Wild NYC: Building Biodiversity in Fresh Kills and City Parks

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Wild NYC: Building Biodiversity in Fresh Kills and City Parks

By: melissa zavala

A dissertation submitted to the Graduate Faculty in Anthropology in partial fulfillment for the degree of Doctor of Philosophy, The City University of New York

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This manuscript has been read and accepted for the Graduate Faculty in Anthropology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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THE CITY UNIVERSITY OF NEW YORK
Abstract

Wild NYC: Building Biodiversity in Fresh Kills and City Parks
by
melissa zavala

Adviser: Professor Michael Blim

This dissertation is an anthropological field study of the work of urban ecological maintenance being conducted in New York City through the analysis of the reclamation and biotic restoration of the Fresh Kills landfill, located in the borough of Staten Island. This landfill was once the largest urban dump in the United States. Its 2,200 acres of trash buried in four mounds have polluted an area historically noted for its natural beauty as a collection of marshes and woodlands bordering the Kill Van Kull, a tidal strait that flows into the New York Harbor. The current plan for park and nature reserve introduces rolling grassland habitats otherwise extirpated in the region and re-introduces native plants to enhance the area’s biotic diversity. The site’s large acreage will also link up with and expand the Staten Island Greenbelt. Fresh Kills, once transformed, will become one of the largest urban nature preserves in the city.

This dissertation also explores the essential maintenance work performed by researchers, city workers, and volunteers alike for creating and preserving wild spaces in New York City. Despite the ecological benefits envisioned in the Fresh Kills conversion, there are challenges ahead for implementing sustainability. Chief among them is the scarce funding for land reclamation in light of competing urban priorities. The substantial commitment to convert the world’s largest landfill into an urban park and nature preserve, however, holds important lessons for public and non-profit agencies interested in urban environmental improvement.
Acknowledgements

As many times as the phrase “this work could not have been possible without the help of many people” is repeated, its truth resonates especially when completing one’s own work. Banal conveniences like the internet seem too commonplace to warrant mention, but even when conducting fieldwork at home (a practical convenience), I was constantly reminded of just how much Google and its maps have improved fieldwork and everyday life. Thanks to their maps, street satellite images, and suggested directions, I saved hours of commuting time—already lengthy given the distance between my home borough and my field site. And on the subject of commuting, because this study is about urban infrastructure, it is only right to acknowledge the everyday services and conveniences that have made this research possible. Thanks are then due to the DOT and MTA for keeping the invaluable transportation system that keeps this great and complicated city running. I am thankful to not have to drive and my bibliography benefited from the time spent on trains, buses and ferries for three years. Thanks must also go especially to DSNY for their hard work keeping the city clean and to Parks for making it more hospitable to humans and non-humans alike. Without these city services, NYC would be vastly diminished.

Beyond conveniences for navigating and services for maintaining cities, the support offered by people in their varying forms is especially appreciated. I want to give special thanks to Dr. Ekaterina Pechenkina for her stellar lectures in physical anthropology where I was able to learn about some of the evolutionary processes that would become prominent in my fieldwork, albeit mainly in the case of plants. Prof. Larissa Swedell was also very gracious for letting me sit in her Primates class where I learned about Primate ecological niches and to a lesser extent those of other animals as well. Thanks to them, I came to better understand biological concepts that initially felt foreign to me but have helped me make sense of the natural world. Thanks also to Miki Makihara and Gregory Johnson. Prof. Tom McGovern was very supportive of my interest in historical ecology and archaeological methods. His lectures in historical ecology as well as his readings have really shaped the way I look at landscapes and I am especially grateful to him for teaching me about the evident “changes to the land” (to borrow a phrase from Bill Cronon) that are easy to miss unless one is looking at a place using a long historical lens.

