need sufficient water in their first year of being planted.

Many people on Long Island have a problem with deer browsing their plantings. If possible, locate your **pollinator** plants behind a deer fence. You can also spray them with deer repellent or use other methods to discourage them. Some plants are more deer resistant than others, but we have learned that deer will eat anything if they're hungry enough. Don't let that stop you from planting **pollinator** plants. (There's more information about this issue 3.2, Deer Resistance.)

With a little research any gardener can select appropriate plants. We encourage you to use native plants as your first choice, as they are adapted to our local climate, soils, are and disease resistant. As a result, they typically thrive with less care than non-**native species**. Some general considerations when choosing plants, as most of Long Island is sandy, we typically don't have to worry too much about wet spots or harsher soils, however about 10% of Long Island is not in sand. If you are one of those lucky ones, please consider soil types for your plants. Then consider primarily sun preferences, most people kill plants by planting sun loving plants in shade or vice versa. After sun-level, consider moisture tolerance, size, seasonal interest, salt tolerance and of course pollinator-loving plants.

For sun level, Full Sun is an area that receives six or more hours of direct, mid-day sun a day. Light shade or Part Sun is four to six hours of direct sun that may be open sky or with a high partial canopy of trees. Part Shade or Medium shade is two to four hours of direct sun, beneath a canopy of trees or with some open sky present but not directly overhead. And finally Full Shade is less than a couple of hours of direct sun, early or late in day and not mid-day sun.

2.2.6. Invasive Plants

Unfortunately, invasive plants are very common in yards across Long Island. Luckily, we have an excellent resource we can go to: the Long Island Invasive Species Management Area (LIISMA.org) website to get the most up-to-date list of plants. As described in the definitions, an invasive plant is causing much more harm to both the ecological systems and to human health and welfare. First, a native plant **cannot** be an **invasive species**, our native plants may be aggressive and fill in the spaces we provide, but are not pushing out other plants, disturbing or replacing **ecosystems** and are still a benefit to our insects and wildlife. An **invasive species** must be an alien plant that may not be aggressive in its home range but is very aggressive here due to lack of predators or is able to overpower our native plants. For instance, the invasive tree, Tree of Heaven (*Ailanthus altissima),* is a problem plant here, displacing a number of our native trees like oaks. It is not a host plant for any native insects but is a host plant for the Spotted Lantern Fly (*Lycorma delicatula*). Spotted lantern flies decimate many crop species, including grapes.

Other **invasive species** that are likely on your property are mugwort (*Artemisia vulgaris*), English ivy (*Hedera helix*), Pachysandra (*Pachysandra spp.),* butterflybush (*Buddleja spp.),* burning bush or winged euonymous (*Euonymush alatus*), forsythia (*Forsythia spp*.), barberry (*Berberis spp*.), multiflora rose (*Rosa multiflora*), rose of Sharron (*Hibiscus syriacus*), Norway maple (*Acer platanoides*), or Oriental bittersweet (*Celastrus orbiculatus*). Some of these plants spread by root, some spread by seed, but all are spreading and causing issues. To remove the trees, cut the tree and remove, shrubs and vines will require removing most of the root mass as well. The mugwort is full root removal and will take multiple tries.

It may take a full season of monitoring and maintenance before replanting with **native species** where an invasive plant was removed.

2.2.7. Soil Preparation

Before adding any fertilizer or soil amendment, test the soil, Suffolk County's Cornell Cooperative Extension offers soil tests at a nominal cost, see the website for more information (https://ccesuffolk.org/horticulture-diagnostic-labs).

Soils may need some preparation, and adding an amendment (compost, fertilizer, or other additive to the soil) will depend on the plants you choose and the existing soils you have. If you are planning to use native plants as the dominant plants in your **pollinator** area, you don't need to add topsoil, compost, or other materials as a supplement for the soils, just plant and mulch. Most of our native plants do not need excess soil richness; a practice that can encourage weed growth.

Most of our yards do have compacted soil from when the house was built. You may need to loosen the soil a bit to help the roots extend out to establish quickly. To loosen soil, common tools are a tiller, potato fork, or if smothering the garden, enlarge the hole and loosen the edges.

2.2.8. Planting

Your garden is prepared, and you can't wait to get the plants into the ground to enjoy your accomplishments! Seeds are not recommended for most residential gardens. It can take two to three growing seasons for the plants to establish themselves, and it's hard trying to identify what is a friend or foe when the seeds do start to grow.

Using potted or ball and burlap plants is better and given the variety of sizes these plants can come in, there will be many to choose from to fit any budget.

Plugs, the smallest potted plant available, in what you can think of as 6-packs like many annual plants, will be full sized within a year, require less maintenance to get established, and are much less expensive than our large pot sizes.

Plugs are small and so you may feel your garden doesn't look very full or complete. Planting in the fall, consider using a majority of plugs for larger plants. It's the perfect time to get started for the following year, and small plants before winter tend to not be an issue. In spring, we're all looking for some instant gratification after a long winter, so you may want to go to full-sized plants right away.

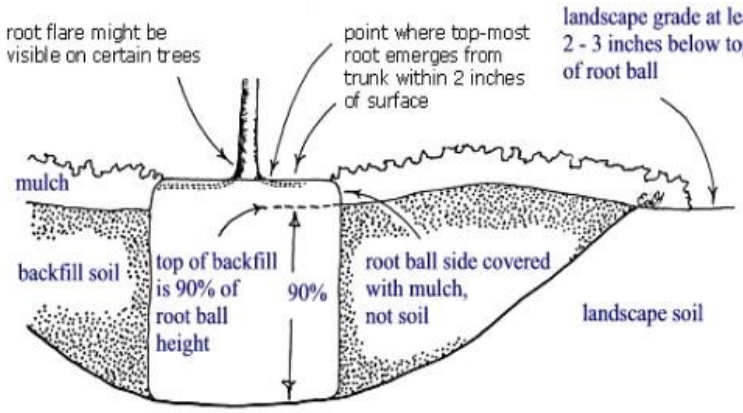
Every gardener longs for the day they have to weed less. So, if the goal is to have less maintenance, in the future, consider planting close together. For perennial gardens, close planting creates a cottage garden look with no space between the plants. A general rule is 12-18" apart for perennials, a foot to 2 feet apart mature growth size for shrubs and look up the optimal planting distance for trees as they are all different. For shrubs, if the plant is a mature width of 6-8', consider planting 4-6' apart for instance.

If the goal is to have a more specimen look to the garden, where the plants do not touch, mulch is key to be added annually to help with weed suppression. This may cause more weeding concern between the plants annually but has a different look that is a more of an arboretum layout. This layout/design will require monthly maintenance on your garden, adding time and expense.

A few simple tricks can help your garden look attractive and make it easy to identify the plants in future years. Place the taller plants in the back and lower-growing plants in the front of the garden space. Stick the pot tags in the soil next to each plant for the first few years as you learn. Plant flowers in groups or masses so similar plants are located next to each other, rather than scattering the plants individually.

Consider placing the mulch first to limit the amount of time walking through a garden that has been tilled or soil loosened to prevent compaction. If you smothered the garden with newspaper or cardboard and placed mulch already, don't worry about walking in your garden. Keep your plants moist before planting, place the plant in the hole, fill the hole with water, allow the water to soak in before backfilling the soil and watering again. Plants in pots are likely root-bound, which looks like the roots are running in circles around the edge of the pot and will make it hard to extract the plant from the pot. You will need to cut the roots down the sides and across the bottom to promote the roots to grow out and not continue to circle. Your plants will thank you for that little extra help.

Dig a hole deep enough to let the roots hang vertically to the bottom of the hole, yet the top 5-10% of the container is above the existing grade. Set the plants so the base of the stem is a little above the ground surface, but make sure the root ball is completely covered by soil or mulch. Gently backfill the hole to minimize air spaces around the roots and press the soil in tight around the plants.



2.3. Choosing Plants

2.3.1 Host Plants

Pollinators need host plants on which to survive. They provide sustenance in the form of nectar and pollen, and/or the plant stems, leaves, or roots are eaten by the larvae of a specific species of insect for this specific species of plants. They develop a relationship that is important for both organisms and is required for the insect to mature to adulthood. Pollinating insects have evolved closely with flowering plants for millions of years, and plants native to a geographic area are the most valuable. Research has shown that native bees visit native plants four times more often than non-native plants, and greater than 30% of native bees have specific plants to gather nectar or pollen from, called specialist bees.

Native oak trees are considered to be keystone species in our ecosystem, supporting hundreds of insects, birds and mammals. Native cherry trees, willows and maples are also significantly valuable. This very foliage of native trees and shrubs supports the larvae of a large number of butterflies and moths. Spicebush swallowtail butterflies specifically rely on spicebush (*Lindera benzoin*) to raise their young.

Along with other flowering shrubs, spicebush also provides nectar and pollen. Insects forage on flowers with specific shapes and colors. For example, only bumble bees or the Eastern blueberry bee have long enough tongues to feed on tubular flowers and only these bees are hefty enough to loosen pollen from blueberry plants. Butterflies and moths have evolved to raise their larvae on plant leaves of a specific chemistry, monarch butterflies being just one example.

2.3.2. Cultivars

Cultivars, cultivated varieties of plants, or nativars, cultivated varieties of native plants, are bred through cloning or hybridization to enhance aesthetic qualities or disease resistance that can be retained through propagation (see 1.1. Definitions for cultivars and hybrids). While many cultivars provide sustenance for **pollinators**, they do not have the same ecological function as "straight" or wild pollinated species of native plants. Extreme examples are double-petalled cultivars of Echinacea, which produce no pollen at all.

2.3.3. Where to Purchase Native Plants

- Retail - native plants have become increasingly available at retail nurseries but can still be hard to find. Requests for native plants at local nurseries will encourage more to stock them. Before purchasing at large nurseries or big box stores check that their stock has not been sprayed with pesticides.
- Wholesale – there are excellent wholesale nurseries on Long Island. Ask your landscaper or landscape design professional to order them for you.
- Local Conservation Organizations – look out for plant sales at The Long Island Native Plant Initiative (www.linpi.org), ReWild Long Island (www.rewildlongisland.org), local Audubon Chapters and others. The Suffolk County Alliance for Pollinators (ccesuffolk.org/gardening/Suffolk-alliance-for-pollinators-sap) is a good networking resource for information on local events and other organizations that support **pollinators** in Suffolk County.

Hummingbird moth at common milkweed

Below are some reliable resources for finding out which plants are native to a particular geographic area:

USDA Plants Database – https://plants.sc.egov.usda.gov/home
Lady Bird Johnson Wildflower Center – wildflower.org
The Biota of North America Program (BONAP) – www.bonap.org
National Audubon Society Native Plants Database – www.audubon.org/native-plants
NY Flora Atlas https://newyork.plantatlas.usf.edu/

Green sweat bee, small but mighty pollinator

2.3.4. Bloom Times

When planting a **pollinator garden**, it is important to include flowers that bloom early in spring, throughout the growing season, to those that bloom late in fall. Extending the flowering season supports a larger number of pollinating insects. Bumble bee queens emerge early in spring and have evolved to forage from native spring ephemeral flowers, such as wild columbine (*Aquilegia canadensis*) and Virginia bluebells (*Mertensia virginica*). Flowering trees such as basswood (*Tilia americana*), red maple (*Acer rubrum*), willows (*Salix spp.*), and red buds (*Cercis canadensis*). Fall blooming asters and goldenrods provide nectar for migrating butterflies such as the monarch. Non-native spring flowering bulbs and non-native weeds are also valuable plants for extending the blooming season.

2.3.5. Plant Schematics

Whether you are augmenting an existing border, starting from scratch, or planting a meadow area in a lawn, you can apply the same basic principles of landscape design.

- Plant a diversity of flowers with different shapes, sizes, and colors.
- Aim for at least three different species that bloom in each growing season.

- Place plants in large clusters, providing **pollinators** “one-stop shopping,” increasing their feeding efficiency.
- Consider the arrangement of layers – tall structural plants, seasonal plants providing color and texture, groundcover, dynamic filler plants, such as annual and bi-annuals that self-seed and fill in gaps. Layers provide seasonal interest and habitat all year long.
- Taller plants should not shade shorter ones.
- Mowed lawn and/or pathways, bordering or traversing pollinator gardens provide a message of intent for neighbors, and they also provide access for weeding or exploring the garden.

2.3.6. Pollinator habitat beyond flowers and host plants – Leave the Leaves

Pollinating insects need undisturbed sites for shelter and materials for nesting and egg-laying.

- Native bees build solitary nests. The majority build nests underground, for which they require untilled, un-mulched, bare areas of soil. Bees that build nests in cavities require woody vegetation or wood piles, hollow plant stems, leaf pieces and mud.
- Leaf litter should be left in place wherever feasible. **Leaf blowers destroy areas needed for hibernating and over-wintering.**
- Untidy, back areas of a property provide shelter for butterflies and moths, which complete their life cycle or overwinter in bark crevices, under rocks, wood piles, leaf litter or within evergreen foliage.
- Pesticide-free landscapes are essential for **pollinator** habitat. **Even pesticides deemed organic kill beneficial insects.**

There is a learning curve with **pollinator gardening**. It may seem counterintuitive to you to leave the leaves, or not cut back your flowers after they’ve bloomed, but you will see more and more **pollinators** enjoying your space and a new commitment to continue along this journey, may bloom. Pun intended!

Bumblebee in Blue Lobelia

3.0. Short and Long-term Maintenance

3.1. Maintenance

Maintenance of a **pollinator garden**, like any other garden, is long term “forever” maintenance. In contrast to a lawn, it will likely be maintained a few times per year instead of weekly mowing, watering and fertilizing, all of which contribute to water quality issues and can negatively affect **pollinators**.

Short-term:

- After planting, watering will be required through the growing season to get the plants established.
- An inch of water per week is enough if you choose plants that are primarily native and/or plants that don’t require a ton of water to thrive.
- Weeding the first year is the hardest. However, a new garden will get more weeds at first, and it is suggested that you go out monthly the first season and bi-monthly the second to weed.

Bumblebee in Blue Lobelia

Long-term Maintenance

If you have planted it densely, similar to a “cottage garden” design, you will likely need to weed the garden only a couple of times per year.

Start when the dandelions are blooming, again at the end of June through Independence Day and once again in late August.

The aesthetic of your garden will determine the amount of weed maintenance is required. The more space you place between plants, the more likely you will need to weed.

As your garden matures, some plants can or should be divided to provide room for new plants or to reinvigorate your existing plants as they age. Dividing tends to occur in the fall or early spring depending on the species.

Number of bees and wasps on Boneset

3.1.1. Modified Garden Clean Up – Again Leave the Leaves

Nurturing **pollinators** requires us to provide plantings that provide nectar and pollen from early spring through the late fall, as well as shelter to enable **pollinators** to survive through the winter. Many **pollinators** use the stems of perennials to find

shelter in the winter, so supporting **pollinators** throughout the year often requires us to be a bit less neat in terms of cleaning up the garden in the fall and in the spring. Leave stems and seed heads on perennials to provide shelter and food in the winter.

