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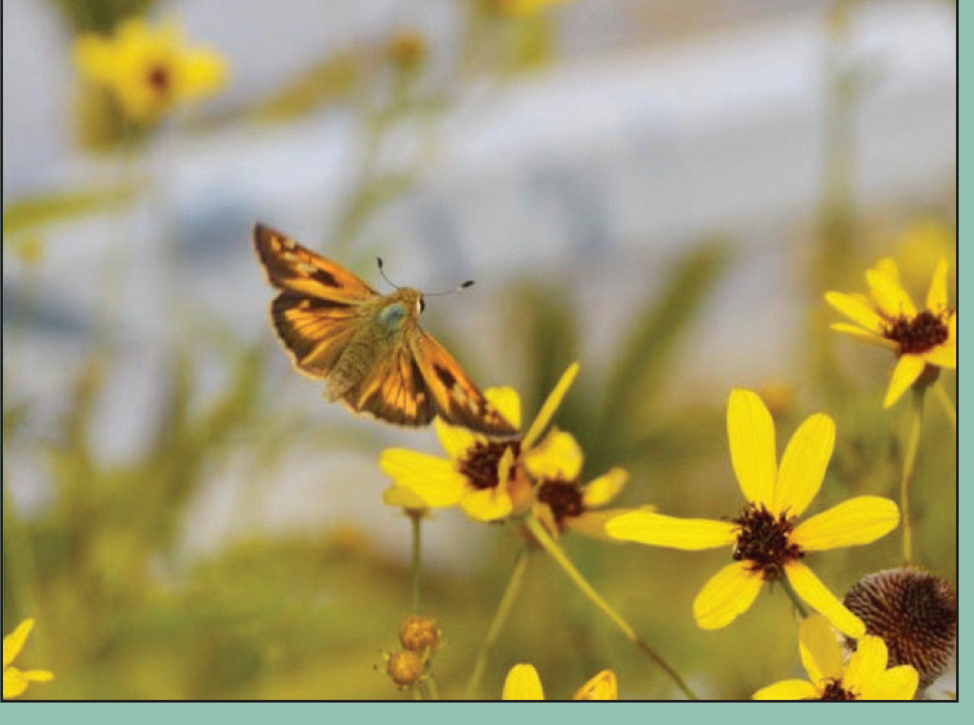

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Cover Photograph: Female Huron Sachem and Tall Tickseed (*Coreopsis tripteris* 'Gold Standard') at the Kingsland Wildflowers green roof complex, Newtown Creek, New York City. Butterfly identification by Sharon and Wade Wander. Photograph by Teri Brennan, used by permission.

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# Butterfly Survey at Newtown Creek, an Industrial Estuary in New York City

Erik Kiviat[1, *] and Lisa Bloodgood[2]

**Abstract** – Butterfly habitats, nectar plants, and larval hosts are infrequently studied in North American cities. We report a survey of butterflies in an urban-industrial area of New York City. Key habitats were an abandoned elevated railroad, green roof complex, community garden, and small patches of spontaneous vegetation elsewhere. We collected data from 2012 to 2024, including seven intensive one-day surveys April– October 2018–2019. We documented 23 butterfly species including the regionally uncommon taxa *Battus philenor* (Pipevine Swallowtail), *Phoebis sennae* (Cloudless Sulphur), *Euptoieta claudia* (Variegated Fritillary), *Libytheana carinenta* (American Snout), and *Atalopedes huron* (Huron Sachem). Nectar plants comprised common, spontaneous, native and non-native forbs as well as horticultural species planted on the green roofs. The abandoned railroad and green roof complex yielded the greatest diversity of butterflies including most of the rare species observations. We recommend that the railroad east of the Dutch Kills be protected in its unmanaged state as butterfly habitat, and that the railroad west of the Dutch Kills, proposed to be developed for recreation and other uses, be enhanced with appropriate plantings of butterfly host and nectar plants in concert with trail development. Disused railroads and green roofs elsewhere should be considered potential butterfly habitats.

## Introduction

The Newtown Creek system constitutes approximately 8 km of broad tidal channels, between northern Brooklyn and western Queens, in New York City. It is connected to the larger New York – New Jersey Harbor Estuary system and the Atlantic Ocean via the East River. Industrialization in the 1800s and 1900s drained and filled existing salt marshes, channelized the once meandering streams, truncated or buried tributaries, created nearly 18.9 km of hardened shoreline, and dredged the creek bottom (Anchor QEA 2018, NCNRDA 2024). Newtown Creek was designated an EPA Superfund site in 2010 due to legacy chemical pollution from industrial activities and ongoing contamination from an antiquated combined sewer system. Even small rain events cause untreated sewage and street runoff to be discharged into the waterway (NCNRDA 2024). Newtown Creek has relatively little freshwater input. For example, in September 2016, salinities ranging from 18 to 24 parts-per-thousand (ppt) were recorded (Calderón et al. 2017; for reference, salinity in the open Atlantic Ocean is ca. 35 ppt). The pollution of Newtown Creek includes high levels of petroleum hydrocarbons and heavy metals in addition to sewage-associated bacteria (Dueker 2012). These alterations have made Newtown Creek emblematic of urban-industrial estuaries, yet the impacts of its pollution and alteration on neighboring upland habitats have not been studied.