In addition to the faculty members in Physical Anthropology, Archaeology and Sociolinguistics, faculty in Cultural Anthropology have also provided valued guidance. Melissa Checker greatly enhanced my familiarity with the literature on environmental justice movements in the U.S. Marc Edelman taught me a great deal about Latin America as a region and I am thankful to him on a personal level for sharing his knowledge of and love for Central America. The independent study he agreed to lead with a small group of us as we finished course work has been a significant learning experience for me while at the Graduate Center. Ida Susser’s ethnographic work in NYC and her attention to neighborhoods served as an early model for me as I switched geographic regions and grappled with the place that would become my field site, an unfamiliar NYC borough. Julie Skurski and the dissertation workshop in the spring of 2012 were helpful in getting me started on writing after being in the field for a couple of years.
Many thanks to the Office of Educational Opportunity and Diversity Programs for the Magnet Program and their financial support while I completed coursework, and to other administrative offices including the IRB Office and the Office of Research and Sponsored Programs. Thanks, Alida Rojas, Kay Powell, Nichol Gallimore, and Hilry Fisher from those various offices. Thanks also to Judy Waldman for help with depositing. Another administrative person deserves special thanks: the ever-helpful and wise Ellen DeRiso. She has offered strategic and friendly advice throughout the years and has virtually held my hand as I have forgotten how to navigate procedures that after so many years should have been easy enough [but never were]. Whether it was to help me understand the administrative ins and outs, policies, taking a leave of absence, or helping me re-register upon returning from a leave, etc., Ellen has been there to help, providing me a laugh as she laughed along with me. Thank you for all you do for everyone, Ellen!

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Beyond the GC community at large, I also wish to thank a few faculty members in other schools. David George Haskell at Sewanee-The University of the South sent great reading suggestions to an unknown student who tweeted him about his book. I am grateful for his friendly and generous exchange with me and I am glad he has written a book on his patch of the forest which has helped me see my neighboring woodlands in more intimate ways. In addition, the ecological anthropologist A. Peter Vayda at Rutgers University agreed to meet with me and talk about all things ecological anthropology. A lunch meeting turned into an entire afternoon of fruitful discussion and stimulating reading thanks to his including me in his email list. Lee Cronk, also at Rutgers, taught me a lot about human ecology, the very valuable anthropological work not taught at the Grad Center. I am very grateful to have had the opportunity to learn from him. Robin Nagle at New York University was extremely helpful in orienting me as I prepared to tackle fieldwork, a process initially riddled with mystery for me. I am especially appreciative to her for providing me extensive and careful feedback based in her broad knowledge of city agencies, waste, and other topics besides.

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List of Acronyms

ALB: Asian Longhorn Beetle
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act
CSI: College of Staten Island
CUNY: City University of New York
DEC: Department of Environmental Conservation
DED: Dutch Elm Disease
DEP: Department of Environmental Protection
DOT: Department of Transportation
DSNY: Department of Sanitation of New York
EAB: Emerald Ash Borer
EPA: Environmental Protection Agency
ICLEI: International Council for Local Environmental Initiatives
LULU(s): Locally Unwanted Land Use
MC: Master Composter(s)
MTA: Metropolitan Transportation Authority
MTS: Marine Transfer Stations
NAV: Natural Areas Volunteers
NRG: Natural Resources Group
NSN: Native Species Nursery
NYPL: New York Public Library
NYRP: New York Restoration Project
RCRA: Resource Conservation and Recovery Act
SIIAS: Staten Island Institute for Arts and Sciences
SIM: Staten Island Museum
ULURP: Uniform Land Use Review Procedure
“This Compost”

By Walt Whitman
From *Leaves of Grass*

1

Something startles me where I thought I was safest,
I withdraw from the still woods I loved,
I will not go now on the pastures to walk,
I will not strip the clothes from my body to meet my lover
the sea,
I will not touch my flesh to the earth as to other flesh to
renew me.
O how can it be that the ground itself does not sicken?
How can you be alive you growths of spring?
How can you furnish health you blood of herbs, roots,
orchards, grain?
Are they not continually putting distemper’d corpses
within you?
Is not every continent work’d over and over with sour
dead?

Where have you disposed of their carcasses?
Those drunkards and gluttons of so many generations?
Where have you drawn off all the foul liquid and meat?
I do not see any of it upon you to-day, or perhaps I am
deceiv’d,
I will run a furrow with my plough, I will press my spade
through the sod and turn it up underneath,
I am sure I shall expose some of the foul meat.

2

Behold this compost! behold it well!
Perhaps every mite has once form’d part of a sick
person—yet behold!
The grass of spring covers the prairies,
The bean bursts noiselessly through the mould in the
garden,
The delicate spear of the onion pierces upward,
The apple-buds cluster together on the apple-branches,
The resurrection of the wheat appears with pale visages
out of its graves,
The tinge awakes over the will-tree and the mulberry-tree,
The he-birds carol mornings and evenings while the she-
birds sit on their nests,
The young of poultry break through the hatch’d eggs,
The new-born of animals appear, the calf is dropt from the cow, the colt from the mare,
Out of its little hill faithfully rise the potato’s dark green leaves,
Out of its hill rises the yellow maize-stalk, the lilacs bloom in the dooryards,
The summer growth is innocent and disdainful above all those strata of sour dead.