Some **pollinators** nest in leaf litter, so "leave the leaves," especially on flower beds. This requires a new way to consider garden cleanup, with tolerance of what may seem to be messiness. Raking leaves to create mulch under your trees and using leaves as mulch on your flower beds through the winter will help to balance the drive for cleanup with the need to provide **pollinators**. You can also keep leaves that you rake off the lawn in a pile that will decompose over time to create valuable leaf mold compost.

Some examples of insects using the left leaves include the mourning cloak, comma, and question mark butterflies which hibernate in dried leaves. Our winter moths are active during the winter and hide in leaves for warmth. The following species overwinter as chrysalis or caterpillars in the leaves -- Cabbage white, Sulphur butterfly, swallowtail, hawk moth and cecropia moth in chrysalis -- while the red-spotted purple, meadow fritillary and viceroy butterflies hibernate as caterpillars in vegetation, seed pods and rolled-up leaves.https://www.fernsfeathers.ca/main-blog/why-leave-your-leaves

Cutting back the garden in the fall tends to create more of an issue than the aesthetic value. There is no biological benefit for cutting back plants, and what you lose for **pollinators** is greater than the aesthetic gain. Many of our smallest bees, like the sweat bees, mason bees, leaf cutters, and more, overwinter in the hollow stems of our plants. Similarly, hoverflies, many beneficial wasps, and beetles also overwinter in the stems of plants. By cutting back the plants in the fall, you are throwing out a number of beneficial insects or their overwinter habitat with the stems.

Clean up your garden in the spring, wait until late April till mid-May when the overnight temperature is 50 degrees most of the week to rid your beds of wilted plants and debris. If you have some plants that are aggressive seeders, cutting off the dead flowers to prevent reseeding or “dead heading” is all you need to do

3.1.2. Cue of Care

A “cue of care” is a way to tell the people around you, whether a neighbor or a passerby, that your pollinator garden is intentional. Some people love the wildflower meadow, cottage garden, or woodland garden, while others prefer a more manicured appearance, especially in a residential setting. And some people have a hard time distinguishing between wildflowers and weeds. So, if your garden is in a visible location, adding a few details to make your garden look deliberate will help keep you on good terms with the neighbors.

You can easily create more order and beauty for the residential yard by employing a few of these common landscaping techniques in your garden.

- Use landscape edging to distinguish the garden from turf and provide an edge to guide the lawn mower, our favorite is segmented edging like brick, paver, or cobble set so that the top of the edger is the same height as the turf to reduce need for a trimmer.
- Define the garden edges with a wall, fence, or row of similar plants.
- Arbors or benches next to the garden help create a defined outdoor space around the garden.
- Group common plants in masses of three or more plants, rather than scattering them around the garden as individual plants. That way, when they bloom, you will have large mounds of color, easier to ID when weeding and looks intentional to the passerby.
- Repeat patterns in the garden or provide symmetry by matching plantings on both sides of the garden or walkway.

- Be mindful of plant heights. Don't place very tall plants next to short plants so that they flop over the little ones. Place the tallest plants in the back or in the center of the garden, and stair-step the plant heights away from the tallest species.
- Finally, don't be afraid to add your favorite garden gnome, bird bath, or decorative rock.

3.2. Identification of Issues

3.2.1. Weeds

A well-known definition of a weed is "is a plant growing in the wrong place. While there are certain "weeds" that we need to manage, many of our great **native species** has weed in its name such as milkweed, sneezeweed, and Joe-Pye weed that are essential for our **pollinators**. Don't confuse the word weed in the common name to think it is bad plant. Weeds are indeed ubiquitous, opportunistic, and pre-adapted to succeed in our gardens. They are able to grow in a wide range of temperatures and light conditions. Their seeds are widely dispersed by wind and animals and have great longevity, contributing to a formidable seed bank. They readily colonize disturbed and bare soils.

Considerations for maintenance:

- Plant gardens densely and /or mulch bare areas with leaf mulch.
- Identify weeds before they get out of hand. Pull them before they go to seed.
- Some non-native plants are valuable habitat. Examples of native plants considered to be weeds are enchanter's nightshade, pokeberry, jewelweed, and violets. Let such plants grow where you do not find them to be a nuisance.
- Allow lawn weeds to flourish and flower by less frequent mowing.
- Refrain from using herbicides as some are harmful to **pollinators**.

3.2.2. Invasive Plants

Invasive plant species are able to establish on many sites, grow quickly and spread to the point of disrupting **ecosystems**. They have no natural predators. They tend to leaf out early, have aggressive root systems, cast deep shade and are allelopathic (release chemicals that inhibit neighboring plants). As with weeds, they thrive in disturbed soil. (See 2.2.7. **Invasive Species**)

It is important to control invasive plants before they escape from gardens to become a detriment to biodiversity and habitat in natural areas, park lands and agriculture. A New York State regulation (Part 575) was adopted in July 2014 that "prohibits or regulates the possession, transport, importation, sale, purchase, and introduction of select **invasive species**. The purpose of this regulation is to help control **invasive species**, a form of biological pollution, by reducing new infestations and spread of existing populations"[8]. Organizations, such as the Long Island Invasive Species Management Area (LISMA), aims to reduce the costs of **invasive species** management by preventing and eradicating new **invasive species** infestations before they get out of hand.

Gardeners can play an important role in controlling invasive plants on their own properties, by referring to the "Do Not Sell List", (https://pb.state.ny.us/assets/1/6/SC_Do_not_sell_list.pdf) and by not dividing or sharing invasive plants. Refer to LIISMA (liisma.org) for details and lists of invasive plants on Long Island.

Effective control of invasive plants:

[8] NYS DEC Invasive Species Regulations: https://www.dec.ny.gov/animals/99141.html#

- Annuals and bi-annuals (e.g. garlic mustard, bindweed, mile-minute-weed) produce copious amounts of seed. Pull or mow before they go to seed.
- Perennials with tough root systems (e.g. oriental bittersweet, porcelain berry, multiflora rose) can be pulled when still seedlings or dealt with mechanically, such as digging and cutting. Constant cutting of extra tough plants, such as Japanese knotweed, in spring will eventually weaken them.

- Cut vines (e.g. English ivy, wisteria) at the base of trees. English ivy running across the ground can be removed by digging the roots on one side and starting to roll it up like a carpet, pulling out roots as you go.
- Chemical control should be used as a last resort. Hire a licensed professional.
- Take care when disposing of invasive plant material. Solarize in black plastic bags before disposal in municipal systems. Do NOT put out for yard waste collection.
- Do not leave bare soil. Mulch controlled areas heavily or better yet replace with a native plant alternative. Check out the USDA Native Plant Alternatives database (www.fs.usda.gov/wildflower/Native_Plant_Materials/Native_Gardening/alternatives.shtml).

3.2.3 Accepting a "Munched-on" garden:

3.2.3.1 Insects

While many gardens are grown exclusively for aesthetics, **pollinator gardens** are grown to provide food and shelter for **pollinators.** Aesthetics can certainly be one of the considerations when planting a **pollinator garden**, alongside sun and moisture levels, soil conditions and how you use your garden, but in a **pollinator garden**, perfection is not a goal.

Holes in leaves are a sign that something in the **ecosystem** is being fed. Insects are not to be considered pests, but rather a part of the backyard **ecosystem** that you are trying to nurture and support. A little bit of "mess" in the garden and forgoing the conventional fall and spring "cleanups" can create the type of environment **pollinators** need to thrive. Leaving the leaves in flower beds and keeping pithy stalks from previous year's growth, can help to provide habitat for **pollinators** and other beneficial insects.

Nonnative, invasive insects, however, can become pests since they often have no natural predators to keep their populations in check. Many times, they aren't food for birds or other animals and can threaten native plant populations through their growing populations.

Spotted lanternflies, emerald ash borers, and Asian longhorn beetles are a few of the invasive pests that we have here in Suffolk County. Ants, caterpillars, wasps, and other insects are part of the native **ecosystem** and play an important part in it.

Spotted Lanternfly

If you want to allow **pollinators** to live in your yard, mosquito spraying cannot occur. Although many companies say their products are all natural and safe for children and pets, they are not safe for other insects.

There are no species-specific insecticides that kill one species but do not harm other insect species. When you spray mosquitoes, you are killing other insects you do want like butterflies and fireflies. If you are looking to reduce the number of mosquitoes in your yard, there are several things you can do.

- The easiest way to control mosquito populations is to remove places where they can breed. Any standing water can become a place for mosquitoes to lay their eggs. Make sure you (and your neighbors) eliminate any areas with standing water. Dishes under flower pots, bird baths, and children's toys after a rain can all become breeding spots for mosquitoes. Replace water in bird baths daily and check that other places where water can puddle are drained.

- To keep mosquitoes away on your deck or patio is to use a fan. Mosquitoes are weak flyers and a breeze can keep them away. An outdoor fan on the patio can keep them away while you spend time outside.

- A bucket trap or Mosquito Dunk© is simply a plastic bucket with water and some organic material in it such as dead leaves or straw and a mosquito dunk. Cover the bucket with a wire mesh to allow mosquitoes in but prevent other animals from accidentally drowning in the water. Mosquito dunks are made with BTI bacteria that prevent mosquito larvae from maturing into adult mosquitos. **They do not harm other insects.** For more information about bucket traps: https://sidewalknature.com/2022/05/08/mosquito-bucket-of-doom/

- Finally, do not use insect "zappers" to kill mosquitos. Mosquitos are not attracted to light and will not be attracted to the bug zapper. These mostly kill moths and other nighttime **pollinators** that you are trying to encourage in your garden.

- Mosquito magnet devices that use carbon dioxide to lure mosquitoes do work by using a small amount of carbon dioxide. Mosquitoes are attracted to the gas and then look for a heat source, which the device provides. At that time, there is usually a fan that sucks the mosquito into a trap.

3.2.3.2 Rabbits

Be Preventive **–** As sustainable gardeners, we can use strategies to protect our tender plants while co-existing, deterring, and not injuring our long-eared friends.

- Fencing – Unlike eight-foot deer fencing, rabbit fencing can be only four feet high but buried at least six inches deep so rabbits can't hop over or burrow under. Bend the top foot of the chicken wire fencing away from the garden so the rabbits can't climb or jump over it. Select mesh narrower than three inches.
- Similarly, for individual plant protection, try a wire cloche. A cloche is a bell-shape covering that you can put over a plant you want to protect. Wire versions are common, affordable, and easy to find. Simply place them over growing plants, and animals will have a hard time reaching those delicate leaves. It's an excellent solution if you have one or two particularly vulnerable plants in your garden or planters that require protection. If you have some chicken wire laying around, you can make your own rough tube cloches, but they won't be nearly as aesthetically pleasing or easy to salvage afterward, so there is a tradeoff to making them yourself.
- Protect sapling trees and shrubs with a wire mesh cylinder of hardware cloth or one-inch chicken netting.
- Spray a liquid mix of any combination of garlic, red pepper, strong-smelling soap, or other strong odors around your garden's perimeter or at the base of trees and shrubs. But this may also keep friends away and alienate neighbors, as an unintended consequence!
    - Try low-maintenance solar-powered LED lights flashing or blinking on a timer.
    - Motion-activated sprayer may startle wildlife away from your yard.
    - Noise-making garden ornaments, wind chimes, spinning pinwheels, and a mobile of pie tins or aluminum cans can deter rabbits. Once again, be mindful of your neighbors! Excessive noise can be offensive to them as well.

Plant wisely, like deer, rabbits will eat almost anything when hungry so there are no guarantees. Removing any temptations early in the spring can prevent their habits from setting in. Rabbits love beans, carrots, lettuce, parsley, peas, and spinach, but will likely avoid plants with fuzzy leaves, milky sap, thorns, and strong scents, as well as any member of the nightshade family, due to their toxins.

When strategically placed, a handful of highly textured or fragrant plants can effectively keep rabbits away from your flower beds. Many of these species are readily available throughout temperate zones and have various growth forms. Some are flowering perennials that would undoubtedly look great next to vulnerable vegetable and herb patches. Others are tall shrubs that can be cultivated along your garden's points of entry. There's a rabbit-deterrent plant to meet every type of need! https://pondinformer.com/plants-that-repel-rabbits/

3.2.3.3 Deer Resistance

White tail deer (*Odocoileus virginianus*) habitat loss and overpopulation in the east coast have caused hundreds of millions of dollars in damage every year in landscaping and gardens. More than $50 million each year in the U.S. is spent on deer repellent alone. Farmers estimate crop damage in the billions of dollars each year. Damage in forests and prairies by grazing deer can permanently harm forests and other **ecosystems**, affecting the undergrowth and eliminating replacement trees.

If they survive in the winter, deer typically need extra nutrition in spring due to the lack of available food sources. Deer love to snack on lush grass, budding plants, fruits, and veggies - making spring the perfect time to replenish their nutrients. Spring is also when doe, female deer, have their offspring.
Having a proper diet is important for new mothers to raise and produce milk for their young. This can cause trouble for your sprouting garden. Bucks are usually in the process of molting their antlers and growing new ones. They are also using this time to bulk up after the rut season.

There will always be plants that you want to include in your garden, but deer preclude their presence. But there are coping strategies and advice on how best to resist the scourge of deer in your landscape.

- Start with the right plant choices. **(**Let's be clear–when deer are hungry enough, they eat anything–even if the plants are labeled "deer resistant"!) Here are some aspects of plants that will make them more resistant to deer browsing.

    - *Plants with fuzzy or hairy foliage:*
    - *Plants with prickly foliage or spines on their leaves:*
    - *Heavily fragranced foliage:*
    - *Toxic foliage:*
    - *Leathery or fibrous foliage:*
    - *Grasses:*

- *Fencing*

If you have the good fortune to be able to fence in your entire yard with a 10-foot fence, your deer problem might be solved. Individual plant protection can be accomplished with wire cages and plastic netting that can protect small plants or young trees.

- *Mass planting*
  Deer and gardeners love hydrangea. By planting several hydrangea plants in a cluster it allows for some nibbling by the deer, but leaves others untouched for a good flower show.

- *Deer Deterrents*
    - **"***Scarecrows,"* Not the "man" on a post dressed like a farmer but rather the new solar- and motion-activated devices attached to a water or sound source can scare deer away. Over time, deer can become habituated so keep it novel. The Smart Crow Motion-Activated Sprinkler, Contac Scarecrow Motion Detector Sprinkler, and Spray Away Motion Activated Water Repellent are some commercially available sprinklers designed specifically to ward off deer and other nuisance animals.