Industrial areas are often assumed to support depauperate biotas, and surveys, if conducted at all, are typically expected to find only a few common species. However, the flora of New York City overall is species-rich (Atha and Boom 2018; Moore et al. 2002), and many native and introduced plant species thrive in highly altered or artificial habitats (Gil-

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bert 1989, Kiviat and Johnson 2013). The butterfly fauna of the city is also rich (Kiviat and Johnson 2013, Matteson and Roberts 2010), presumably because of the panoply of host and nectar plants, diverse microclimates, and varied habitats in the large region with numerous greenspaces. Many butterfly species can occupy small areas of habitat that have the correct host and nectar plants (Hardy and Dennis 1999). Because of ongoing conservation and restoration efforts at Newtown Creek and the potential for remediation of contamination with associated habitat restoration (Anchor QEA 2018, NCNRDA 2024), the biota of the creek and its vicinity is of great interest.

Cities typically have a high plant diversity, and high human population density is positively correlated with high plant species richness, usually because of the addition of nonnative species to the native species assemblage (Kowarik 2011). Despite the associated negative connotations, industrial and post-industrial areas can be important habitats, including in and near New York City (Kiviat and Johnson 2013, Kiviat and MacDonald 2022). They are managed with a variety of regimes, including no active management, and exist in a range of soil and vegetation development. Yet the relationship between plant diversity and lepidopteran diversity in urban settings remains poorly understood, as do the negative or positive effects of nonnative host and nectar plants. In California, 34% of 236 butterfly species oviposit or feed on nonnative plants (Graves and Shapiro 2003). In New York City Parks, nonnative species comprised 7 of 10 plants most-used by butterflies for nectaring or resting (Giuliano et al. 2004). In small urban gardens of the Netherlands, vegetation cover and plant species richness were the principal correlates of insect species richness, with the proportion of native plants uncorrelated with richness (Morpurgo et al. 2024). In an English city, butterfly species occurrence was more closely related to the presence of nectar plants than the presence of host plants (Hardy and Dennis 1999) because butterflies tend to be nectar generalists and host specialists. Habitat fragmentation is an important problem for urban butterflies, despite their mostly good-to-excellent dispersal abilities (Pietrzak 2023) and many species thrive in small patches with the needed plants (Hardy and Dennis 1999).

Biodiversity, the variety in nature from genes and populations to ecosystems and regions, is an important indicator of resilience (i.e., ability to recover from ecological disturbance). Biodiversity is also used as a proxy for ecosystem function because higher biodiversity usually indicates greater overlap in species function, making ecosystems more resilient. Urban ecosystems commonly suffer from the assumption of low biodiversity and conservation value (Soanes 2019), but plants adapted to frequent disturbance, soil drought, contamination, and other stressors, including some rare native species, can thrive in these environments (Schwartz et al. 2013). Much urban biodiversity depends on the nature, use, and management of urban greenspaces (Aronson et al. 2017).

The project we report here documented both plant and butterfly species within approximately 100 m of the entire Newtown Creek shoreline. This paper focuses on the butterflies. Surveying butterflies can yield information useful for monitoring and understanding the human environment as well as conserving insects and other wild organisms (Pollard and Yates 1994). Monitoring insect populations is especially critical given recent data indicating taxonomically and geographically broad declines (Montgomery et al. 2020). Indeed, butterfly abundance declined 22% in just the first two decades of the current century, with 13 times as many species declining as increasing (Edwards et al. 2025). Our study will help optimize the remediation, restoration, and conservation of the Newtown Creek area by providing more detailed, site-specific information about the biota present, improve the management of pollinator resources, and inform future restoration at Newtown Creek (RNCA 2018) and other urban-industrial environments.