What chemistry!
That the winds are really not infectious,
That this is no cheat, this transparent green-wash of the sea which is so amorous after me,
That it is safe to allow it to lick my naked body all over with its tongues,
That it will not endanger me with the fevers that have deposited themselves in it,
That all is clean forever and forever,
That the cool drink from the well tastes so good,
That blackberries are so flavorful and juicy, orchard, that melons, grapes, peaches, plums, will none of them poison me,
That when I recline on the grass I do not catch any disease,
Though probably every spear of grass rises out of what was once a catching disease.

Now I am terrified at the Earth, it is that calm and patient,
It grows such sweet things out of such corruptions,
It turns harmless and stainless on its axis, with such endless successions of diseas’d corpses,
It distills such exquisite winds out of such infused fetor,
It renews with such unwitting looks its prodigal, annual, sumptuous crops,
It gives such divine materials to men, and accepts such leavings from them at last.
Repurposing
Introduction

If human history reserves a privileged place for the Egyptians because of their rich conception of the afterlife, what place will it reserve for a people who, in their seeming worship of convenience and greed, left behind mountains of electronic debris? What can be said of a culture whose legacies to the future are mounds of hazardous materials and a poisoned water supply? Will America’s pyramids be pyramids of waste?


**Finding Fresh Kills, a Monument to Waste**

In the spring of 2008 I visited what was then the closed Fresh Kills landfill for the first time. That tour was scheduled as one of a couple of class trips to various compost-related sites for a Master Composting (MC) course I was enrolled in at the time. These trips were intended to introduce trainees to a range of composting and gardening techniques and to get everyone thinking more regularly about the impacts of waste on the environment. The MC training is part of a certificate program for urban composting funded by the Department of Sanitation of New York (DSNY) for promoting waste reduction through each borough’s botanical gardens. As I prepared to conduct fieldwork in Central America on waste management in peripheral shantytowns and scavenger communities living from open dumps outside city margins, I spent a lot of time wondering how I could best manage my own waste, at home and upon reaching the field. Composting food scraps was one way I could manage and reduce my own rubbish output at a field site without regular garbage pick up. This is what motivated me to sign up for training through this program.
I spent eight weeks learning about the process of decomposition of organic materials as well as thinking about how to reuse everyday things that regularly result in waste like product packaging. Lowering the amounts of waste we individually produce through recycling, reusing, and composting is a central part of the course. The field visits to community gardens with composting programs were aimed at helping us see the diverse efforts going on around the city that we could use as models for building our own individual programs. Promoting compost and conducting outreach within our communities is a central component of the training and necessary for successful completion of the program. Visiting the city’s last operating landfill, the Fresh Kills site on Staten Island, enabled us to simultaneously think about the impacts of waste on the environment and the valuable benefits offered by ecological restoration for promoting biological processes.

Waiting final capping on two of four of the site’s mounds, Fresh Kills will undergo a transformation that will remake an old landfill to a park and nature preserve over the next 30 years. At the time of my visit, the Parks and Recreation Department (from here on Parks Department, or simply Parks) had recently begun offering birding tours to small groups over several weekends each season. A design contest held in 2002 produced a vision and plan for the future of the site by what was then a little known architectural firm, James Corner Field Operations. At the time of their proposal, they had not completed many projects and were mostly known for their designs rather than finished constructions. Since then, the reclamation of the High Line Park in the Meat Packing District on the west side of downtown Manhattan has made this team an internationally recognized name as pioneers in the field of architectural designs for urban
reclamations. Visitors to Fresh Kills on the day of my field trip were able to see the site’s potential firsthand, the beauty of its rolling green hills found in few places around New York City (NYC), especially as open grasslands accessible to the public.¹

Prior to my excursion to Fresh Kills, I had visited Staten Island (officially known as Richmond County) fewer than a dozen times despite growing up in NYC. Living in Queens, I had gone there only once as a teen on a trip with two friends to the Staten Island Mall on Victory Boulevard facing part of the old landfill. Vague memories of sea gulls on a sunny afternoon and tall barren mounds covered with scorched grass notwithstanding, I had not had much reason to go anywhere on Staten Island until I got married to visit family from Queens who had moved there. The long commutes between boroughs, however, continued to limit those visits. Despite the increase in contact with family living there, the westernmost coast of Staten Island remained a faint memory of the Staten Island Mall and the tall mounds adjacent to it. Staten Island remained a distant² site to me, a fairly typical experience for many native New Yorkers, with the exception of some native Brooklynites with closer ties to Richmond County due in large part to the connection between the two boroughs provided by the Verrazano-Narrows Bridge. But my visit with the class of Master Composters proved to be a course-altering one for research.