    - *Electronic Deer Repellent* - The Electronic Deer Repellent by the Woodstream Corporation, is a scare device that administers a harmless electric shock to the deer's nose or mouth. The shock conditions deer to avoid the area, which prevents them from re-visiting and causing damage. This battery-powered device works similarly to the baited deer fence, only without the fence, and can be placed among flowers and shrubbery, or around gardens. It is less invasive and more appealing than electric fencing. Reports suggest results similar to the baited electric fence, without the visual detraction that the fence creates.

- *Sprays*
  Sprays deter deer because of the foul odor and taste. Favored brands include Bobbex, Deer Out, Liquid Fence, Plantskydd, and Deer Away. DIY concoctions can be mixed with eggs, garlic, and other ingredients for a home brew to apply to prized plants. To be successful, most sprays need weekly applications. Some deterrents have an additive for winter applications. Bars of soap, predator urine, human and animal hair may be effective for a short time in a small area, but over time deer ignore them.

- Blocking
  Protect vulnerable, tasty-to-deer plants by blocking them with plants that are unappealing to them.

Most of all … be patient and flexible. What worked last year may not work this year. Experiment with deer-resistant plants and deer repellents with the understanding that when deer are hungry (or young and naïve) they'll try everything, and not all strategies work the same all the time!

3.2.3.4 Light Pollution

While light pollution may not rank as high as climate change as an environmental concern, its impact on the **ecosystem** and the human spirit deserves our attention. Flowers lit artificially are not pollinated as frequently – moths headed to collect the flowers' nectar are attracted to the light where hungry bats await them.

Fireflies
What often gets people's attention with light pollution is the loss of fireflies, the magical creatures that light up the forests and fields–or used to. Excessive outdoor lighting along with pesticide use and habitat loss have decimated 80% of the firefly population world-wide.

What can you do?
Inspect your own outdoor lighting and check the municipal lighting code. Install dimmers, replace offending fixtures, or purchase shields for the fixtures, motion detectors, avoid high Kelvin blue-white lights, turn off all outdoor lights when not in use. Replace the solar lights that stay on all night with motion-sensor lights.

One of the best resources for information on light pollution and saving the dark is IDA, the International Dark Sky Association .

The following information is from the IDA's website:

"For billions of years, all life has relied on Earth's predictable rhythm of day and night. It's encoded in the DNA of all plants and animals. Humans have radically disrupted this cycle by lighting up the night.
Plants and animals depend on Earth's daily cycle of light and dark rhythm to govern life-sustaining behaviors such as reproduction, nourishment, sleep, and protection from predators.
Scientific evidence suggests that artificial light at night has negative and deadly effects on many creatures including amphibians, birds, mammals, insects, and plants."

Artificial Lights Disrupt the World's Ecosystems

Nocturnal animals sleep during the day and are active at night. Light pollution radically alters their nighttime environment by turning night into day. According to research scientist Christopher Kyba, for nocturnal animals, "the introduction of artificial light probably represents the most drastic change human beings have made to their environment."
"Predators use light to hunt, and prey species use darkness as cover," Kyba explains. "Near cities, cloudy skies are now hundreds, or even thousands of times brighter than they were 200 years ago. We are only beginning to learn what a drastic effect this has had on nocturnal ecology."

Glare from artificial lights can also impact wetland habitats that are home to amphibians such as frogs and toads, whose nighttime croaking is part of the breeding ritual. Artificial lights disrupt this nocturnal activity, interfering with reproduction and reducing populations.

- *Find Dark Sky Friendly Lighting*
  IDA's Fixture Seal of Approval program certifies outdoor lighting fixtures as being Dark Sky Friendly, meaning that they minimize glare while reducing light trespass and skyglow. All products approved in the program are required to be fully shielded and to minimize the amount of blue light in the nighttime environment. To learn more about good outdoor lighting, visit the IDA Lighting Basics page.

To find retailers that sell good lighting, see their Dark Sky Retailers page or browse the guide below to find fixtures that have been approved under our Fixture Seal of Approval program.

Definitions

Small wasp on butterflyweed

1.1.0. Pollinator:

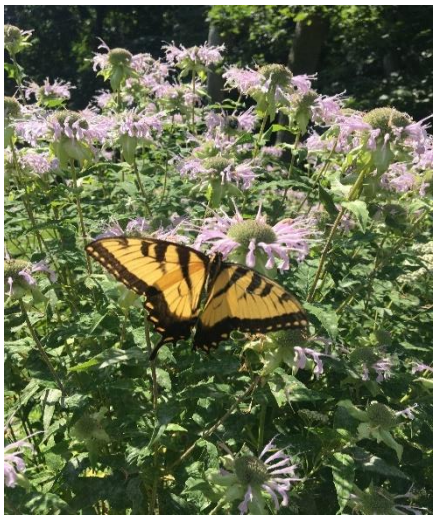
An organism that facilitates the sexual reproduction of flowering plants by moving pollen grains from the reproductive organs of one flower to the reproductive organs of another flower. This interaction enables fertilization and the subsequent production of seeds and/or fruit. Most pollination is performed by insects, primarily bees, as well as flies, wasps, ants, butterflies, moths, beetles, and many other insects. In addition to insects, vertebrates, such as birds and bats, are also **pollinators**.

1.1.1. Native Species:

A species that has developed over hundreds, thousands and even millions of years in a particular region or **ecosystem.** The species has evolved and thrives in a particular **ecosystem**. This can include any species that developed with the surrounding habitat and can be assisted by or affected by a new species.

Native plant species are defined or determined by the NY Natural Heritage Program and can be found at the NYS Flora Atlas (New York Flora Atlas - https://newyork.plantatlas.usf.edu/). This website may be intimidating at first, but it is the most scientifically accurate way to determine if a plant is native to not only New York, but to Long Island.

Give it a try: We suggest that enter your plant name, preferably the botanical or scientific name, into the search box at the top or click on the county for the full list. The search box is easier. A number of websites and lists are available on the web and published, and may be very accurate, but it is always good to check with this source if you can.



1.1.2. Pollinator Garden:

A type of garden designed and populated with flowering plants and shelter-providing vegetation to attract and support insect **pollinators**. In order for a garden to be considered a **pollinator garden**, it should provide various nectar producing flowers (native plants preferred), shelter, larval host plants, and avoids the use of pesticides. **Pollinator gardens** have productive plants, not only **native species**, a productive plant is one that has a high wildlife value that provides those items listed above.

1.1.3. Habitat Garden:

A **habitat garden** is an intentional, cultivated garden or landscape designed to benefit wildlife. Native plants are the basis for habitat because they support native insect populations, which in turn support all other higher forms of life in our yards and surrounding natural areas. The goal is to provide food, shelter, and habitat throughout the year. Food can be provided by nectar, pollen, leaves, roots, and other parts of a plant. There are many ways to provide shelter; some examples include piles of sticks, allowing fallen leaves to remain year-round, keeping some ground exposed, and delaying (or avoiding) garden clean-up until May**. Pollinator gardens** are a type of **habitat garden**.

1.1.4. Ecosystem:

A system made up of a community of animals, plants, and bacteria interrelated together with its physical and chemical environment.

1.1.5. Introduced Species/Non-native Species/Alien Species:

Any living organism (plant, animal, microorganism) introduced intentionally or unintentionally to an **ecosystem** outside of where it naturally occurs. This can include domesticated and cultivated species, as well as wild. These species are determined by the New York Natural Heritage Program.

Research suggests that most **pollinators** prefer to forage on native plants, but not exclusively, and plenty of non-**native species** are great **pollinator** plants. You don't have to avoid **non-native species**, just consider reducing the percentage to 20-30%, that they are not invasive, and that they do provide a benefit to the **pollinators** and are not sterile like fall chrysanthemums, that don't produce pollen.

1.1.6. Invasive Species:

An **alien species** whose introduction does, or is likely to, cause economic or environmental harm or harm to human health, grows quickly, and spreads to the point of disrupting communities or **ecosystems.**

Invasive Species for Long Island are defined and determined within the Tier Ranking List from the Long Island Invasive Species Management Area (https://liisma.org/species/).

1.1.7. Restoration:

Projects that are created in natural areas with degraded habitat to restore the habitat to the native **ecosystem**. These habitats will provide a genetically diverse plants such as ecotypic plants (plants grown from wild-sourced seed) and straight species (plants not bred for ornamental use) are best used to promote the genetic diversity and habitat resiliency.

1.1.8. Plant Cultivar and Hybrid:

Many of our native plants have been bred to have specific ornamental traits. A cultivar (cultivated variety), or ornamental plant has been bred or selected to have bigger flowers, grow to a certain height, or have different color foliage. Some cultivars have flowers, but those flowers do not produce nectar, so the habitat benefit is reduced. For a **pollinator** or **habitat garden**, make sure the cultivar is a good source of either food or shelter. A cultivar is a plant that has a 'name of plant' for instance Echinacea purpurea 'white swan', this is a white swan cultivar of purple coneflower and is not as beneficial to insects, but not a bad plant. A hybrid plant has an 'x' between the genius and species

name or the genius and no species name, for instance Agastache ‘Blue Fortune’.

1.1.9. Host Species:

Any plant species that supports the growth and development of an insect **pollinator** through one or more of its life stages. Some insect species can develop on a broad range of host plants (generalist species), while others can only complete their lifecycle on a few specific species with which they have co-evolved (specialist species). For example, the monarch butterfly (*Danaus plexippus*), feeds on nectar from a wide range of plants as an adult but requires milkweed (*Asclepias sp*.) to lay its eggs and feed on during its larval (caterpillar) stage.

Upper picture has a monarch butterfly, while the lower picture has a monarch caterpillar and milkweed aphids on butterflyweed. Butterflyweed is a milkweed and host plant to both organisms.

Left picture is a black swallowtail caterpillar, right is the full butterfly on partridge pea.

1.1.10. Keystone Plant:

Native plants that are essential to our **ecosystems** because they support 90% of the caterpillar species that enable our terrestrial birds to reproduce, as well as all of our specialist native bee species.

Technical Subcommittee Report

Overview

The technical subcommittee of the Suffolk County Pollinator Taskforce developed the Suffolk County Pollinator Pathway mapping tool, an interactive spatial mapping product created using Geographic Information Systems (GIS) to enable the identification of existing pollinator gardens and to help guide the establishment of new pollinator garden projects across Suffolk County. The contents of this report provides information on how this tool was developed and the supporting documentation for the contents of the Suffolk County Pollinator Pathway mapping tool.

Goal of the technical committee

The goal of the technical committee was to develop a spatial product (e.g., map) capable of identifying current and potential pollinator garden projects across Suffolk County, and the development of an interactive mapping tool for pollinator pathway priorities. The interactive mapping tool was developed to both collect and store locations of current pollinator gardens and to serve as a guide on where to prioritize new pollinator garden projects. Priority areas for new gardens could be located based on ownership, ecological value, and/or key areas needed to expand a network of gardens into pathways of pollinator gardens across the county. To accomplish this goal, we identified and sourced geospatial data needed to map current pollinator gardens and potential pollinator garden projects across the county. We then developed an interactive mapping tool hosted by Suffolk County GIS.

What's in the SC Pollinator Habitat map

Working in collaboration with the Suffolk County GIS team the committee has developed the Suffolk County Pollinator Pathway mapping tool (Figure 1), an online interactive pollinator pathway mapping tool hosted by Suffolk County GIS within ESRI's ArcGIS experience builder.

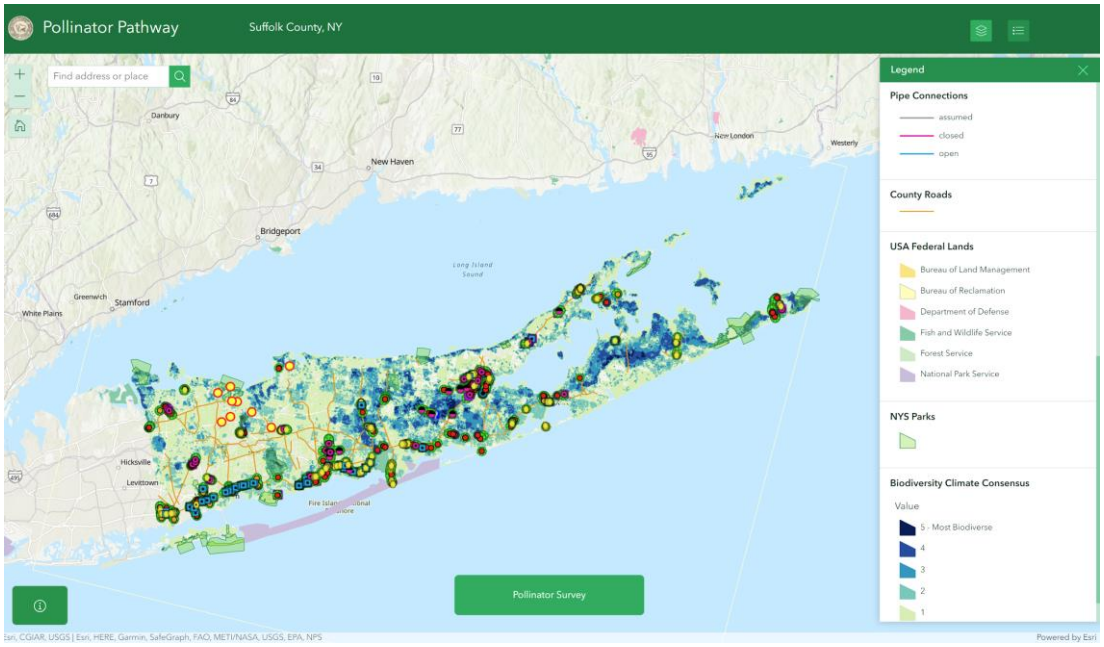


Figure 1. Image of the Suffolk County Pollinator Pathway Mapping Tool.

The components of this interactive mapping tool include several data layers, including 1) existing pollinator gardens, 2) locations that may be ideal for pollinator gardens based on ownership and/or land use type and 3) areas of high ecological value. Additional information including the reason for including each data layer is included below:

1) Existing Pollinator gardens

Current pollinator gardens, both public and privately owned and maintained.

- Locations of existing Pollinator Gardens
    - Pollinator pathway.org- Public and Private Gardens Data layer provided to us by Pollinator Pathway Organization (https://www.pollinator-pathway.org/)
    - Public and Private Gardens Data
    - Four Harbors Audubon Society native plant garden locations

- Pollinator Garden Submission tool
    - Within the mapping tool there is a submission portal for individuals to add their pollinator garden to the map. The portal includes a series of questions related to pollinator garden location and land management practices, as well as links to educational materials around pollinator-friendly practices (e.g. why the garden needs to be pesticide free).
    - Separate mapping process for public and private gardens.
        - Private - summary of the number of gardens within a census block level. Larger points on the map indicate more pollinator gardens with that census block. Residential garden owners that are comfortable sharing their exact garden location will also show a point on a map at the exact location provided for the garden.
        - Public - Included in the census block summary and in addition the inclusion of a point on a map at the exact location provided for the garden.