## Methods

### Study Area

The highly urbanized waterway banks comprise historic, linear wetland fill and are variably hardened with rock riprap, demolition debris, timber cribbing, concrete seawalls, piles of scrap materials, and active rail infrastructure. Vegetation ranges from sparse grasses and forbs to dense stands of shrubs and trees. A series of large cemeteries and city parks stretches eastward from Newtown Creek with gaps of ca. 400–1000 m separating them. The closest cemetery extends within 100 m of the creek. The mouth of Newtown Creek on both shores is undergoing development of waterfront parks and construction of skyscrapers. The core study area extended approximately 100 m either side of the mainstem of Newtown Creek and its tributary branches (Fig. 1). We included areas beyond the 100 m boundary: 1. The abandoned elevated railroad trestle that crosses the Dutch Kills tributary had diverse and locally lush ruderal flora and yielded many butterfly observations, thus we included in the butterfly survey area the entire segment of the railroad for 250 m east of the Dutch Kills and paralleling the mainstem of Newtown Creek, and for 550 m west of the Dutch Kills where the railroad swings northward and has a Y-shaped end adding another 150 m for a total of 700 m of elevated railbed or an area of ca. 19,000 $m^2$ of woodland and waste ground habitat including woody vegetation adjoining the railroad; 2. Smiling Hogshead Ranch, ca. 2700 $m^2$ of vegetable and flower gardens with a similar area of woodland adjacent to the north end of the railroad west of the Dutch Kills, bordered by Skillman Avenue, Pearson Place, Davis Court, 49th Avenue, commercial buildings, and the rail corridor; 3. The Kingsland Wildflowers green roof complex covering ca. 2200 $m^2$ at 520 Kingsland Avenue, Brooklyn, installed 2016–2019 on the shore of the creek (https://www.kingslandwildflowers.com/) - the roof was planted with a long list of native and nonnative plants; 4. Hunter's Point South Park on the East River ca. 300 m north of the mouth of Newtown Creek (included for iNaturalist records only). There is little information published about butterflies occurring on green roofs (Nestory 2018) or along railroads (Dylewski et al. 2022, Kalarus and Bąkowski 2015) despite the potential ecological significance of these environments. Pietrzak (2023) suggested butterfly dispersal occurs along urban rail corridors. The northwestern ends of the railroad lacked the bordering trees and had fewer species of nectar plants. These additional sites vary in terms of soil type, substrate quality and depth, management history, and proximity to other greenspaces. Because the habitat units surveyed adjoin other habitats (e.g., small groves of trees adjoining parts of the railroad), the abovementioned habitat areas should not be compared quantitatively.

### Survey Methods

We surveyed butterflies on mostly sunny (ca. 0–50% cloud cover), warm (ca. 21–29 C), calm (mostly Beaufort 0–3 wind speed near the ground) days by walking slowly through areas with nectar plants in flower, focusing on the abandoned railroad, observing at flowers in the community garden enclosure, and watching the green roof complex. Survey effort was not evenly distributed among these areas and was often opportunistic. Additional butterfly records were obtained from iNaturalist (iNaturalist.org) for the Newtown Creek corridor and vicinity.

Preliminary field work to determine the feasibility of biological surveys was conducted by EK in August and October 2012. Butterfly observations were recorded during botanical work by LB and Elise Heffernan every 2–3 weeks on about 40 days October–November 2017 and April–September 2018. The preliminary reconnaissance and the botanical survey identified areas suitable for butterfly field work. Surveys (EK) continued in 2019 with sole focus on butterflies and their nectar plants. On 30 April, 24 June, 29 August 2018, and 12 June, 25 July, 17 September, 10 October 2019, EK concentrated on observations of butterflies and nectar plants in the key areas mentioned; this constituted the most focused survey work. LB observed the green roof habitat opportunistically but frequently, photographing butterflies during and after the dates of our primary survey period.