Our group arrived at the St. George Ferry terminal where we met an Urban Parks Ranger waiting for us with a Parks Department van. The ride took about half an hour

¹ While Pelham Bay Park in the Bronx has a capped landfill transformed into grassy hills adjacent to marshland and abutting the mouth of the Hutchinson River, the landfilled area of the park is not open to the public. It is a Superfund site and therefore restricted. On August 12, 2013, the NY Times reported that families suing the city over the deaths of their children to leukemia connected to the toxins illegally dumped at this site had received a settlement, to some degree acknowledging the risks contained therein.
² This sense of separation is felt especially strongly by Staten Islanders. Public elected officials representing Staten Island regularly describe the sense of disconnect separating that borough from the rest of NYC. People I regularly met over the course of fieldwork consistently echoed this feeling as well.
through turning roads past a public housing complex adjacent to the ferry terminal, vacant factories on the waterfront beyond that, and later past a series of suburban homes. We arrived at Fresh Kills, drove up to the security gate before following a long road winding up one of the mounds. The Parks Ranger hosting our visit narrated some of the history that would become familiar through continued park visits over the three years I spent in the field, recounting how a “temporary” landfill endured for over 50 years and became the last working dump in the city, angering Staten Islanders ever since. This anger and frustration associated with Fresh Kills has spurred continuous fights between residents and city government as the site grew to become the largest urban landfill in the world at its operational peak throughout the decade of the 1980s. Fresh Kills has been a ready political tool wielded by local politicians to mobilize their constituents. The promise to close the site is said to have won Republican candidate Rudolph Giuliani the mayoral race in 1993 when he defeated David Dinkins, the City’s first and only black mayor.

At the height of its life as a receptacle of the city’s waste, the 2,200 acre site was rumored to be one of the few manmade structures visible from space, much like the Great Wall of China. Despite this rumor being untrue, the myth took hold and people still repeat it today. The lack of truth of this statement notwithstanding, the site’s massive size, associated smells and related problems bred a growing frustration still palpable as the borough has been unable to shed its reputation as a “dump.” This lingering resentment mixes with larger political tensions stemming from the marked differences in
demographics and political leanings between Staten Islanders and residents from the other boroughs. ³ This history is explored in more detail throughout this study.

On the day of our visit, the group was awed by the spectacular views of Manhattan and the dense tree canopy visible from the top of the mounds covering a large percentage of Staten Island. Trees stretch as far as the eye can see from the top of the mounds, sprawling across what is called the Staten Island Greenbelt. It is this stretch of continuous parkland that makes Staten Island “The Borough of Parks.” I was so mystified by the scale and strange beauty of the site that I continued to investigate the workings of “sanitary landfills.” I started doing this in the context of exploring why these facilities are not feasible in the developing world as part of the study I was initially planning on conducting on scavenging populations. Eventually, I came to explore the history and engineering of Fresh Kills itself. Because my research began after the site’s closing, I began considering a new research topic by asking: how are environmental cleanups conducted? What are the established best practices for “restoring” ecosystems and building new habitats? These questions served as early catalysts for this multi-sited ethnographic case study of ecological restoration in NYC, guiding me in my selection of which city offices to reach out to for interviews.

³ Staten Island is the most suburban, least populated, less developed, and ethnically and socioeconomically least diverse of NYC’s boroughs. Historically it has also tended to vote mainly Republican in local and national elections.
Freshkills\textsuperscript{4} is the largest park to be built in NYC in over 100 years. Its transformation presents an opportunity to bring more balance to a landscape that is both engineered and wild,\textsuperscript{5} and will provide a range of features with significance to various groups including recreational features and “natural” habitats from wooded areas to marshes and grasslands. How can this site provide ways for thinking about the human impact on the environment brought on by (over)consumption? What kind of management is required by urban landscapes blighted by pollution and other ecological disturbances like contaminated soils and plagued by invasive species? What is the future of conservation given the unique conditions in cities? This ethnographic study is a response to these questions inspired by my first visit to this unusual site, a landscape constructed to ameliorate some of the damages imposed by consumption practices.

\textsuperscript{4} The name of the site has become condensed into one word as part of its rebranding as it is transformed into a park. The site will be referred to as two words in general and historical terms throughout this study, and alternately as a single word when the park is being referred to in particular.