2) Ownership

Federal, state, county, local municipality, and privately-owned lands that have the potential for future pollinator garden projects based on ownership and/or land use designations. Locations with intact native vegetation or large areas of land where native habits can be restored and maintained are ideal for pollinator pathways. This includes information based on:

- Tax parcel
    - Included so that users of the tool may identify parcel-level ownership of potential pollinator garden locations.
- Federal, state, and county, and privately-owned parks
    - Parks provide ample opportunity to maintain native vegetation and/or install a pollinator garden.
- County buildings and properties
    - County-owned properties that have natural habitats and/or areas of grass can be ideal locations to restore native vegetation or install pollinator gardens.
- County roads
    - Roadsides provide ample and continuous habitats that have been shown, if managed appropriately, can be beneficial pollinator habitat.
- Airports, golf courses
    - Airports and golf courses provide maintained habitats, but often retain native vegetation features such as native forests and important grassland ecosystems. These locations can provide pollinator habitat by supporting native vegetation or restoring areas to native habitat types and removing pesticide use on these properties.
- Schools and libraries
    - School and library properties can maintain natural habitats and/or areas of grass can be ideal locations to restore native vegetation or install pollinator gardens.
- Sumps and maintained recharge basins

        - Sumps and recharge basins that are not maintained can become sources of mosquitoes, which leads to pesticide applications that could be detrimental to pollinators. We are highlighting these locations for the opportunity for native vegetation maintenance that reduces mosquito breeding.
    - Utility Transmission lines – utility rights of way, such as the land underneath transmission lines that carry electricity, can be beneficial pollinator habitat if managed appropriately.
    - Solar energy sites – Planting native plants under solar panels can provide beneficial pollinator habitat if managed appropriately.

3) Ecological Value
   Locations with high potential for pollinator gardens based on ecological value for biodiversity and climate change resilience that should be prioritized for new projects and for pollinator garden pathways (i.e., areas of connected habitat). A consensus map was created to identify areas of high ecological value which included information on:
    - Pollinator habitat for native bees
    - Areas of high climate resilience (The Nature Conservancy)
    - Priority areas for birds today and under climate change (Audubon climate strongholds)
    - Areas important for helping to stabilize climate change based on carbon storage and sequestration (Audubon priority areas for natural climate solutions)

For more details on the data, such as citations and data access, please see the Data and Citations section below.

How to access the Suffolk County Pollinator Pathway mapping tool

The mapping tool can be accessed here:

https://experience.arcgis.com/experience/c85ef569cbc44b69a1fefdafc42d288a

Please note that all submissions will need to be approved before they appear on the map. If you have any questions about the mapping tool please contact: gis@suffolkcountyny.gov

Data and Citations

In this section, please find information including links and citations for the GIS data layers:

Existing Pollinator Gardens

Locations of existing pollinator gardens

- https://services.arcgis.com/JsDD4qdG5r2a7hR5/arcgis/rest/services/Pollinator_Habitat_Point_Public_Map_and_App_View/FeatureServer

Ownership Data

These data were collected from Suffolk County GIS, Cornell Cooperative Extension of Suffolk County, NYS Parks, Bureau of Land Management, Esri U.S. Federal Datasets and Geoplatform.gov.

Post Construction Inventory

- https://services1.arcgis.com/0Lw2m57KEotYYFaA/arcgis/rest/services/SC_MS4/FeatureServer/

Surface Water Outfalls

- https://services1.arcgis.com/0Lw2m57KEotYYFaA/arcgis/rest/services/SC_MS4/FeatureServer/

Joint Structures

- https://services1.arcgis.com/0Lw2m57KEotYYFaA/arcgis/rest/services/SC_MS4/FeatureServer/

Pipe Connections

- https://services1.arcgis.com/0Lw2m57KEotYYFaA/arcgis/rest/services/SC_MS4/FeatureServer/

County Roads

- https://services1.arcgis.com/0Lw2m57KEotYYFaA/arcgis/rest/services/SC_MS4/FeatureServer/

County Buildings

- https://gis.suffolkcountyny.gov/server/rest/services/LocalGovernmentSQLData/CountyBuildingPolygon/FeatureServer/0

Tax Parcel

- https://gis.suffolkcountyny.gov/server/rest/services/LocalGovernmentSQLData/TaxParcelPolygon/FeatureServer/0

Road Centerline

- https://gis.suffolkcountyny.gov/server/rest/services/LocalGovernmentSQLData/RoadCenterline/FeatureServer/0

Right of Way-500 ft. buffer around county-owned roads

- https://gis.suffolkcountyny.gov/server/rest/services/PlanningSQLData/RightOfWayPolygon/FeatureServer/0

Parks

- https://gis.suffolkcountyny.gov/server/rest/services/LocalGovernmentSQLData/ParkPolygon/FeatureServer/0

USA Federal Lands

- https://services.arcgis.com/P3ePLMYs2RVChkJx/ArcGIS/rest/services/USA_Federal_Lands/FeatureServer/0

NYS Parks

- https://services.arcgis.com/1xFZPtKn1wKC6POA/arcgis/rest/services/NYS_Park_Polygons/FeatureServer/0

Airports

- https://gis.suffolkcountyny.gov/server/rest/services/Applications/GISViewer/MapServer/5

Golf courses

- https://gis.suffolkcountyny.gov/server/rest/services/Applications/GISViewer/MapServer/63

Schools

- https://gis.suffolkcountyny.gov/server/rest/services/Applications/GISViewer/MapServer/26

Libraries

- https://gis.suffolkcountyny.gov/server/rest/services/Applications/GISViewer/MapServer/27

Utilities- Transmission lines

- https://hifld-geoplatform.opendata.arcgis.com/datasets/transmission-lines/explore?location=40.878415%2C-72.801617%2C10.49

Solar energy sites

- https://hub.arcgis.com/datasets/fedmaps::power-plants-in-the-u-s--2/explore?location=41.090219%2C-72.739762%2C9.10

Aerial Imagery

- https://gis.suffolkcountyny.gov/image/rest/services/Imagery/2020/ImageServer

Peconic Land Trust's Master Parcel Dataset

- https://peconic.maps.arcgis.com/home/item.html?id=d57037a3517b4e6eb586d56ccf9b2a41

Long Island Greenway

- Long Island Greenway proposed trail as of August 2023, hosted by Trust for Public Land

Ecological Value

Biodiversity and Climate Resilience Consensus Map

- https://audubon.maps.arcgis.com/home/item.html?id=61c1cc1433914d3db8fb0d4a0e301ad4
- To define the Biodiversity and Climate resilience Consensus map, we identified areas of consensus across several biodiversity and climate spatial datasets that are the best available information relevant to pollinators. Areas of high consensus across these data indicate higher ecological value for prioritizing new pollinator garden projects. Data included in this consensus map are:
    - Pollinators
        - Wild bee abundance, floral availability, and nest resource availability index
        - Description: Maps for wild bee abundance index, floral resource availability index, and nest resource availability index.generated using InVEST crop pollination model with 2013 CDL data and expert opinion.
        - Data Access and Citation:
            - https://www.pnas.org/doi/10.1073/pnas.1517685113
            - https://figshare.com/articles/dataset/Wild_bee_abundance_map_for_49_states/6728399
            - Koh, I., Lonsdorf, E. V., Williams, N. M., Brittain, C., Isaacs, R., Gibbs, J., & Ricketts, T. H. (2016). Modeling the status, trends, and impacts of wild bee abundance in the United States. *Proceedings of the National Academy of Sciences*, *113*(1), 140-145.
    - Climate Resilience
        - The Nature Conservancy Resilient Sites
        - Description: "Resilience Score: A site's Resilience Score estimates its capacity to maintain species diversity and ecological function as the climate changes. It was determined by evaluating and quantifying physical characteristics that foster resilience, particularly the site's landscape diversity and local connectedness. The score is calculated within ecoregions based on all cells of the same geophysical setting and is described on a relative basis as above or below the average. For example, cells of granite bedrock were compared with all other cells of granite bedrock, and coastal plain sands were compared with other coastal plain sands. Our goal was to identify the places most resilient to climate change for each geophysical setting within each ecoregion."
        - Data Access and Citation:
            - https://maps.tnc.org/resilientland/
            - Anderson, M. G., Clark, M., & Sheldon, A. O. (2014). Estimating climate resilience for conservation across geophysical settings. *Conservation Biology*, *28*(4), 959-970.
    - Priority areas for biodiversity and climate resilience
        - National Audubon Society Natural Climate Solutions - Priority areas to maintain for Birds and Carbon
        - Description: Priority areas to maintain for bird and carbon are areas where climate strongholds align with high carbon stores or active carbon sinks. These areas are prioritized because they represent overlap between (1) areas that are suitable for birds now and that will remain suitable under climate change and (2) areas that are effective

carbon stores or active carbon sinks currently. Thus, maintaining their current condition and function is critical for both climate change adaptation and mitigation.

- Data Access and Citation:
  - https://experience.arcgis.com/experience/765b3669247c47db9b5bc44f33962fe6/page/Page/?views=Forests
  - Bateman, BL, J Grand, JX Wu, SP Saunders, C Koseff, and CB Wilsey. 2021. Natural Climate Solutions Report: Maintaining and Restoring Natural Habitats to Help Mitigate Climate Change. National Audubon Society: New York.

Legislative Subcommittee Report

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I. Introduction

Although the warning signs of a potential environmental catastrophe are clear and alarming, the good news is that nature is resilient, and good science can inform effective public policy. Towards that end, municipalities hold a wide range of authority due to their ability to exercise Home Rule. Municipal Home Rule generally exists as a provision within a state's constitution that grants local municipalities the autonomy to enact their own laws and ordinances.[9] As such, Home Rule provides municipalities broad discretion in exercising self-governance.[10]

With the authority to enact laws and ordinances, Home Rule allows municipal governments to enact and enforce their own land use policies to ensure specific land use practices are met, so long as they promote public health, safety, or the general welfare.[11] The State of New York has enacted a provision for municipal Home Rule in their state constitution which grants local governments the power to adopt or amend local laws relating to the municipality's property, affairs, or government, so long as they are not inconsistent with other provisions of the New York State Constitution or any general law enacted by the state.[12] With the authority of Home Rule, municipalities play an important role in implementing programming to encourage land use practices that support the conservation, restoration, and stewardship of native pollinator habitats.

The following document serves as a resource for local governments to reference when adopting incentive- and enforcement-based programing to implement conservation, restoration, and stewardship of native pollinator habitats. This document explores three types of incentives that various municipalities can use in enacting programming to protect native pollinator populations: 1) funding-based mechanisms, 2) enforcement-based mechanisms, and 3) collaborative efforts with Suffolk County Vector Control to benefit pollinators and mosquito source reduction.

II. Incentives for Conservation, Restoration, and Stewardship of Pollinator Habitats

A. Funding-Based Mechanisms

This section introduces two potential types of funding-based mechanisms to promote voluntary conservation, restoration, and stewardship of native pollinator habitats, namely a permanent rebate program and a recommendation that ecological restoration funding should be included in the county's septic improvement program. In exploring these mechanisms, the subsections below discuss the function and importance of each and provide examples of how municipalities nationwide have successfully enacted programs to support the conservation and restoration of native pollinator habitats.

1. Pollinator Habitat Assessment Reduction

Financial incentive programs for ecological restoration projects have been very successful in different jurisdictions. The use of such financial incentives for desired action could benefit from uniformity throughout the state to maximize awareness of the programs and increase involvement. One such financial incentive would be a reduction of assessed property valuation statewide for program participation. Similar to the STAR program or the First Responder exemption under Real Property Law 466-a, the tax reduction would provide an incentive for commercial and residential property owners to economically achieve common goals of habitat restoration, natural and redundant stormwater management, and coastal resiliency. A model statute to support such a

[9] *See* Cornell Legal Information Institute, https://www.law.cornell.edu/wex/home_rule.

[10] *Id*.

[11] *See The Principles of Home Rule for the 21st Century*, National League of Cities 45, 50 (2020). https://www.nlc.org/wp-content/uploads/2020/02/Home-Rule-Principles-ReportWEB-2-1.pdf.

[12] N.Y. Const. Art. IX, § 2.

program is annexed as Appendix A. Example application criteria to qualify for such an incentive is annexed as Appendix B.

Rebate programs serve as an important tool for encouraging voluntary public action. By providing monetary compensation for implementing certain actions, residents and landowners are more likely to engage in an action. To facilitate voluntary land use practices that support habitat restoration for native pollinators specifically, rebate programs offer a powerful incentive for landowners to implement municipal programming that supports pollinators. By providing the opportunity to be reimbursed for some of the costs incurred, landowners are more likely to implement pollinator-friendly practices on their property.

Below provides examples of successful rebate programs implemented by various municipalities to facilitate pollinator habitat restoration. The statutory law enacted for each can serve as an alternative to assessment reduction code for local legislators to adopt similar programs and modify the language as they see fit for their location and constituency:

1. Native Plant Residential Rebate Program - *North Hempstead, NY*

   In 2021, the town of North Hempstead enacted the Native Plant Residential Rebate Program to incentivize landowners to plant native plant species and remove invasive species on their land.[13] By planting species that are native to a geographical area, native pollinator species are provided with nectar and host plant resources that their young need to survive.[14] In a partnership between the Long Island Native Plant Initiative and the Nassau County Soil and Water Conservation District, the town of North Hempstead received a grant to offer North Hempstead residents a rebate of up to $350 for the purchase of native plant species used to replace grass/turf or add to an existing garden in their yard.[15]
   Each resident was provided the opportunity to fill out an application available on the town's municipal website, where the resident proposed a replanting plan to the municipality.[16] Once the application was approved, the resident purchased the native plants and was reimbursed by the Nassau County Soil Conservation District for native plants that are listed on the town's native plant species list.[17]
   Native plant species that are not on the town's native plant species list were eligible for reimbursement with prior approval by the town upon review of the rebate application.[18] Each application was evaluated based on a points system, with a certain amount of points awarded for each aspect of the resident's replanting proposal.[19] The application scores replanting proposals based on 7 different criteria: 1) the type of garden they will be planting into, 2) replacement of their lawn or turf, 3) the diversity of the plants they are proposing to plant, 4) the number of each plant species, 5) replacement of invasive plant species, 6) the size of the garden they are building or adding to, and 7) whether they are a new or repeat

[13] *See Native Plant Residential Rebate Pilot Program 2021*, Town of North Hempstead, https://northhempsteadny.gov/nativeplantrebate.

[14] See *Protecting Pollinators*, Town of North Hempstead, https://northhempsteadny.gov/pollinators.

[15] *See Native Plants*, Town of North Hempstead, https://www.northhempsteadny.gov/np.

[16] *See 2023 Native Plant Residential Rebate Program Application*, Town of North Hempstead, https://www.northhempsteadny.gov/filestorage/16255/18642/Town_of_North_Hempstead_Native_Plant_Residential_Rebate_Application_2023-Fillable_Updated.pdf.