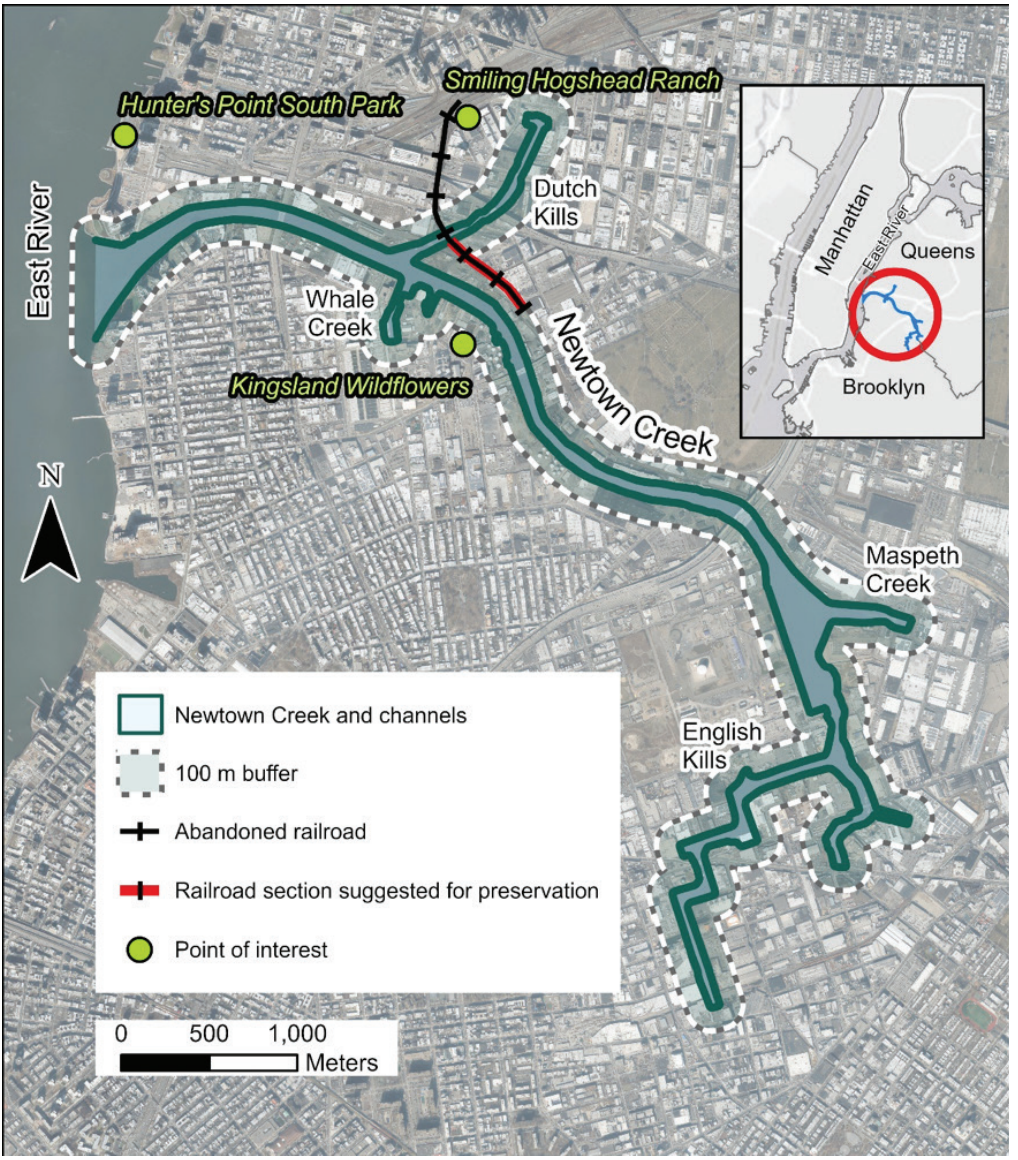


Figure 1. Map showing the mainstem and tributaries of the Newtown Creek estuary in Brooklyn and Queens, New York City. Newtown Creek is an eastern tributary of the East River and extends from lower right to upper left on the map. The entire creek system is tidal with reversing currents. (Map prepared by Lea Stickle. Background imagery from New York State GIS Clearinghouse.)

We identified and noted flowers visited by butterflies whenever these visits were observed. Plant identification was based on our prior experience with northeastern ruderal plants and standard identification references such as Gleason and Cronquist (1991). Scientific names of wild plants follow Werier et al. (2025). We referred to Glassberg (1993) and Cech and Tudor (2005) for the identities of northeastern host plants shown in Appendix A. Whenever possible we photographed the butterflies we observed. Digital photographs are archived at Hudsonia (EK) and on iNaturalist (LB). Scientific names with authorities of butterflies observed are in Appendix A. We identified butterflies in the field and in our photographs using Glassberg (1993) and other regional butterfly literature.

## Results

A total of 23 butterfly species was identified (Appendix A). Key butterfly habitats included the abandoned railroad embankment east and west of the Dutch Kills, the small patch of semi-natural habitat on the east side of the Dutch Kills between the two railroads, an adjoining stand of Blackberry, Knotweed, and Poison-ivy on the north side of the active railroad just east of the Dutch Kills, the Smiling Hogshead Ranch community garden and woodland, and the Kingsland Wildflowers green roof complex. Despite modest species counts, we observed 5 species that are uncommon or rare in the region: Huron Sachem, Variegated Fritillary, Pipevine Swallowtail, Cloudless Sulphur, and American Snout. Huron Sachem (formerly known as "Sachem") occasionally irrupts into the New York City region (Glassberg 1993), and this may have occurred in 2025 when LB (pers. obs.) found them regularly near the Newtown Creek study area. American snout is an uncommon or rare resident associated with Hackberry (*Celtis occidentalis*), an urban-tolerant small tree. Pipevine Swallowtail could breed locally if there is a sufficient amount of a host plant (certain Aristolochiaceae) in gardens (see https://www.inaturalist.org/observations/218223151 for a local record of an ornamental *Aristolochia*), or could be a vagrant from the New Jersey Palisades or elsewhere. Variegated Fritillary and Cloudless Sulphur are southern vagrants. In some years, Variegated Fritillary is common in southern coastal New Jersey and an Orange County, New York, location. The species sometimes breeds locally but does not overwinter (Gochfeld and Burger 1997).

The nectar plant records (Appendix B) suggest that common, ruderal, nonnative and native plants, such as these species, may be important nectar plants in urban areas (see Cech and Tudor 2005).