\textsuperscript{5} The term “wild” in this case refers to the contrast between “natural” and “recreational,” the two types of parks most typical around the city. “Wild” in this case does not refer to popular ideas about wilderness or to the “pristine” landscapes usually associated with the concept in the U.S. (Nash [1967]2001; Marx [1964]2000; Cronon 1996a, 1996b). The notion of “wild”—like other concepts including “sustainability”—are used in different and contested ways by the various communities of individuals participating in this study.
Islands of Waste: Wastelands and Nature Reworked

Although contemporary perceptions of the city’s landscapes routinely neglect the use of the landfilling, this method has been instrumental to NYC’s expansion as well as those of other older cities, particularly those on the east coast. As City Co-Ordinator, Robert Moses significantly expanded the city’s coastlines pushing land further out to sea and “reclaiming” islands. But filling lakes, swamps, and other waterways and expanding coasts predates the Robert Moses era. While Moses’ use of fill changed the scale of landfilling, the practice has been reshaping the city since the 17th century (Cantwell and Wall 2001; Rothschild [1990]2008; for a comparison with another major east coast city, see Seasholes 2003 for details on landfilling in Boston, Massachusetts).

First used to broaden the tip of Manhattan as early settlement expanded east and west (despite land availability to the north), reclamation facilitated growth where real estate was most valuable, in downtown Manhattan. Given the dense settlement on the tip of Manhattan, the problem of waste disposal was addressed by pushing dumping sites further out to peripheral areas at first still on the island, and eventually everywhere else.

Each borough had its own landfills at different times. Manhattan’s old neighborhood dumps were built over as the city grew. The polluted Collect Pond, once a water source for the city fouled by dumping, is today located under Foley Square on Leonard Street, between Lafayette and Centre Streets. The area around the Fulton Market, among others, also stopped serving as dumps given the density of settlement and the need to build on just about every square inch of space on Manhattan. Instead, the islands around Manhattan and the boroughs of the Bronx, Brooklyn and Queens came to

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6 Islands were connected to the mainland or to each other making way for new parks, playgrounds, bridges, and expressways.
serve as the main warehouses for city waste, relieving Manhattan of the onerous task of handling and managing its own rubbish and facilitating that island’s growth.

There are a number of predecessors to Fresh Kills, among them Barren Island-Brooklyn on Jamaica Bay, Rikers Island (geographically adjoined to Queens via the Francis R. Buono Memorial Bridge but zoned to the Bronx), marshland on Flushing Bay, and others. These filled sites closed at different times and were repurposed to accommodate new functions like a large prison complex in the case of Rikers Island, LaGuardia Airport in Queens, among other uses. The Fountain Avenue and Pennsylvania Avenue landfills in Brooklyn and Edgemere in Queens would also close operations in the 1980s leaving Fresh Kills as the last operational landfill within city limits for another two decades. Richmond County, with its undeveloped and agricultural or rural areas, made for an ideal area for waste disposal. Fresh Kills would come to outlive the valuable dumps in Brooklyn on Jamaica Bay.

Barren Island in southern Brooklyn, along with other various small islands around the city, was an invaluable dumping site for individuals in the waste industry beginning in the middle of the 19th century. Called “Equindito” by the local Native American inhabitants, Barren Island got its name “Broken Lands” for its configurations of sandy fingers surrounded by marsh (Miller 2000). Barren Island came to be a very fitting name given that the land was cleared of everything but rubbish and the horse carcasses that were brought in for rendering. In his book about the history of NYC’s garbage over the last 200 years, Benjamin Miller, former director of policy planning for New York City's Department of Sanitation, says of life on Barren Island:

In spite of the scores of souls who lived there, the island was cut off almost entirely from the outside world. With the exception of a weekly
mail boat, the only vessels that approached it were scows filled with offal. But to any visitor who might have reached the island the landscape would have appeared barren indeed (Miller 2000:44).

Jamaica Bay’s diverse island habitats were transformed by dumping activities, a standard occurrence in all places serving as dump sites. In another example, Randall’s Island, Wards Island and Sunken Meadow were joined together with fill and zoned to Manhattan. Randall’s Island became the seat of Moses’ empire, operating independently in the shadow of the Triborough Bridge.

Great Kills, located on the eastern coast of Richmond County, was filled for recreational purposes, transforming the seasonal island of Crooke’s Point into a peninsula. Castle Clinton in the upper NY Bay was also welded to the mainland, a practice that added real estate to the islands making up NYC, and changing their natural ecosystems in the process. Wright’s Island and Blizzard Island in the Bronx were incorporated into the city’s mainland, as was Canarsie Pol in Brooklyn and Plum Island in Jamaica Bay. Like Plum Island, White Island in Southern Brooklyn is another landfilled plot of land that came under the protection of the Gateway National Parks system of urban parks along with places like Great Kills and others also featured in this greenway.