[17] *See Native Plant Residential Rebate Program Native Plant List*, Town of North Hempstead, https://tonhempstead-my.sharepoint.com/:x:/g/personal/fastucam_northhempsteadny_gov/EY8SRSedAE5CuN3UPkf38p0BkvNDc6Yb5D3FZAjkzOoZaA?rtime=0QvGngt820g.

[18] *Native Plant Residential Rebate Program 2023 Terms and Conditions*, Town of North Hempstead, https://www.northhempsteadny.gov/filestorage/16255/18642/Town_of_North_Hempstead_Native_Plant_Residential_Rebate_Terms_and_Conditions_2023-_Final.pdf.

[19] *Id*.

applicant.[20] In order for a resident's application to be approved, they must receive a minimum of 34 out of 65 points.[21]

2. Long Island Garden Rewards Program - *Long Island, New York*
   As part of the Long Island Nitrogen Action Plan - a multi-year initiative led by the New York State Department of Environmental Conservation and the Long Island Regional Planning Council to reduce the amount of nitrogen entering Long Island's groundwater and surface water, Long Island has enacted a Garden Rewards program.[22] This program incentivizes property owners to implement green infrastructure on their land by offering homeowners a reimbursement of up to $500 for installing native plants, rain barrels, rain gardens and other nitrogen-reducing infrastructure.[23] To apply for reimbursement, local homeowners can enter their address on the program website to determine eligibility.[24] If eligible, the homeowner can fill out an application provided on the program website, which requires the applicant to provide photos of the infrastructure project they have implemented (rain garden, rain barrel, or native planting), as well as the reimbursement request amount and receipt(s) for eligible costs incurred.[25]

3. "Lawns to Legumes" Individual Support Grants - *Minnesota State*
   In 2019, the state of Minnesota Board of Water and Soil Resources enacted the Lawns to Legumes program, which features reimbursement grants to incentivize landowners to establish new native pollinator habitats. As the program's mission seeks to "combat population decline by creating new pollinator habitat and habitat corridors that provide food sources and nesting space for pollinators,"[26] the program places an emphasis on protection of native at-risk species, such as the Rusty Patched Bumble Bee.[27] Funding is provided by the Environment and Natural Resources Trust Fund for Minnesota residents to receive a rebate of up to $350 for costs associated with planting native plant species in their yard.[28] This includes expenses incurred for purchasing local native plant species, as well as planting materials such as compost, mulch, edging, equipment rental, delivery fees, and even informational workshops run by Metro Blooms and Blue Thumb as part of the Lawns to Legumes program.[29]

   For renters specifically, a rebate of up to $100 is available for the cost of planters and raised bed materials.[30] Contract work is also an eligible expense covered within this rebate program, including

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[20] *Id*.

[21] *Id*.

[22] *Long Island Garden Rewards Program*, Long Island Regional Planning Council, https://lirpc.org/garden-rewards-program/#:~:text=The%20program%20allows%20homeowners%20to,so%20don't%20miss%20out.

[23] *Id*.

[24] *Id*.

[25] *See Long Island Garden Rewards Program*, New England Interstate Water Pollution Control Commission (NEIWPCC), https://neiwpcc.org/long-island-garden-rewards-program/.

[26] *See Lawns to Legumes: Your Yard Can BEE The Change*, Minnesota Board of Water and Soil Resources, https://bwsr.state.mn.us/l2l.

[27] *Id*.

[28] *Lawns to Legumes Program Overview*, Minnesota Board of Water and Soil Resources, https://bwsr.state.mn.us/sites/default/files/2020-10/Lawns%20to%20Legumes%20fact%20sheet%20September%202020.pdf.

[29] *Lawns to Legumes Individual Support: Eligible Expenses and Acceptable Vegetation*, Minnesota Board of Water And Soil Resources,

https://bwsr.state.mn.us/sites/default/files/2023-04/Eligible%20Expenses%20and%20Acceptable%20Vegetation%202023.pdf.

[30] *Id*.

contract installation and management of the project.[31] Out of the total reimbursement request a resident submits, a minimum of 70% of the expenses must be for plant materials.[32]

Located on the supporting organization, Blue Thumb, website, Minnesota residents can apply to be a Lawns to Legumes Individual Support Cost Share grant recipient for implementing a native planting project.[33] Applications are chosen based on a randomized drawing, and priority is given to projects that are implemented in higher-priority areas.[34] High-priority areas are mapped out by the state's Board of Water and Soil Resources, and the map is included on the grant application for residents to view.[35]

Those who are chosen as individual cost-share grant recipients are then eligible to fill out a reimbursement request on the Blue Thumb website. Grant recipients filling out the application for their rebate must provide project details such as the type of plants they have planted, before and after photos of the project, the total cost of the project, and photos of receipts for the expenses they are requesting a reimbursement for.[36] Additionally, to be approved for reimbursement, the grant recipient must match at least 25% of the total costs incurred for their project, which must be documented on the reimbursement application, and they are required to attend at least one Blue Thumb informational workshop.[37] Appendix C provides a statutory language that was adopted to enact a native pollinator plant rebate program, adapted from Minnesota State Legislature Bill HF 207.[38]

4. Native Landscaping Rebate Program - *Ames, Iowa*

The city of Ames, Iowa, offers a variety of rebate programs as part of the city's Pollinator-Friendly Community Plan, a 10-year

Initiative led by the Ames Public Works Department and Prairie Rivers of Iowa.[39] The Native Landscaping Rebate Program offers rebates to residents to cover costs incurred for planting native plant and tree species in their yard. Residents of the city of Ames can fill out an application located on the city's website to request a rebate of up to $350, where the resident must specify the proposed native landscaping project area, including the size of the total yard, the size of the planting area, the type of plants that will be planted, and the project's proposed completion date.[40] Receipts for the requested reimbursement must also be uploaded to the application.[41]

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[31] *Id*.

[32] *Id*.

[33] *See Apply for Lawns to Legumes Assistance*, Blue Thumb, https://bluethumb.org/lawns-to-legumes/apply/.

[34] *Id*.

[35] *See Lawns to Legumes ArcGIS Map*, Minnesota Board of Water and Soil Resources, https://bwsr.maps.arcgis.com/apps/webappviewer/index.html?id=b5786f3e11d54b1799a6f8f0f3a57c1c.

[36] *See Request Lawns to Legumes Reimbursement,* Blue Thumb, https://bluethumb.org/lawns-to-legumes/grantee-guide/request-reimbursement/.

[37] *Id*.

[38] Lawns to Legumes Program, Minn H.J., 93rd Leg., HF 207.

[39] *Pollinator-Friendly Community Plan Released*, City of Ames, https://www.cityofames.org/Home/Components/News/News/7355/2106.

[40] *See Native Landscape Rebate Program*, City of Ames, https://www.cityofames.org/home/showpublisheddocument/72610/638227784522030000.

[41] *Id*.

For a proposed native landscaping project to be eligible for reimbursement, the resident must be a City of Ames Utilities customer, and the project must be completed within 30 days.[42]

2. Pollinator Habitat Restoration Funding Can Be Included in the Suffolk County Septic Improvement Program.

This section reviews examples of restoration costs that benefit native pollinator habitat that can be included under municipal grants for wastewater infrastructure upgrades. Suffolk County has developed the Septic Improvement Program (SIP) to provide state and county grant funding to homeowners for the purchase and installation of a nitrogen removal septic system and leaching structure. The stated goal of the SIP is to limit the nitrogen load into surface waters to ameliorate persistent eutrophication and reduce harmful algal blooms.

As older septic systems contribute excessive nitrogen loading, this funding encourages residents to replace their old septic systems with new technology that reduces the nitrogen load leached out of the septic system.[43] Through the Suffolk County SIP, Suffolk County offers homeowners a $10,000 Grant to replace their old septic system with a new Innovative and Alternative Onsite Wastewater Treatment System, as well as a $5,000 grant for Low to Moderate Income Applicants, and a $5,000 grant when a Pressurized Shallow Drain Field is required.[44] The state of New York also offers further grants through their Septic System Replacement Program of up to $10,000 and 50% of eligible costs, not including sales tax, pumping or decommissioning, internal plumbing or operation and maintenance costs.[45]

While purchase and installation of a new system is eligible for an SIP grant, all other costs, including engineering costs, post-installation landscaping restoration, irrigation repairs, electrical improvements unrelated to system installation, costs above the authorized grant amount or other improvements are not eligible to be covered through the county or state septic grant program.[46]

It is worth noting that when a conventional sanitary system is replaced by a so-called innovative alternative septic system, it destroys much of the yard around the site of installation. Including the restoration of native habitat as a separate and covered cost would secure an additional benefit for homeowners, provide important pollinator habitat, and help to directly achieve the goal of reducing nitrogen load into Long Island's groundwater and surface water in a myriad of ways.

First, as highlighted by a recent study in the prestigious journal Ecological Applications, Long Island's habitats that are invaded by exotic plant species exhibit a higher litter decomposition rate, resulting in "leaky" systems and soil nitrogen loss into groundwater and surface waters.[47] Additionally, the installation of native plant communities promotes the onsite retention of stormwater (reducing nitrogen load associated with nitrogen deposition), facilitates coupled nitrification/denitrification (venting soil nitrogen

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[42] *Id*.

[43] *Reclaim Our Water: Septic Improvement Program*, Suffolk County Department of Health Services, https://reclaimourwater.info/Septic-Improvement-Program.

[44] *Id*.

[45] *Id*.

[46] *Id*.

[47] Isabel Ashton et al, *Invasive Species Accelerate Decomposition and Litter Nitrogen Loss in a Mixed Deciduous Forest*, 15 Ecological Applications (2004); *see also* Frank Piccininni and Kristin Perret, *SMPIL Comments on the Long Island Nitrogen Action Plan*, 28 Environmental Claims Journal 346-352 (2016).

back into the atmosphere), and leads to the assimilation of nitrogen directly into plant tissues.[48] Finally, the reduction in stormwater sheet flow associated with native plant communities will reduce forcing of nitrogen out of conventional septic systems.[49] To summarize, native plantings reduce nitrogen in the atmosphere and in our coastal water. They are important in helping to fight Long Island's nitrogen problem.

B. Enforcement-Based Mechanisms

1. Enhanced Biological Site Assessment Form

This section proposes an Enhanced Biological Site Assessment Form to be used as a supplemental questionnaire when an agency files a short form Environmental Assessment Form (EAF). The Enhanced Biological Site Assessment Form is a necessary procedural step that agencies and municipalities should use along with an EAF to integrate better biological science into local land use law.

The enhanced Biological Site Assessment Form can help inform the empirical rigor of substantive land use law by ensuring that biological science is accounted for when an agency or local board considers a land use application (e.g., local wetlands permit or building permit). **Appendix D** provides a model for an Enhanced Environmental Assessment Form to be used alongside a short form EAF.

2. Pollinator Habitat Preservation and Restoration Overlay District

This section will highlight the best practices and adaptive management principles for the successful restoration of pollinator-friendly habitat using the Town of East Hampton Overlay District as a model. Pollinator Habitat Preservation and Restoration Overlay Districts can be referenced by governments when they require buffer plantings or demand restoration pursuant to violations of local environmental laws.

Pollinator Habitat Conservation and Restoration Overlay District

We propose a Pollinator Habitat Conservation and Restoration Overlay District in the town's zoning code to help conserve and restore the remaining pollinator habitat within the municipality. As we are facing an unprecedented biodiversity crisis, native pollinators provide essential ecosystem services that are critical to the long-term habitability of the town or village. By establishing a Pollinator Habitat Conservation and Restoration Overlay District, municipalities can preserve important indigenous ecological communities, reduce impacts from residential and commercial development, and reduce the ecological impact of human land use.

Appendix E provides model statutory language adapted from the East Hampton Overlay District Code[50] that can be adopted to implement a county overlay district code. **Appendix F** provides a Biodiversity and Climate Resilience Consensus Map for Suffolk County New York, which maps priority areas for the Suffolk County Pollinator Pathway.[51] These include Audubon Natural Climate Solutions Priority areas for birds and carbon, The Nature Conservancy's resilient sites, and wild bee abundance, nesting, and plant maps.[52] This data-driven map produced by this committee can directly serve as the map for a Suffolk County municipality's adopted pollinator overlay districts.

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[48] *Id.*

[49] Erin Kinney and Ivan Valiela, *Nitrogen Loading to Great South Bay: Land Use, Sources, Retention, and Transport from Land to Bay*, 27 Journal of Coastal Research (2011).

[50] East Hampton, N.Y., Overlay Districts Code, §255-3 (2015).

[51] Brooke Bateman, *Biodiversity and Climate Resilience Consensus Map for Suffolk County New York*, https://audubon.maps.arcgis.com/home/item.html?id=61c1cc1433914d3db8fb0d4a0e301ad4.

[52] *Id*.

3. Best Practices for Mandated Revegetation and Ecological Restoration Projects

Revegetation and ecological restoration work is often cited as a remedy for violating State and Local environmental laws. At other times, plantings are required as a condition of development. Unfortunately, such restoration work is often unsuccessful due to challenging field conditions; challenges include the proliferation of invasive species associated with disturbed habitat, excessive deer browse, and inappropriate plant choices. As such, **Appendix G** provides best practices that can be adapted for mandated revegetation and native buffer plantings.

C. Sump Stewardship as a Means to Increase Pollinator Habitat and Reduce Mosquito Breeding

Suffolk County Vector Control has identified recharge basins ("sumps") as a primary contributor to mosquito container breeding or sump standing water breeding. Mosquito container breeding results from garbage that washes into the sump via the storm sewers, such as plastic bottles. Standing water, in turn, is due to deferred maintenance, the proliferation of invasive plant species within the sumps, and the accumulation of silt in the basin. This section outlines opportunities to adaptively manage sumps to benefit ecological function while simultaneously addressing mosquito source reduction. Appendix H provides a resolution that can be enacted by a local governing body to ensure pollinator-friendly sump stewardship practices, thereby reducing the need for vector control activities and reducing public health hazards.

Sump Stewardship

Many professionals who are charged with the maintenance of sumps primarily reference the NYS Department of Transportation's Design, Construction, and Maintenance of Recharge Basin's manual. This manual generally highlights only the engineering aspects of the sump management – namely their ability to recharge aquifers, maintain peak operating heads, and dry out in between rainfall events.[53] Although such design criteria are understandable given the infrastructure function served by the sump, we submit that the manual should be amended to allow for more effective stewardship of pollinator habitat.

The NYSDOT manual calls for the establishment and regular maintenance of turf grass, cites "weed control" as a primary management objective, and notes erosion as a concern for the long-term viability of sumps. Essentially, as their construction guidelines are generally interpreted and applied in Suffolk County, sumps are supposed to be completely devoid of vegetation except for a mowed "lawn" in the bottom of the basin. Such an approach misses a key opportunity to promote ecological function without impairing sump functionality. This is especially important in places where sumps represent one of the last remaining green spaces in the community.