## Discussion

The butterfly fauna documented at Newtown Creek represents a small subset of the broader New York City assemblage (87 species in a 9-year period, Matteson and Roberts [2010]). However, New York City includes much larger, more floristically diverse, and more "natural" greenspaces, especially on Staten Island (Kiviat and Johnson 2013), which support some butterfly species unlikely to occur in a densely built industrial area like Newtown Creek. Butterfly taxa that were particularly underrepresented in our study included skippers, fritillaries, and satyrids, among others. These groups may be less urban-tolerant than the species we observed. A 3-year survey of 18 community gardens in the central Bronx and East Harlem found 24 butterfly taxa (Matteson and Langellotto 2010). Their list and ours share 17 taxa (Appendix A), not counting Orange Sulphur and Clouded Sulphur which Matteson and Langellotto combined. Our list contains 3 species (Variegated Fritillary, Pipevine Swallowtail, Cloudless Sulphur, all vagrants) not found by Matteson and Langellotto; their list contains 5 species (Common Checkered Skipper, Hobomok Skipper, an unidentified skipper, Great Spangled Fritillary, Spicebush Swallowtail) not on our list. Matteson and Langellotto listed Spring Azure but our 25 July record would suggest Summer Azure (Glassberg 1993). However, D'Ercole et al. (2024) concluded from genetic data that all U.S. *Celastrina* are conspecific.

A comparison with the New Jersey Meadowlands butterfly fauna (Kiviat and MacDonald 2022) may be instructive, as both sites are largely highly altered estuarine wetlands and wetland fill. The Meadowlands cover a much larger area and a longer study period, and include some species no longer found there. Both lists lack or virtually lack fritillaries (and their violet host plants), and both lists contain northward wanderers that may be colonizing.

A global review of urban butterfly studies concluded that most research found butterfly abundance and species richness reduced in urban areas (Ramírez-Restrepo and MacGregor-Fors 2017). In the U.K., butterfly species are declining more rapidly in urban than in rural areas (Dennis et al. 2017). A one-season survey of 10 urban riverside greenspaces along a single river in Fuzhou City, China, documented 28 species of butterflies (Fang et al. 2023). Another one-season survey of greenspaces in a 4-ha university campus in Japan yielded 25 species (Nagase et al. 2019). Yet different urban boundaries, proportions of greenspace, and variable delimitation of study areas make biotic comparisons among surveys only approximate (see Hardy and Dennis 1999).

Among environmental factors potentially adverse to butterflies at Newtown Creek are the loss and fragmentation of certain habitats, absence or scarcity of many host and nectar plants (Chowdhury and Soren 2011), heavy road and ship traffic, lack of natural unpolluted soils, and airborne sewage-derived bacteria. Sewage-associated bacteria, including many human pathogens, are aerosolized during artificial aeration of Newtown Creek water, and such bacteria can move inland substantial distances (Dueker et al. 2012). While some of these organisms are human pathogens, some could be pathogens of insects, and this merits investigation. We saw little butterfly activity in habitats affected by Newtown Creek tides, presumably due to water pollution and high salinity.

The various habitats surveyed, green roof, community garden, abandoned railroad, and pockets of shoreline vegetation, contributed to the butterfly species list. For example, of the vagrants recorded, pipevine swallowtail and cloudless sulphur were on the railroad, whereas variegated fritillary was on the green roof. Only the community garden lacked unique species. Besides supporting nectar plants, the railroad may have acted as a movement corridor or an interceptor of butterflies flying in a cross direction. Railroads are not well studied butterfly habitats (but see Dylewski et al. 2022, Kalarus and Bąkowski 2015). Given the occurrence of a number of species on the railroad at Newtown Creek, this and other railroads may be serving as corridors inasmuch as they connect widely across the New York metropolitan region although some rail segments have little vegetation. Abandoned railroads are common in urban areas and their biodiversity functions should be studied prior to conversion to recreational or other uses. How butterflies reached the green roof complex relatively quickly (a year or two) after installation is unclear. Dispersal may occur via the nearby cemeteries and parks and along the partially vegetated banks of the creek system. In the Japan campus study, the community garden was important butterfly habitat, and the green roof less so (but the roof was much higher than the green roofs at Newtown Creek) (Nagase et al. 2019).

Host plants missing or scarce in the Newtown Creek corridor include violets (for fritillaries), and *Carex* sedges and many grasses (Poaceae) (for many skippers and others, despite a large stand of *Schizachyrium scoparium*, Little Bluestem, on the northwestern ends of the railroad). Largely-missing habitats include wetland and woodland, both scarce and in small fragments. The narrow belts of trees along portions of abandoned railroad at Newtown Creek evidently are sufficient to support woodland-associated species such as the Question Mark, although others, including Mourning Cloak and Eastern Comma, are apparently absent. There are virtually no sedges at the Newtown Creek corridor, and a limited assemblage of weedy grasses, which may limit resources for many skippers. Nectar plants, on the other hand, seem moderately abundant and sufficient for the extant butterfly assemblage. There were nectar plants in flower at each of our visits, often in abundance, although at the early and late survey dates the diversity and abundance of flowers was markedly lower. The apparent urban-sensitivity of butterfly taxa such as the fritillaries may be more the urban-sensitivity of their larval hosts or possibly nectar plants.