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7 Data on the islands surrounding NYC included in this section draws heavily from the work of Sharon Seitz and Stuart Miller ([1996]2011). The NY Public Library’s Lionel Pincus and Princess Firyal Map Division were also instrumental for piecing together this history. Their map collection dating back to the 15th century includes local maps that trace the history of the islands mentioned here as well as those of some of the forgotten islands around NYC.
Besides attaching islands to the main land, others were outright created from fill where land had not existed before. After the burning of the Quarantine\(^9\) on Staten Island’s north shore in 1858, an entirely new site had to be built to provide a replacement facility for housing the sick displaced by the torching in Tompkinsville. Hoffman and Dix Islands were created off the eastern coast of Staten Island with sand dredged from NY Harbor in 1872. Some of these facilities, once abandoned, were reclaimed by plants and animals. Other small islands are today primarily habitats for animals, places like Goose Island, Rat Island, Subway Island in Jamaica Bay made for facilitating the A-train line, have become bird sanctuaries and places where native plants compete fiercely with invasives. Prall’s Island and Shooter’s Island, off the coast of Staten Island on the Kill Van Kull, are also sites plagued by invasive plant species that the Natural Resources Group (NRG) has been working to restore. Transforming places destroyed by dumping

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\(^9\) This facility came to serve as a rallying call for resisting unwanted land uses in the borough well into the 20\(^{\text{th}}\) century, including resistance to the siting of the Fresh Kills landfill. This is the same quarantine mentioned in Chapter 6.
into bird sanctuaries, parks, golf courses, or industrial production sites, has been a common practice over time with varying results.

Even though NYC has been settled since the early 17th century, the tendency to destroy and build anew sets it apart from cities more often associated with long histories like Philadelphia and Boston. Mark Kurlansky, a public historian who writes about NYC’s social and environmental histories, offers this assessment of the city’s model of development:

New York is a city that does not plan; it creates situations and then deals with them. Most of its history is one of greedily grabbing beautiful things, destroying them, being outraged about the conditions, tearing them down, then building something else even further from nature’s intention in their place (Kurlansky 2006:xvii).

Development has not always followed well-planned patterns and destruction of invaluable resources has been common. It is mostly retroactively that New Yorkers have come to value places and natural resources. Polluting and destroying vital places has steadily continued, frequently in ways too mundane for the public to notice or occurring too often to garner enough attention and sustained interest in prevention.

But while sources of pollution like sewage and oil spills are more often accounted for in studies analyzing environmental conditions in NYC, the effects of landfilling are not as frequently documented. Landfilling falls in a category of persistent pollution that tends to be eclipsed by attention to more traditional sources of contamination, from automobile traffic to environmental pollutants. But given that dumping is a significant contributor to methane production, the gas responsible for exacerbating the greenhouse effect, it merits more persistent attention. This study is intended as a contribution to this body of knowledge on the effects of pollution on people and landscapes.
Of Ruins and Cleanups

Thinking through landscape invites us to reconsider the relationship between an assumed objective ecology of natural processes and the human, all too human, world of ideology, discourse, and history.


While NYC may seem an unlikely place for a study of conservation given the high level of fragmentation and duress open landscapes exist in, divided by the tall buildings and roads dominating the landscape, this is still a city that can inform us on evolutionary changes and ecological conditions. Considering this city from an ecological context is important for a variety of reasons, including the importance its geographic location.

… New York City sits in the middle of the “great bend” of the Eastern seaboard—where the north-south-running coastline coming up from Florida becomes the east-west running New England coast. This “corner effect” in the middle of the coast makes New York City and the larger H2O region [5,300 square miles of land and water] an important hub on the Atlantic flyway, with hundreds of millions of migrating birds moving through it twice a year (Meier and Hiss 2013:23).

Coastal cities bordered by water make particularly useful laboratories for analyzing the effects of climate change writ large.

Besides the city’s unique location and its island environments, the fragmented habitats typical in NYC can offer remarkable opportunities for understanding the impact of the environment on various organisms. An example of the insights provided by studies of wildlife adapting to urban conditions is illustrated in Chapter 3 in the work of an evolutionary biologist conducting genetics research throughout the city’s parks.
Though fragmentation is more often than not associated with ecological problems, disruptions in landscapes also present researchers with opportunities to understand broad changes to the environment and its inhabitants that can begin to point to what these changes might mean for human beings.