Interestingly, due to deferred maintenance, and despite the general acceptance of the NYSDOT manual, many sumps in Suffolk County naturally undergo ecological succession and become thriving habitats, inclusive of healthy forested canopies and understories, and some meadow-like habitat. The roots of native trees and shrubs hold the sometimes steeply pitched walls together and provide robust habitat for native pollinator species. Like many wild places in Suffolk County, however, these sump habitats are often impaired by the proliferation of invasive plant species, often encroaching from nearby neighborhoods. Overrun by invasive vines in particular, mature trees are often downed, causing drainage issues as the organic matter and coarse woody debris matter is added to fine silts and sediments that enter the sumps through the storm drains. This, in turn, can create a public health hazard through mosquito breeding activities.

Community Involvement in Sump Stewardship

Suffolk County Vector Control faces a daunting task in sustainability, managing mosquito populations throughout the County. Such a mandate is made more difficult by the fact that Sumps are often not owned or managed by the County, but by other public and private landowners.

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[53] *Geotechnical Design Procedure (GDP) -8, Design, Construction, and Maintenance of Recharge Basins, Revision #6*, New York State Department of Transportation (2022).

Unfortunately, sump stewardship is not often made a priority as local governments and private landowners similarly do not have the resources to address proper stewardship. Yet, this maintenance problem can become a thriving program for local individuals and organizations to "adopt a sump" and turn a mosquito breeding hazard into a pollinator haven. Such a program has successful precedent on Long Island. For example, through Nassau County's "adopt a sump" program, the South Shore Audubon Society created the Michael Sperling Memorial Bird Sanctuary out of a sump in North Massapequa. This project garnered abundant attention from the community and can serve as a model to be pursued elsewhere in Suffolk County.

One obvious means for the sumps to benefit from community involvement is cleanup of trash that washes in through the storm drains. Plastic containers that collect stormwater allow mosquito breeding in 4-5 days! Additionally, informed by best adaptive management guidelines, the community can help to steward the sump's pollinator habitat.

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III. Conclusion

As native pollinator species are declining at drastic and alarming rates due to human land use, it is essential that municipal and state governments take action by implementing laws that will help rebuild and protect native pollinator habitats. This document reviews three types of programming that can be enacted to promote conservation, restoration, and stewardship of native pollinator habitats: 1) funding-based mechanisms, 2) enforcement-based mechanisms, and 3) collaborative efforts with Suffolk County Vector Control to benefit pollinators and mosquito source reduction.

In using funding-based mechanisms to protect native pollinator habitats, various municipalities have enacted residential rebate programs to incentivize homeowners by providing partial funding for planting native plants and restoring native pollinator habitats on their own lawns. Additionally, Suffolk County has enacted a rebate program to incentivize replacing outdated septic systems with newer technology that will reduce the amount of nitrogen pollution generated from older infrastructure.

Using enforcement-based mechanisms, municipalities should use an Enhanced Biological Assessment Form (see Appendix F) to better incorporate biological principles into their EAF when assessing the environmental impact of land use and development projects. Additionally, overlay districts such as those enacted by the town of East Hampton[54] (see Appendix G) can be incorporated into a municipality's zoning code. Overlay Districts can be referenced by governments when requiring buffer plantings or demanding restoration pursuant to violations of local environmental laws and can help conserve and restore the remaining pollinator habitat within the municipality.

Using Suffolk County Vector Control's initiatives for sump improvement and stewardship as a framework, municipalities can allow for vegetation to grow in sumps that will help protect vital ecosystem functions while not posing harm to sump infrastructure. Where invasive vegetation has also become prolific in sump habitats, municipalities can use a biologically enhanced approach to sump stewardship (see Appendix I) to reduce invasive vegetation and repair sump habitats from hazardous mosquito breeding areas to those which promote and protect native pollinator habitats. Successful implementation of this concept has been enacted by Nassau County through their "Adopt a Sump" program which encourages transformation of sumps into native pollinator habitats using best management practices and community stewardship.

By exploring various native pollinator restoration programming that municipalities and states have successfully implemented, this document serves as a resource for local governments to reference when adopting incentive- and enforcement-based programming to implement conservation, restoration, and stewardship of native pollinator habitats. With the increasingly dire risks facing pollinator species, where 1-in-4 species currently face the risk of extinction,[55] the survival of native pollinator species depends upon local land use laws that can prevent further degradation of native foliage and pollinator habitats. The longer our laws ignore nature and biology necessary in preserving native pollinator species, the greater the risk of extinction grows. With the risk of

[54] *Supra* note 49.

[55] *Supra* note 3.

extinction, our food system also faces grave risks as an average of 70% of all food supply is dependent upon pollination from native pollinators.[56] Local governments hold crucial responsibility in enacting land use laws and programming that will work *with* native pollinator species not against them. Enacting programming similar to those reviewed in this document can serve as an important step toward protecting and rebuilding native pollinator habitats and species.

IV. Appendices

Appendix A–Model Residential rebate program

1. Real property owned by a person who has undertaken ecological restoration of a property it owns residing in any county having a population of more than XXXX inhabitants but less than YYYY inhabitants, determined in accordance with the 1990 federal census, or in any county having a population of more than XXXX inhabitants but less than YYYY inhabitants, as determined by the latest federal decennial census, shall be exempt from taxation to the extent of a minimum or **five percent** and a maximum of **ten percent** of the assessed value of such property for city, village, town, part town, special district or county purposes, exclusive of special assessments, provided that the governing body of a city, village, town or county, after a public hearing, adopts a local law, ordinance or resolution providing therefore; provided further, however, that such exemption shall in no event exceed three thousand dollars multiplied by the latest state equalization rate for the assessing unit in which such real property is located.
2. Such exemption shall not be granted unless:

   (a) the applicant resides or maintains a place of business in the city, town or village;

   (b) the applicant has been certified by the city, town or village or its designee(s) to have. It shall be the duty and responsibility of the municipality which adopts a local law, ordinance or resolution pursuant to this section to determine the procedure for certification; and

   (c) the property is certified as having complied with the limits as detailed herein:

Less than total Area of Structures on Property	Equal to Total Area of Structures on Property to ⅔ of Total Area Property	Total Area Property equal to ⅔ of Total Property Area	⅔ to ¾ of Total Property Area	¾ or more of Total Property Area
0%	5%	7.5%	8.5%	10%

[56] *Supra* note 4.

3. Application for such exemption shall be filed with the assessor or other agency, department or office designated by the municipality offering such exemption on or before the taxable status date on a form as prescribed by the commissioner.

4. No applicant who is receiving any benefit under the provisions of this article on the effective date of this section shall suffer any diminution of such benefit because of the provisions of this section.

Appendix B

Native Plant Residential Rebate application criteria; modified from Town of North Hempstead Application :[57]

1. Type of garden
    - New (10 points)
    - Adding to existing (5 points)
2. Replacement of lawn/ turf
    - Yes (10 points)
    - No (0 points)
        - Note: Removal of turf must be from entire area of garden not just around area of each plant installed.
3. Diversity of plants
    - High: 9 or more different species (10 points)
    - Moderate: 6-8 different species (5 points)
    - Low: 5 or less species (2 points)
4. Number of trees planted
    - High- 5 or more trees (10 points)
    - Moderate- Between 2-4 trees (5 points)
    - Low- 1 or no trees (2 points)
5. Number of each plant species
    - High: 7 or more of each species (10 points)
    - Low/Moderate- 1-6 of each species (5 points)
        - Note: there must be at least 3 of each herbaceous species (flowers, grasses, sedges, rushes, ferns)
6. Replacement of invasive species
    - Yes (5 points)
    - No (0 points)
7. Size of garden
    - Large: 201 square feet or greater (10 points)
    - Small/Moderate: 50-200 square feet (5 points)
        - Note: the planted area must be a minimum of 50 square feet.
8. New or return application
    - New applicant (10 points)
    - Repeat applicant (0 points)

[57] *Supra* note 16.

Appendix C

Model state statute for native pollinator planting rebate program adapted from Minnesota State Legislature Bill HF 207.[58]

A bill for an act relating to natural resources; establishing lawns to legumes grant program; appropriating money; proposing coding for new law in [State] Statutes, chapter [X].

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF [X]:

§ X [NAME OF REBATE PROGRAM].

The [funding agency/organization] may provide financial and technical assistance to plant residential landscapes and community spaces with native vegetation and pollinator-friendly forbs and legumes to protect a diversity of pollinators with declining populations, providing additional benefits for water management, carbon sequestration, and landscape resiliency. The [funding agency/organization] must establish criteria for grants or payments awarded under this section. Grants or payments awarded under this section may give priority consideration for proposals in areas identified by the United States Fish and Wildlife Service as areas where there is a high potential for rusty patched bumble bees and other priority species to be present. The [funding agency/organization] may collaborate with and enter into agreements with federal, state, and local agencies; Tribal Nations; and other nonprofit organizations and contractors to implement and promote the program.

§ X [NAME OF REBATE PROGRAM]; APPROPRIATION.

$2,000,000 in fiscal year 2024 and $2,000,000 in fiscal year 2025 are appropriated from the state general fund to the [funding agency/organization] for the [rebate program name] under [State] Statutes, section XXX.XXX. The [funding agency/organization] may enter into agreements with local governments and other organizations to support this effort.

Appendix D

Enhanced Environmental Assessment Form (EAF)

1) Project and Sponsor Information
    a) Are native trees, shrubs, or herbaceous species to be cleared as part of the proposed action?
        i) If Yes, please provide the following:
            (1) For each species of native tree (defined as woody plants greater than 2” diameter at breast height) provide an estimate of basal area (per ft2);
            (2) For each species of shrubs or tree saplings, provide a frequency (per ft2);
            (3) For each species of native herbaceous species, provide a ground cover estimate (per ft2)

[58] *Supra* note 32.

ii) Provide details about the method of plant removal

b) If chemical/herbicide treatment will be used, specify product(s)

c) Describe the current conditions of the site:

i) % cleared, % native, % non-native, % non-native/invasive

d) Can clearing of native plants be avoided through any practicable alternatives?

e) What ecological community type should be prevalent at the project location in the absence of human land use in accordance with the New York State Natural Heritage Program Ecological Communities of New York (2nd Edition or subsequent editions)?

f) What is the proposed quantity of lawn (turfgrass) on the property after construction?

g) What % of the property is currently lawn (turfgrass)?

h) What % of the permeable area is lawn (turfgrass)?

i) What approximate % of the property is non-functional turf? (non-functional turf to be defined as areas that are used extremely rarely (less than 1x per month or not at all).

j) Are new plantings proposed?

i) If yes, what percentage of the plants are native?

ii) If yes, do the plantings follow any best planting and adaptive management practices?

k) Are stormwater controls currently present or proposed?

i) If so note type and size (if known), rain garden, bio swale, drywell, etc

l) Will the proposed project have a net carbon emission or Sequestration?

m) How many pounds of nitrogen per year does the property currently contribute (based on estimated sanitary discharge, runoff of nitrogen due to stormwater, and fertilizer load)?

n) After the proposed action, how many pounds of nitrogen per year will the property contribute (based on estimated sanitary discharge, runoff of nitrogen due to stormwater, and fertilizer load)?

o) What evidence-based field survey methods were used to ascertain the presence or absence of State or Federal listed species?

i) If a field survey was conducted, did the survey take into account the appropriate phenology of the species of interest?

Appendix E

§ XXX-X-1 Overlay districts established

For the purpose of applying additional uniform land use regulations to specific categories of land sharing certain important characteristics, there are hereby established the following overlay districts:

1. Pollinator Habitat Preservation and Restoration Overlay District

§ XXX-X-2 Overlay district boundaries.

The boundaries of overlay districts shall be as described in the text of this article, in other official public documents specifically referred to in such text, or as depicted on the Use District Map or any combination thereof. Said map is hereby adopted, incorporated herein as Article xxx of this chapter and declared to be a part hereof. Said map may consist of one or more sheets and, from time to time, may be amended by the Town/Village Board by local law without the necessity to amend any other provision, part or section of this chapter. The boundaries of all use districts (zones) shall be as depicted on the Use District Map. District boundary lines shown on said map as streets or rights-of-way shall be deemed to coincide with the center lines of same and, when shown as paralleling and adjacent to a street, right-of-way or surface water body, shall be deemed to be 200 feet distant from and parallel to the property lines fronting on such street or right-of-way or the shoreline of such water body unless specifically dimensioned otherwise.

§ XXX-X-3 Effect of inclusion in overlay district.

A lot or land included in any overlay district established hereunder shall continue to be included as well in the use district into which it has been placed. Except to the extent that one or more regulations of said use district is suspended or overridden by the specific language of an applicable overlay district regulation, all use district regulations affecting the use of the lot or land, and the use of buildings and structures and other activities thereon, shall continue to apply. Where an applicable use district regulation and an applicable overlay district regulation address the same subject matter, and one does not by its terms override or supersede the other, the regulation imposing the greater restriction on the use of the affected building, structure, lot or land shall control.

§ XXX-X-4 Purpose.

The purpose of the Pollinator Habitat Conservation and Restoration Overlay is to conserve and restore the remaining pollinator habitat within the Town/Village. This provision was enacted with the realization that the Town/Village is facing a biodiversity crisis of unprecedented proportions. Pollinators such as bees, birds, butterflies, and bats provide an irreplaceable ecosystem service by facilitating the reproduction of flowering plants and food crops, both of these functions are critical to the long-term habitability of our Town/Village. The Pollinator Habitat Conservation and Restoration Overlay District will preserve important indigenous ecological communities; reduce impacts from residential and commercial development; and reduce the ecological impact of human land use. The overlay district will help preserve important ecological benefits for future generations.