As is the case in many urban-industrial environments, diverse habitats are present at Newtown Creek. We documented 17 butterfly species associated with the abandoned railroad, 7 at small patches of spontaneous vegetation off the railroad, 12 at the green roof, and 4 at the community gardens. Because of high salinity, industrial activities, hardened shores, and contaminated water, there are virtually no intertidal vascular plants in Newtown Creek. We did not observe mud-puddling in the estuary and potential puddling spots were extremely limited elsewhere in the study area. Given the salinity, butterflies may be able to obtain sodium from exposed areas of the intertidal zone, although marine puddling has been reported infrequently (John and Tennent 2012). The small patches of spontaneous vegetation on and near the shorelines supported nectar and probably host plant resources for certain species.

Little has been published about butterfly use of small urban fragments. Urban gardens are well-studied as habitat for butterflies and other insects (Matteson and Langellotto 2010). Smiling Hogshead Ranch is an example, largely due to companion plantings such as marigold as well as the presence of trees. We spent little time observing there because of the distance from Newtown Creek proper, and we surely missed additional butterfly species. Green roofs vary in their capacity to attract flying insects. The Kingsland Wildflowers green roof complex attracts moderate numbers and fairly diverse species of butterflies. Extensive area and diverse planted forbs with showy flowers (ca. 55 species of plants installed) contribute to the quality of butterfly habitat. Distances between key habitat areas – community garden, railroad, and green roofs – are small enough that strong flyers such as Monarch and Tiger Swallowtail may be able to use combinations of resources from multiple sites.

The linear character of the railroad corridor and the similar nature of Newtown Creek itself may be environmental features that intercept vagrants as well as features that act in and of themselves as movement corridors. Perhaps some of these butterflies fall out or stop over on the railroad, green roof, or elsewhere nectar is plentiful. Observations of vagrant or irruptive species occurred in mid-to-late summer on the railroad (Pipevine Swallowtail, Cloudless Sulphur) and green roof (Variegated Fritillary, Huron Sachem). Vagrancy in butterflies may allow populations to discover and use small habitat fragments (Hardy and Dennis 1999). The railroad and green roof complex may represent relatively large "targets" for dispersing species. Abandoned railroads (Dylewski et al. 2022) may have warm microclimates attractive to butterflies and their nectar flowers. Although green roofs are cooler than conventional flat roofs (Fleck et al. 2022), green roofs nonetheless may have warm microclimates favorable to butterflies.

Disused industrial areas are often redeveloped for new industry or for residential buildings. Such areas in their abandoned state can serve as important butterfly habitats (Cech and Tudor 2005). The remediation and development of many such *brownfields* is an important economic venture. Relatively few post-industrial areas are remediated for contamination and then dedicated as parks or nature preserves. Many abandoned railroads are being developed as rail trails. The most prominent example in New York City is the High Line, a carefully landscaped pedestrian path in Manhattan. We recommend that new creation of urban or rural rail trails include assessment of flora and flower-visiting insects prior to trail design, and that leaving at least half the width of the railbed and verges for spontaneous wild biota is appropriate in many cases. Wide railroad verges with diverse herbaceous flora and warm, dry microclimates are good butterfly habitats (Kalarus and Bąkowski 2015). Specifically we recommend that the segment of the abandoned railroad east of the Dutch Kills, with adjacent vegetation, be preserved as habitat in its current unmanaged state without recreational development. The railroad in its wild state can continue to accommodate informal pedestrian use. We also recommend that the portion of the railroad west of the Dutch Kills, which is proposed for development for recreation and other human uses (the Dutch Kills Loop, https://dutchkillsloop.org/ ), retain half of its area for butterfly habitat with the addition of substantial plantings of urban-tolerant, native, host and nectar plants (the current proposal lacks a biodiversity component [Hunter 2021]). In addition to preservation of much of the existing vegetation, including the little bluestem area at the northwestern terminus and much of the weedy native and nonnative forb vegetation now present, key selected butterfly host and nectar plants could be added or increased. Plants should be selected for season-long, overlapping flowering periods as well as self-maintenance and tolerance of local conditions. High quality, native candidates for such plantings include Common Milkweed (*Asclepias syriaca*), Hemp Dogbane (*Apocynum cannabinum*), Seaside Goldenrod (*Solidago sempervirens*), and Needle Beggar-ticks (*Bidens bipinnata*). Railroad verge habitats should be mowed every 2-3 years to hinder overgrowth by woody plants (Kalarus and Bąkowski 2015), in rotation such that extensive habitat is always suitable for butterflies.

Finally, examination of the Newtown Creek neighborhood should reveal strategic locations where establishment of plantings or enhancement of existing vegetation may provide stepping stone habitats or satellite habitats related to the major butterfly habitats documented here. Such vegetation management is in progress at a recently established park, Under the K Bridge Park, 0-0.65 km from the mainstem of Newtown Creek on its southwest side beneath the Brooklyn-Queens Expressway (LB, unpublished data). Many restoration and park projects are proposed for the Newtown Creek vicinity (RNCA 2018), and there are ample derelict areas to allow enhancement and creation of habitats for butterflies, their nectar and host plants, and other urban-tolerant organisms.