In terms of waste production—the other side of this narrative on urban ecology—NYC becomes a more obvious place for studying consumption and waste production. The city produces a lot of trash given not just its density but also because of its hurried pace. At an estimated 4.6 pounds of trash produced per person per day in the United States, this rate exceeds that of other developed nations (McBride 2012:1). It was initially this aspect of NYC that made it a natural choice for this study. I quickly realized that extensive waste production was a concern to a variety of people and that ordinary individuals constantly worry about their own contribution to the waste stream and try to curtail it in different ways. Enthusiasm for recycling is an example of the type of organizing around waste countering the environmentally damaging tendencies mainly associated with NYC. The city is more than litter and rats (Sullivan 2004) and consumption is only one nodal point of waste production. Fresh Kills presents a site for seeing the aftereffects of consumption, a place of contamination and “fallen nature,” as the “inner city” is sometimes conceived (Di Chiro 2003:229-230). This type of “border,” or “wasteland,” is in fact created within complex and interlocking processes that implicate everyone in the creation of landscapes like the landfill-turned-park featured in this study.

In a seemingly counterintuitive argument given that NYC is a significant source of trash production, it has also been hailed as one of the greenest cities in the nation. Its
density is the key to its environmental sustainability. Life in small spaces means less energy use in terms of heating and cooling. The city’s system of public transport is another central factor making it greener than other places around the country. Most New Yorkers rely on public trains and buses and less on cars, reducing fuel consumption and making for a smaller carbon footprint. Because NYC is a city of neighborhoods, services and shopping are available locally, further reducing the need to drive and encouraging people to walk, having additional positive impacts on public health (Frumkin et al. 2004).

With its “stark nature/culture contrasts” and “its remarkably small ecological footprint,” NYC presents “a model for an urbanizing planet” (Waldman 2013:11). The very design of NYC presents a counterpoint to the idea that consumption and pollution are the defining elements of the city’s environment.

NYC has also recently been tackling environmental problems more directly than many other cities around the country. Under Mayor Michael Bloomberg, a plan for sustainability called PlaNYC was assembled. On Earth Day, April 22, 2007, Mayor Bloomberg introduced this plan before a room of reporters, officials, business leaders, and other interested parties at the American Museum of Natural History. Some of the key aims of PlaNYC include reducing greenhouse gas emissions, improving infrastructure, creating public spaces, and protecting fragile environmental resources. The plan includes 127 initiatives and aims “… to achieve 10 overarching goals\(^\text{10}\) to

\(^{10}\) The 10 overarching goals are: 1. create homes for almost a million people; 2. maintain or improve travel times; 3. ensuring that every New Yorker lives less than 10 minutes away from a park; 4. increase investment in back-up water network systems; 5. reach a “state of good repair” on roads, subways and rails for the first time in history; 6. upgrade energy infrastructure; 7. achieve the cleanest air of any big city “in America”; 8. clean up more than 1,700 acres of polluted land and return it to communities; 9. preserve wetlands and open up 90% of polluted waterways for fishing and boating; and, 10. reduce global warming emissions by 30% (ICLEI, April 1010; my emphasis).
improve the infrastructure, environment, and quality of life in the city” (ICLEI, April 2010:5) with different target dates ranging between 2014 and 2030. These initiatives are supported by strategic programs, target goals, and ways for implementing them, making it a more definitive plan than those begun in other cities.

PlaNYC emerged as an agenda after the city consulted with experts and an international community of local governments aiming to make their communities more sustainable. According to the administration, this desire to promote sustainability is premised on the following three convictions: that global warming is a reality, that for the first time in human history most of the population lives in cities, and, related to the second point, that cities are charged with the special responsibility of addressing climate change. Implementing the plan has meant working on a range of projects, from creating miles of bike lanes, to ensuring affordable housing units (100,000 created or preserved). The city has also created the nation’s first office of brownfield remediation, the Office of Environmental Remediation. Energy efficiency is now a requirement for large buildings and constructing more sustainable modern buildings is the standard. Lastly, decreasing carbon emissions by 9% and moving to cleaner fuels are also part of the agenda. All of these are new target goals for NYC especially when conceived as a concerted effort aimed to make the city more environmentally sound.

Cleaning up “brownfields” (disturbed or polluted places), presents additional opportunities for understanding the effects of climate change and urban ecology.

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Preserving wetlands. The International Council for Local Environmental Initiatives (ICLEI) is an international organization made up of local governments in support of environmental initiatives.