§ XXX-X-5 Regulations

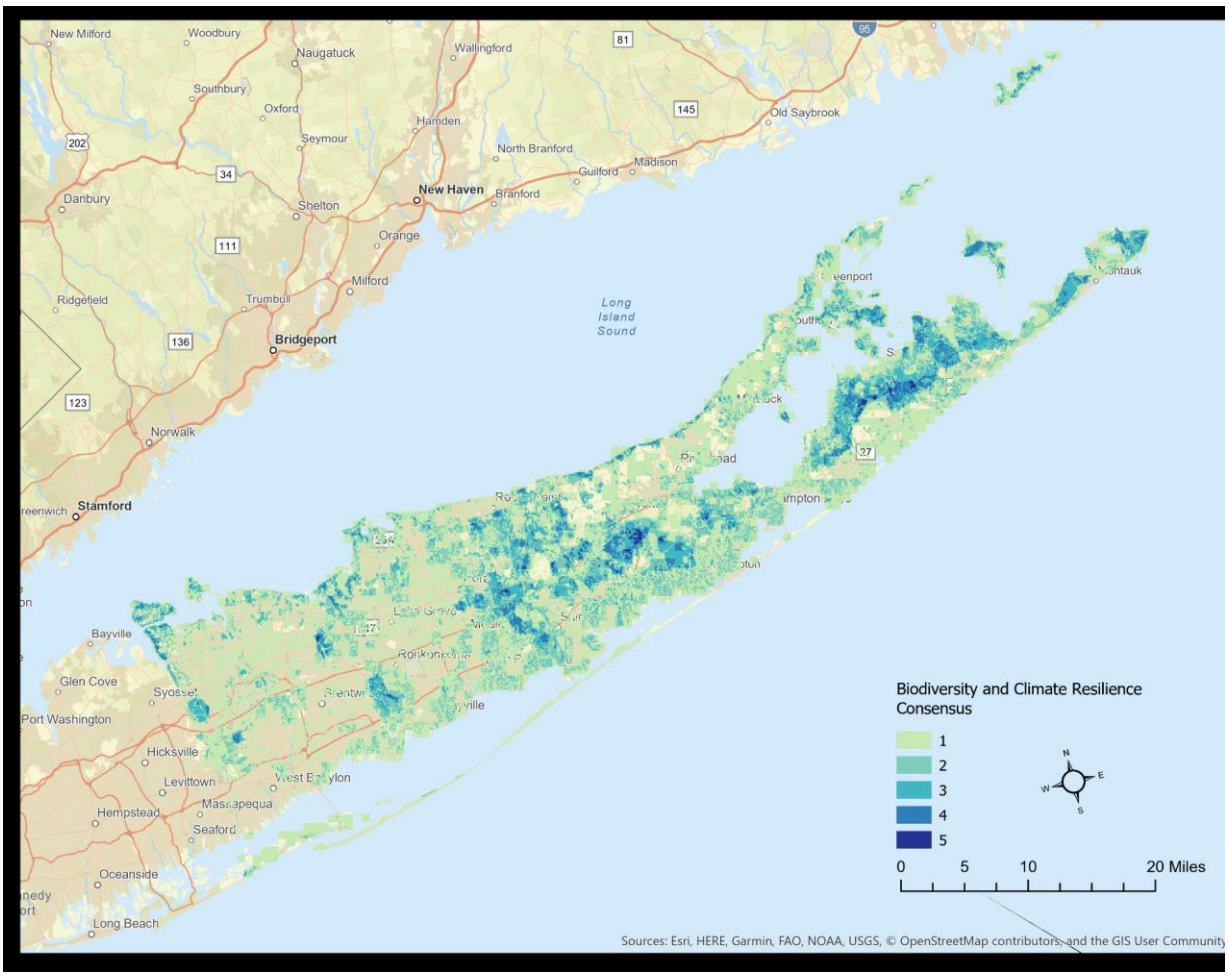
Except as may be permitted on building lots within open space subdivisions created pursuant to Chapter 193, clearing of lots or parcels of land within the Pollinator Habitat Preservation and Restoration Overlay District shall be restricted as set forth herein.

The total area of a lot which may be cleared of indigenous natural vegetation shall not exceed the following amounts for any lot located wholly or partly within the overlay district:

Lot Spatial (square feet)	Clearing Limit for Biodiversity and Climate Resilience 1	Clearing Limit for Biodiversity and Climate Resilience 2	Clearing Limit for Biodiversity and Climate Resilience 3	Clearing Limit for Biodiversity and Climate Resilience 4	Clearing Limit for Biodiversity and Climate Resilience 5
Up to and including 39,999	10, 000 ft2 or 45% of lot area, whichever is greater	10, 000 ft2 or 40% of lot area, whichever is greater	10, 000 ft2 or 35% of lot area, whichever is greater	10, 000 ft2 or 30% of lot area, whichever is greater	10, 000 ft2 or 25% of lot area, whichever is greater
From 40,000 to and including 280,000	10,000 + (lot area X 13.5%)	10,000 + (lot area X 13%)	10,000 + (lot area X 12.5%)	10,000 + (lot area X 12%)	10,000 + (lot area X 11.5%)
Greater than 280,000	55000 ft2	50000 ft2	45000 ft2	40000 ft2	35000 ft2
Commercially Zoned Locations					
All lots	10, 000 ft2 or 35% of lot area, whichever is greater	10, 000 ft2 or 40% of lot area, whichever is greater	10, 000 ft2 or 45% of lot area, whichever is greater	10, 000 ft2 or 50% of lot area, whichever is greater	10, 000 ft2 or 55% of lot area, whichever is greater

In calculating the amount of clearing permitted by this subsection on a flag lot or a lot which is burdened by a common driveway easement or access easement, the area of any flag strip or any common driveway easement or access easement shall be excluded from lot area. Likewise, any clearing for driveway purposes within the flag strip or within the common driveway easement or access easement shall not be counted into the permissible amount of clearing.

Appendix F



Appendix G

Best Adaptive Management Practices for Revegetation, Native Buffer Planting, and Ecological Restoration

The following guidelines are intended to inform ecological restoration and adaptive management of a site.

a. Ecological Site Assessment

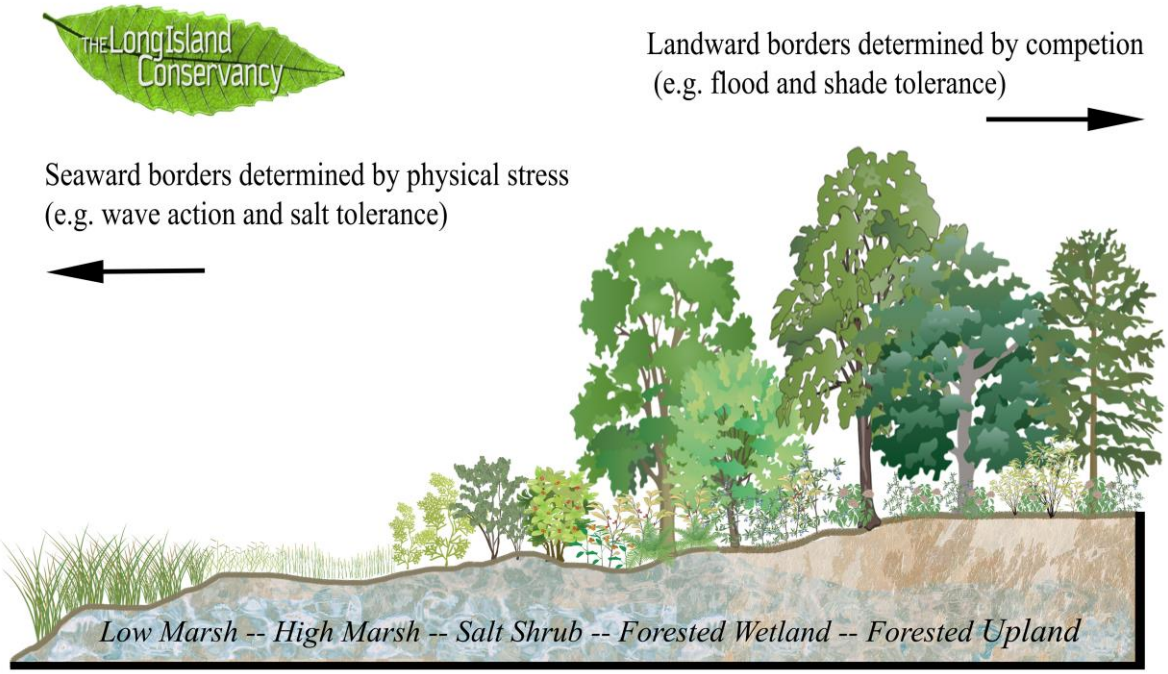


Figure 1. *Topography, hydrology, soil type, and competition determine ecological community type.*

i. Prior to the development of an ecological restoration plan, planners must characterize the ecology of the site. Long Island contains many unique ecosystems. Figure 1 depicts a typical historical toposequence, which is the change in plant community given the change in topography. Further details to assess and characterize the site's ecological community type should be garnered from the NY Natural Heritage Program Ecological Communities of New York State.[i]

ii. The proper community type can be inferred by patterns of hydrology, a survey of existing native vegetation, assessment of soil texture and observation of the characteristics of surrounding locations. Note that numerous community types can exist within a site; for example, upland hummocks or islands can persist in a mosaic of wetland habitat. Land use planners should map the spatial extent of each individual ecological community type within the restoration area.

iii. Planners should discern gradients of shade to inform plant selection.

b. **Site Preparation**

i. Identify and protect existing native trees, shrubs, and herbaceous species from installation equipment. Follow ISA (International Society of Arboriculture) guidelines for protection of woody

species. Native herbaceous species should be protected to the maximum extent practicable, with extra consideration for rare or listed species.

ii. Protect soil from compaction and do not allow areas within the restoration area to be impacted.

iii. If soil is compacted, select plant material that tolerates compacted soil or remediate the soil before transplant. See Section d.i. for soil remediation techniques.

iv. Prior to planting, invasive plant species should be removed to the maximum extent practicable. Some invasive plants removed will require follow-up work for several years to ensure their eradication (e.g., Japanese knotweed and tree-of-heaven).

v. Do not allow removal of parent soil from the restoration site.

c. Plant Size, Plant Quality, and Species Selection

i. Woody plant material:

a) Select native trees with a caliper of no more than 3 inches (this is the diameter of the tree 6 inches above the ground for trees less than a 4-inch caliper). For trees and shrubs, diversity in age and/or height is preferred over uniformity.

b) For balled and burlapped trees, several studies have demonstrated that smaller caliper trees establish faster over larger caliper trees[ii]. Transplanting smaller caliper trees also allows more trees to be planted to account for losses.

c) Shrubs: Sizing will vary from plug liners, container stock, to balled and burlapped shrubs.

d) Roots should not be root bound or circling excessively. Alternatively, roots should not be underdeveloped as this will lead to drought stress.

e) Attention should be given to the soil type of the root ball if there are concerns regarding incompatibility of soil types.

f) When introducing balled and burlapped plant material or containerized plant material, ensure the specimen is free from noxious and invasive weeds and pests.

g) Ecotypic or straight species are preferred over cultivars to promote genetic diversity and provide ecological value.

h) Plant choice should be informed by the ecological site assessment guidelines noted in section a. See a list of commercially native plants available in Appendix 1.

ii. Herbaceous plant material:

a) Use seed, plugs, and container stock.

b) Ecotypic or straight species are preferred over cultivars.

d. **General Planting Practices: Woody Plant Material**

i. Compacted soils: Break up surface and subsurface compaction to a minimum 8-inch depth before planting. For severely degraded soils, topdress with 6 to 8 inches of quality compost and incorporate within the upper soil profile (top 24 inches). For severe compaction below 10 inches, a subsoiler and/or a backhoe might be necessary to correct degraded conditions and adequately incorporate compost. Allow soil to settle for a few days before planting after correction of severely degraded sites.

ii. Before transplanting woody plant material, ensure plants are well hydrated. Do not transplant drought-stressed or dry plant material. Reveal the trunk flare for all trees; do not bury the trunk flare with soil or mulch. Inspect the upper portion of the root system. Correct any circling and girdling roots before planting. If excessive circling and/or girdling roots are found, do not transplant. Planting trees too deeply reduces availability of oxygen to the existing root system, encourages the development of girdling roots, and creates hazardous trees over time.

iii. Plant trees 8 feet on center and shrubs 4 to 8 feet on center.

a) For ecological restoration, the objective is to establish a community of plants that compete for resources such as light and nutrients; this is true even if certain plants decline over time. Research has shown that dense planting helps to increase biomass and community establishment with no significant cost in tree survival, although the impact of community competition is a highly species- and site-specific matter.[iii] Furthermore, co-associated plant species existing in relatively close proximity have been shown to interact with each other and the soil microbial community to enhance plant growth and soil health.[iv]

iv. When transplanting shrubs, remove burlap or the container so the root system can be inspected. Correct any root deficiencies before planting. Do not bury the crown of the shrub or pile mulch against the base of the shrub.

v. For any container stock, remove the tree/shrub from the container. Loosen the root system and cut away any dead or damaged roots and any circling or girdling roots.

vi. If circling and girdling roots are excessive, do not plant.

vii. Remove nursery stake if present and any tape or tags attached to stems and branches.

viii. Planting holes should be 2 to 3 times wider than the height of the root ball. Depth should be no deeper than the height of the root ball after the trunk flare is revealed. The bottom of the planting hole should be firm.

ix. Create a saucer around each tree and large shrub; this will ensure water drains to the root system instead of running off. Water well mid-way during planting and again after topdressing with mulch. Water deeply at planting regardless of current and forecasted rain conditions (15-20 gal. per plant).

x. Topdress with no more than 2 to 3 inches of coarse mulch or quality compost (depending on site specifications). Keep topdressing away from the trunk flare. Trunk flare should remain visible at all times.

xi. Provide supplemental water for the first two years. Remove irrigation rings around trees and shrubs after establishment.

xii. Tree supports are recommended for windy sites. Use flat nylon straps (usually woven polypropylene) to secure the tree to stakes. Do not tightly loop straps around the trunk. Configure the straps in a figure eight design to allow for growth of the stem and to avoid girdling. Remove supports after the first year.

e. General Planting Practices: Herbaceous Plant Material

i. Check that plants are not drought-stressed at planting.

ii. Herbaceous plants should be planted in clumps 6 to 12 inches on center when planted under trees; a tighter planting scheme can be done with no woody plants present. Plant clumping allows for positive interaction between plants and improves resiliency of the plant community.[v]

a. Spacing choices should be determined, in part, by the characteristics of the site to be restored. In a highly disturbed site, spacing should be tight to minimize weed competition. In sites that are less disturbed (e.g., planting under an established native canopy), planting can be less dense.[vi]

iii. If mulch is used, topdress with no more than 2 to 3 inches of mulch and avoid burying the crown of plants.

f. **Required Stewardship**

i. Account for need of maintenance after the project is planted. Use of volunteers is recommended if dedicated staff are not available.

ii. Monitor for invasive species regrowth. Remove invasive species at least until native plants are established.

iii. Maintenance pruning of woody plants is only allowed to encourage good structure of sapling trees and removal of hazardous branches or trees, or diseased/infested trees. Topping or hedging is not acceptable since it weakens the main structure of the tree.

iv. If deer pressure is high, protect plants from browsing and rubbing damage using temporary fencing around each tree or entire project area. Duration of protective fencing depends on tree species. Refer to Appendix 1 for deer resistance ratings for commercially available plants.

Planting Guidelines Appendix 1

Ecological communities as noted by the New York Heritage Program.

Red Maple-Hardwood

Prepared by Mina Vescera, Nursery and Landscape Specialist, Cornell Cooperative Extension of Suffolk County, and Frank Piccininni, President, Spadefoot Design and Construction, LLC, Co-founder and Trustee, The Long Island Conservancy for the Suffolk County Pollinator Pathway Task Force, August 2023.