We also recommend that the Newtown Creek study area be considered for the establishment of an annual Fourth of July Butterfly Count. Existing count areas in the U.S. skew strongly toward rural environments and a count in an urban-industrial area such as Newtown Creek would provide a valuable comparison. The recommendations presented here may contribute to the broader "insect awareness" that Pyle (1976) considered essential.

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Appendix A. Butterflies documented in the Newtown Creek (New York City) study area. Status = abundance in New York City region, from Glassberg (1993): A= Abundant, C= common, U= uncommon, R= Rare, S= Stray, L= Locally. Hab.= Habitat: C= Community garden, G = Green roof, P= Patch of habitat elsewhere in study area, R= Railroad. Dates are when a species was observed in the study area.

| Common name | Scientific name | Status | Hab. | Dates | Larval host plant* |
|---|---|---|---|---|---|
| | Hesperiidae | | | | |
| Huron Sachem | *Atalopedes huron* W.H. Edwards, 1863 | S | CGP | 29Aug18, 11Sep, 17Sep19, 9Jul21, 1Jun24 | Bermuda Grass (*Cynodon*), Crabgrass (*Digitaria*) |
| Silver-spotted Skipper | *Epargyreus clarus* Cramer, 1775 | C-A | R | 25Jul19 | Black Locust (*Robinia pseudoacacia*), False-indigo (*Amorpha fruticosa*) |
| Common Sootywing | *Pholisora catullus* Fabricius, 1793 | C | GP | 3Jun18, 8May19, 6Jun19, 11Oct20, 25Jun21 | Pigweed (*Chenopodium album*), others |
| | Lycaenidae | | | | |
| Azure | *Celastrina* sp.? | | PR | 31May19, 25Jul19 | Many species? |
| Eastern Tailed-blue | *Cupido comyntas* Godart, 1824 | C-A | P | 16Sep18 | Legumes (Fabaceae), others |
| Gray Hairstreak | *Strymon melinus* Hübner, 1818 | U-C | R | 17Sep19 | Many species |

Appendix A cont. Butterflies documented in the Newtown Creek (New York City) study area. Status = abundance in New York City region, from Glassberg (1993): A= Abundant, C= common, U= uncommon, R= Rare, S= Stray, L= Locally. Hab.= Habitat: C= Community garden, G = Green roof, P= Patch of habitat elsewhere in study area, R= Railroad. Dates are when a species was observed in the study area.

| Common name | Scientific name | Status | Hab. | Dates | Larval host plant* |
|---|---|---|---|---|---|
| Red-banded Hairstreak | *Calycopis cecrops* (Fabricius, 1793) | LU-LC | G | 6Aug21 | Winged Sumac (*Rhus copallina*) |
| | Nymphalidae | | | | |
| Monarch | *Danaus plexippus* Linnaeus, 1758 | U-A | GPR | 8Aug12, 10Oct17, 14-15Jul18, 1Aug, 8Aug, 29Aug18, 1Sep18, 25Jul, 4Sep19, 17Sep19, 31Oct19, 20Sep20, 8Jun24, 19Jun24 | Common Milkweed (*Asclepias syriaca*), Butterfly Milkweed (*A. tuberosa*; larvae observed) |
| Variegated Fritillary | *Euptoieta claudia* Cramer, 1775 | R | GP | 17Jul19, 26Jul, 18Sep21 | Violets (*Viola*), stonecrops (*Sedum*), Purslane (*Portulaca oleracea*) |
| Buckeye | *Junonia coenia* Hübner, 1822 | R-C | CGR | 25Jul, 17Sep19 | Plantain (*Plantago*), Butter-and-eggs (*Linaria vulgaris*) |
| American Snout | *Libytheana carinenta* Cramer, 1777 | LR | R | 12Jun, 25Jul19** | Hackberry (*Celtis occidentalis*) |
| Pearl Crescent | *Phyciodes tharos* Drury, 1773 | A | GR | 29Aug18, 17Sep19 | Asters (Astereae) |

Appendix A cont. Butterflies documented in the Newtown Creek (New York City) study area. Status = abundance in New York City region, from Glassberg (1993): A= Abundant, C= common, U= uncommon, R= Rare, S= Stray, L= Locally. Hab.= Habitat: C= Community garden, G = Green roof, P= Patch of habitat elsewhere in study area, R= Railroad. Dates are when a species was observed in the study area.