[i] NY Natural Heritage Program Ecological Communities of New York State *https://www.nynhp.org/documents/39/ecocomm2014.pdf*

ii Watson, W. T. 2005. Influence of Tree Size on Transplant and Establishment. HortTechnology. 15(1):118-122

iii Stoffella Susan L., Flooding and Planting Density Shape Forests in an Experimental Everglades Landscape: Lessons for Forest Restoration. Ecosphere 13 (9): e42230

iv Dickie Ian A. et al.. 2002. Influences of Established Trees on Mycorrhizas, Nutrition, and Growth of Quercus rubra Seedlings. Ecological Monographs. 72(4): 505-521; Gorzelak M.A. et al. 2015. Inter-plant Communication Through Mycorrhizal Networks Mediates Complex Adaptive Behaviour in Plant Communities. 7: e50; Courty P.E. 2010. The Role of Ectomycorrhizal Communities in Forest Ecosystem Processes: New Perspectives and Emerging Concepts. Soil Biology and Biochemistry. 42: 679-698.

[v] Stillman, B. et al. 2015. Facilitation Shifts Paradigms and Can Amplify Coastal Restoration Efforts. PNAS: 112(46): 14295-14300; Temmink R.J.M. 2020. Mimicry of Emergent Traits Amplifies Coastal Restoration Success. Nature Communications: 11: 3668.

vi Hammann L et al.. 2021. Optimal Planting Distance in a Simple Model of Habitat Restoration With an Allee Effect. Frontiers in Marine Science. 7: 1-130; Duggan-Edwards et al.. 2019. External Conditions Drive Optimal Planting Configurations for Salt Marsh Restoration. Journal of Applied Ecology. 57 (3): 619-629.

Swamp (https://guides.nynhp.org/red-maple-hardwood-swamp/)

Scientific Name	Common Name	Deer Browse Resistance	Shade Tolerance	Wetland Indicator Status
Carex stricta	Tussock Sedge	Deer Resistant	intolerant	OBL
Acer rubrum	Red Maple	Intolerant until above the browse line (use temporary fencing)	tolerant	FAC
Onoclea sensibilis	Sensitive Fern	Deer Resistant	tolerant	FACW
Ilex verticillata	Winterberry	Intolerant until above the browse line (use temporary fencing)	Intermediately tolerant	FACW
Lindera benzoin	Spicebush	Intolerant until above the browse line (use temporary fencing)	Intermediately tolerant	FACW
Viburnum dentatum	Arrowwood Viburnum	Intolerant until above the browse line (use temporary fencing)	Intermediately tolerant	FAC
Osmunda cinnamomea	Cinnamon Fern	Deer Resistant	Intermediately tolerant	FACW
Vaccinium corymbosum	Highbush Blueberry	Intolerant until above the browse line (use temporary fencing)	Intermediately tolerant	FACW
Nyssa sylvatica	Black gum	Intolerant until above the browse line (use temporary fencing)	tolerant	FAC
Clethra alnifolia	Sweet Pepperbush	Intermediately Deer Resistance	Intermediately tolerant	FAC
Osmunda regalis	Royal Fern	Deer Resistant	tolerant	OBL

Hempstead Plains Grassland (https://guides.nynhp.org/hempstead-plains-grassland/)

Scientific Name	Common Name	Deer Browse Resistance	Shade Tolerance	Wetland Indicator Status

Andropogon virginicus	Broomsedge	Deer Resistant	Intermediately tolerant	FACU
Andropogon gerardii	Big Bluestem Grass	Deer Resistant	Intermediately tolerant	FACU
Asclepias tuberosa	Butterfly Milkweed	Deer Resistant	intolerant	UPL
Eupatorium hyssopifolium	Hyssop Leaf Boneset	Intermediately Deer Resistance	intolerant	UPL
Andropogon scoparium	Little Bluestem Grass	Deer Resistant	Intermediately tolerant	FACU
Sorghastrum nutans	Indian Grass	Deer Resistant	Intermediately tolerant	FACU

Coastal Oak-Beech Forest (https://guides.nynhp.org/coastal-oak-beech-forest/)

Scientific Name	**Common Name**	**Deer Browse Resistance**	**Shade Tolerance**	**Wetland Indicator Status**
Quercus rubra	**Red oak**	**Intolerant until above the browse line (use temporary fencing)**	**Intermediately tolerant**	**FACU**
Quercus velutina	**Black Oak**	**Intolerant until above the browse line (use temporary fencing)**	**Intermediately tolerant**	**FACU**
Quercus coccinea	**Scarlet Oak**	**Intolerant until above the browse line (use temporary fencing)**	**intolerant**	**UPL**
Quercus alba	**White oak**	**Intolerant until above the browse line (use temporary fencing)**	**Intermediately tolerant**	**FACU**
Quercus prinus	**Chestnut Oak**	**Intolerant until above the browse line (use temporary fencing)**	**Intermediately tolerant**	**FACW**
Viburnum dentatum	**Arrowwood Viburnum**	**Intolerant until above the browse line (use temporary fencing)**	**Intermediately tolerant**	**FAC**

Aster divaricatus	**White Wood Aster**	**Intermediately Deer Resistance**	**tolerant**	**UPL**
Fagus grandifolia	**American Beech**	**Intolerant until above the browse line (use temporary fencing)**	**tolerant**	**FACU**

Salt Shrub (https://guides.nynhp.org/salt-shrub/)

Scientific Name	Common Name	Deer Browse Resistance	Shade Tolerance	Wetland Indicator Status
Myrica pensylvanica	**Bayberry**	**Deer Resistant**	**Intermediately tolerant**	**FAC**
Baccharis halimifolia	**Groundsel Bush**	**Deer Resistant**	**Intermediately tolerant**	**FACW**
Iva frutescens	**Marsh Elder**	**Intermediately Deer Resistance**	**intolerant**	**FACW**
Distichylus spicata	**Salt Grass**	**Deer Resistant**	**intolerant**	**FACW**
Panicum virgatum	**Switchgrass**	**Deer Resistant**	**Intermediately tolerant**	**FAC**
Eupatorium perfoliatum	**Common Boneset**	**Intermediately Deer Resistance**	**Intermediately tolerant**	**FACW**

Pitch Pine-Oak Forest (https://guides.nynhp.org/pitch-pine-oak-forest/)

Scientific Name	Common Name	Deer Browse Resistance	Shade Tolerance	Wetland Indicator Status
Acer rubrum	**Red Maple**	**Intolerant until above the browse line (use temporary fencing)**	**tolerant**	**FAC**
Pinus strobus	**Eastern White Pine**	**Intolerant until above the browse line (use temporary fencing)**	**Intermediately tolerant**	**FACU**

Quercus ilicifolia	**Scrub Oak**	**Intolerant until above the browse line (use temporary fencing)**	**intolerant**	**UPL**
Quercus alba	**White Oak**	**Intolerant until above the browse line (use temporary fencing)**	**Intermediately tolerant**	**FACU**
Pinus rigida	**Pitch Pine**	**Intolerant until above the browse line (use temporary fencing)**	**intolerant**	**FACU**
Quercus coccinea	**Scarlet Oak**	**Intolerant until above the browse line (use temporary fencing)**	**intolerant**	**UPL**
Quercus rubra	**Red oak**	**Intolerant until above the browse line (use temporary fencing)**	**Intermediately tolerant**	**FACU**
Quercus velutina	**Black Oak**	**Intolerant until above the browse line (use temporary fencing)**	**Intermediately tolerant**	**FACU**
Vaccinium corymbosum	**Highbush Blueberry**	**Intolerant until above the browse line (use temporary fencing)**	**Intermediately tolerant**	**FACW**
Carex pensylvanica	**Pennsylvania Sedge**	**Deer Resistant**	**Intermediately tolerant**	**UPL**

Maritime Forest Red Cedar Forest (https://guides.nynhp.org/maritime-red-cedar-forest/)

Scientific Name	Common Name	Deer Browse Resistance	Shade Tolerance	Wetland Indicator Status
Juniperus virginiana	**Eastern Red Cedar**	**Intolerant until above the browse line (use temporary fencing)**	**intolerant**	**FACU**
Prunus serotina	**Black Cherry**	**Intolerant until above the browse**	**intolerant**	**FACU**

		line (use temporary fencing)		
Myrica pensylvanica	Bayberry	Deer Tolerant	Intermediately tolerant	FAC
Parthenocissus quinquefolia	Virginia Creeper	Intolerant	Intermediately tolerant	FACU
Andropogon scoparium	Little Bluestem Grass	Deer Tolerant	Intermediately tolerant	FACU
Solidago sempervirens	Seaside Goldenrod	Intolerant	intolerant	FACW
Pancium virgatum	Switchgrass	Deer Resistant	Intermediately tolerant	FAC
Prunus maritima	Beach Plum	Intolerant until above the browse line (use temporary fencing)	intolerant	UPL

Oak-Tulip Forest (https://guides.nynhp.org/oak-tulip-tree-forest/)

Scientific Name	Common Name	Deer Browse Resistance	Shade Tolerance	Wetland Indicator Status
Acer rubrum	Red Maple	Intolerant until above the browse line (use temporary fencing)	tolerant	FAC
Acer saccharinum	Silver Maple	Intolerant until above the browse line (use temporary fencing)	tolerant	FACW
Fagus grandifolia	American Beech	Intolerant until above the browse line (use temporary fencing)	tolerant	FACU
Liriodendron tulipifera	Tulip Tree	Intolerant until above the browse line (use temporary fencing)	intolerant	FACU
Quercus alba	White Oak	Intolerant until above the browse line (use temporary fencing)	Intermediately tolerant	FACU

Quercus coccinea	**Scarlet Oak**	**Intolerant until above the browse line (use temporary fencing)**	**intolerant**	**UPL**
Quercus rubra	**Red oak**	**Intolerant until above the browse line (use temporary fencing)**	**Intermediately tolerant**	**FACU**
Quercus velutina	**Black Oak**	**Intolerant until above the browse line (use temporary fencing)**	**Intermediately tolerant**	**FACU**
Hamamelis virginiana	**Witch Hazel**	**Intolerant until above the browse line (use temporary fencing)**	**tolerant**	**FACU**
Vaccinium angustifolium	**Lowbush Blueberry**	**Intolerant**	**Intermediately tolerant**	**FACU**
Cornus florida	**Flowering Dogwood**	**Intolerant until above the browse line (use temporary fencing)**	**tolerant**	**FACU**
Aster divaricatus	**White Wood Aster**	**Intermediately Deer Resistance**	**tolerant**	
Thelypteris noveboracensis	**New York Fern**	**Deer Resistant**	**tolerant**	**FAC**
Polystichum acrostichoides	**Christmas Fern**	**Deer Resistant**	**tolerant**	**FACU**

Appendix H

Resolution to be enacted by a local governing body to ensure pollinator-friendly sump stewardship practices:

Whereas, the protection and planning of native pollinator access and usage of open space vegetation should be applied where possible and appropriate. Pollinators utilize vegetation within recharge basins, areas where vector management is often required due to standing water. As such, best management practices should be followed for recharge basin maintenance and any vector control operations.

Whereas, recharge basins (sumps) enable the diversion and collection of local precipitation into constructed depressions which allows infiltration and percolation of precipitation to replenish groundwater, safe management of stormwater runoff, minimize local flooding, and reduce downstream erosion. Recharge basins also improve water quality by collection of plastics, debris, fine silts and other materials not intended for direct discharge into water bodies.

Whereas, all recharge basins follow a number of discrete steps during design and are engineered specific to local hydraulic factors and rate of natural water recharge. Proper operation requires the basin to dry out as often as

possible between storm water events to minimize maintenance needs, and preserve functionality. Removal of built up refuse, debris, organics, and silts is regularly required to preserve the ability of collected waters to infiltrate and percolate into groundwater reservoirs for replenishment.

Whereas, the inability of a recharge basin to dry out leads to microbial growth, development of biofilms, and clogging of the soils matrix between particles. Thus further reducing the infiltrative and percolative ability of collected storm waters. This onset of standing waters allows mosquito, midge and other biting insects of public health importance to proliferate.

Whereas, the proliferation of mosquitoes, vectors of human disease, within the recharge basins requires suppression and control as per Suffolk County Charter §C8-4(B). Following data driven Integrated Pest Management (IPM) and best practices promoting environmental stewardship, the first and most effective method of mosquito suppression is source reduction. The elimination of standing water, removal and proper disposal of containers, such as plastic bottles, should be a primary maintenance objective where possible.

Resolved, that standing water will be minimized in recharge basins by conducting regular maintenance as per Geotechnical Design Procedure (GDP) -8, Design, Construction, and Maintenance of Recharge Basins, Revision #6, April 2022 by NYSDOT. Recharge basin property owner or agent thereof, under appropriate agreement, should complete regular assessment and maintenance where possible.

Resolved, these actions provide a united response for pollinator protection, access, and the reduction or removal of standing water, which will require less intensive management action to protect public health. Proper recharge basin maintenance will reduce the need for vector suppression activities within these locations, fostering a higher degree of environmental stewardship and further promote pollinator safety and health across Suffolk County.

Resolved, where possible, within recharge basins, pollinator-friendly low-lying vegetation should be planted as long as it does not interfere with proper GDP-8 NYSDOT, or other engineering, design or function guidelines.

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Next steps and recommendations

The Pollinator Pathway Task Force recommends that there be ongoing networking and continued dialogue that will facilitate the development and growth of pollinator gardens across Suffolk County. We anticipate participation from the community in adding gardens to the county's GIS tool. We hope to grow participation from Suffolk County and local town officials.

Training

- Municipal employees – While the included recommendations to create pollinator gardens can be used by homeowners and employees of schools, libraries, businesses and more, task force members will aim to fine tune recommendations for county, state and town highway departments. Slight modifications will be made that will focus on landscapes that are larger than the average homeowner's lawn.

    - Additional refinements would assist government bodies in establishing protocols and management practices that encourage the development of pollinator-friendly landscapes near government buildings, roadways and more. Recommended practices include:
        - A certain percentage of property to be left unmown;
        - Mowed grass not being cut as short as it has been in the past; and,
        - Certain spots designated to be left wild.
    - Task force members would assist government bodies in providing symposiums for employees.
        - Symposiums could begin with workshops either in person or on Zoom; and,
        - An additional workshop would be held in the field.
    - Benefits to municipalities include being more fiscally responsible.
        - Less gasoline is used;
        - There is reduced wear and tear on equipment; and,
        - A reduction in staff time spent on mowing and maintenance.

Enhancements to GIS tool

- The Pollinator Pathway GIS tool can be utilized for other tasks as more gardens are added, such as adding notifications that an area is lacking in a specific species of native plants.

Marketing and Media Outreach

- Suffolk County Legislature should promote the Pollinator Pathway initiative to encourage residents to help build a pathway to nourish bees, butterflies, birds, moths and other pollinators.
    - Posting to county social media pages on National Days dedicated to pollinators;
    - Sending press releases to local news outlets; and,
    - Attending civic association meetings to explain the Pollinator Pathway report to residents.