| Common name | Scientific name | Status | Hab. | Dates | Larval host plant* |
|---|---|---|---|---|---|
| Question Mark | *Polygonia interrogationis* Fabricius, 1798 | U | PR | 5Oct18, 12Jun, 25-26Jul, 17Sep19 | Elms (*Ulmus*), Nettles (*Urtica*), Hackberry |
| Red Admiral | *Vanessa atalanta* Linnaeus, 1758 | C-A | PR | 8Aug12, 26Apr, 30Apr18, 4May, 2Jun, 22Jun, 25Jul19 | Nettles, Pellitory (*Parietaria*), Hops (*Humulus*) |
| Painted Lady | *Vanessa cardui* (Linnaeus, 1758) | R-U | G? P | 10Oct17, 24Jun18, 11-12Jun19 | Thistles (*Cirsium*), others |
| American Lady | *Vanessa virginiensis* Drury, 1773 | C | R | 11May, 16May, 19May, 12Jun, 25Jul19 | Aster family (Asteraceae) spp. |
| | Papilionidae | | | | |
| Pipevine Swallowtail | *Battus philenor* Linnaeus, 1771 | R-LC | R | 25Jul19 | Pipevine (*Aristolochia*) (see text) |
| Eastern Tiger Swallowtail | *Papilio glaucus* Linnaeus, 1758 | C | GPR | 7Jun18, 12Jun19 | Black Cherry (*Prunus serotina*) |
| Black Swallowtail | *Papilio polyxenes* Fabricius, 1775 | C | CGPR | 29Jun18, 29Aug18, 22May19, 11Jul, 25Jul, 17Sep19, 7Jul20 | Parsley family (Apiaceae) spp. (larva observed on *Zizia* on G) |

Appendix A cont. Butterflies documented in the Newtown Creek (New York City) study area. Status = abundance in New York City region, from Glassberg (1993): A= Abundant, C= common, U= uncommon, R= Rare, S= Stray, L= Locally. Hab.= Habitat: C= Community garden, G = Green roof, P= Patch of habitat elsewhere in study area, R= Railroad. Dates are when a species was observed in the study area.

| Common name | Scientific name | Status | Hab. | Dates | Larval host plant* |
|---|---|---|---|---|---|
| Orange Sulphur | *Colias eurytheme* Boisduval, 1852 | C-A | GPR | 11Sep19, 17Sep19, 21May22 | *Medicago*, other legumes (Fabaceae) |
| Clouded Sulphur | *Colias philodice* Godart, 1819 | C-A | GR | 17Sep, 25Sep19 | Clover (*Trifolium*), other legumes |
| Cloudless Sulphur | *Phoebis sennae* Linnaeus, 1758 | R | R | 17Sep19 | Sennas (*Cassia* spp.; not found in our study) |
| Cabbage White | *Pieris rapae* Linnaeus, 1758 | A | CPR | 10Oct, 28Oct17, 24Jun18, 6Jul18, 29Aug18, 12Jun, 15Jun, 25Jul19, 14Jun, 7Aug22 | Mustard family (Brassicaceae) |

* Among known host plant species, these are the plants we infer support each butterfly species in the Newtown Creek area. It is likely that some butterflies (e.g., Pipevine Swallowtail, Variegated Fritillary) migrate or stray through the study area as adults and do not reproduce there.

** There were 3 additional observations of American Snout at Newtown Creek 25-26 July 2019 (iNaturalist).

Appendix B. Nectaring records from the Newtown Creek corridor (EK and LB observations, this survey). See Appendix A for scientific names of butterflies.

| Butterfly | Nectar plants observed |
| --- | --- |
| Hesperiidae | |
| Huron Sachem | *Calystegia sepium, Cirsium vulgare, Conoclinium coelestinum, Echinacea purpurea, Eupatorium serotinum, Tagetes erecta* |
| Common Sootywing | *Symphyotrichum* |
| Lycaenidae | |
| Azure | *Ampelopsis glandulosa, Daucus carota* |
| Gray Hairstreak | *Eupatorium serotinum* |
| Red-banded Hairstreak | *Solidago* |
| Nymphalidae | |
| American Lady | *Daucus carota* |
| American Snout | *Daucus carota, Rubus, solidago* |
| Buckeye | *Daucus carota, Symphyotrichum, Eupatorium*, Lamiaceae sp. |
| Monarch | *Buddleja, Cirsium vulgare, Reynoutria japonica, Solidago sempervirens* |
| Red Admiral | *Echinacea purpurea, Monarda, Prunus* (nonnative) |
| Painted Lady | *Rubus* |
| Pearl Crescent | *Eupatorium serotinum, Reynoutria japonica* |
| Variegated Fritillary | *Liatris* |

Appendix B. Nectaring records from the Newtown Creek corridor (EK and LB observations, this survey). See Appendix A for scientific names of butterflies.

| Butterfly | Nectar plants observed |
| --- | --- |
| Papilionidae | |
| Eastern Tiger Swallowtail | *Hemerocallis* |
| Black Swallowtail | *Lonicera japonica, Tagetes erecta,* Asteraceae |
| Pieridae | |
| Cabbage White | *Ageratina altissima, Asclepias syriaca, Bidens bipinnata, Cirsium vulgare, Eupatorium*, *Melilotus alba* |
| Orange Sulphur | *Bidens bipinnata*, *Conoclinium coelestinum* |