11 Despite the construction of these affordable units, homelessness reached an all-time high under the Bloomberg administration and one of the key criticisms of the Mayor’s tenure has been his record on housing and the wildly segregated city he leaves behind at the end of his 12 years in office.
Brownfields make valuable laboratories for understanding natural processes as well as political and social ones.\textsuperscript{12}

Brownfields are postindustrial borderlands that, as new political and ecological entities, enable us to learn from the past and reinvent a more sustainable future. … Brownfield revitalization, from the perspective of environmental justice, envisions a sustainable, “green” community in terms of social equity and ecological interconnectedness (Di Chiro 2003:220).

The concept of “borderlands” is of special significance for this study. Natural landscapes are peripheral in NYC. In the case of Fresh Kills, Staten Island’s marginal location made it an ideal site for dumping. Close enough to Manhattan to make shipping that island’s waste expedient but underdeveloped and far enough and to provide affordable land that would put garbage out of sight, Richmond County presented a convenient borderland. Borderlands make for interesting case studies in ecology producing edge effects impacting the overall health of ecosystems. Marginal places are also often sites of environmental injustices (Bullard 2005; Johnston 1994).

Sometimes perceived as “wastelands” from the standpoint of capitalist value production, places can be geographically or socially marginal spaces. Other times, they can exist in the heart of the city. Such is the case of postindustrial spaces, or “industrial ruins,” as Tim Edensor (2005) refers to such landscapes and abandoned places. These places serve to reorganize space in ways that defy capitalist order. Edensor’s work highlights how social meaning is derived from crumbling ruins, how real estate value is generated in relation to capitalist production—and later, post-production—and how social meaning is created by the people who inhabit these places for living or recreational

\textsuperscript{12} Brownfield laboratories around NYC abound, from Gowanus, to Newtown Creek, Mount Corona, the Harlem River, and Five Points Collect Pond. These other places in need of cleanups will further inform processes of restoration.
purposes. Derelict spaces represent a full cycle of life and for this reason too, they present special opportunities for making sense of them in more dynamic ways. Imagining new purposes for crumbling ruins redeems them from otherwise wasted spaces to areas characterized by “multiple relations between things, space, non-human life and humans” (Edensor 2005:124). This opportunity for generating multiple relations between plants, animals, and wasted places built on wasted things, is what is being pursued at Fresh Kills.

Dumping significantly transformed Staten Island’s environmental history: garbage mounds have elevated what was once flat land to comparable levels like those of the natural hilly geological serpentine spine left behind by glacial retreat. To borrow from Ann Stoler’s work on imperial relics, in the case of the Fresh Kills marshes, the effects of pollution residing in the underground hollows of the marshes have transformed the landscape and left behind a set of enchanted, large-scale and desolate “ruins” of sorts now grown over. Stoler’s theorization of imperial debris provides useful language for looking at corroded infrastructures and drained swamps marked by a “tinge of decay” (Stoler 2008:195).

Borrowing the idea of a “tinge of decay” from Franz Fanon, Stoler also employs Walter Benjamin’s idea about “petrified life” and together constructs a means for looking at “ruin” as both the state of a thing, and concurrently as a process of ruination. Understanding both aspects is imperative for contextualizing the political resentment that builds as objects decompose. Her formulation of a theory of ruination, while more specifically about French Colonialism, nevertheless provides perspectives that “delineate the specific ways in which waste accumulates, where debris falls, and what
constitutes ‘the rot that remains’” (Stoler 2008:211). In the case of the conversion of a landfill, her language is especially suitable for exploring the future of the past.

My ethnographic case departs from her critical work on imperial debris in that it expands beyond the process of ruination and looks instead at the process of reclamation. Reclamation is a portion of the continuum her essay is less clear on, even while the processes she discusses as ongoing are yet to be explored in her work. Moreover, while Stoler posits salvage projects as necessarily exploitative, often based on a sense of nostalgia about things and places that one has never known or seen and that may or may not exist, this study shows that salvage projects aimed at preservation can be motivated by other factors, including a desire and need for ecological renewal. This aim differs from the type of economic exploitation Stoler highlights in the case of the tourist industry centered on (re)creating colonial landscapes to be experienced. And while creating a nature preserve can still fall under the capitalist program of producing value in the form of useful real estate, it never the less differs from the type of experience spotlighted by Stoler and others (Collins 2008; Szmagalska-Follis 2008).

In the case of postindustrial cleanups, constructing functioning ecological systems (or at the very least improving them and then excluding unwanted parts of these systems, such as animals considered threatening like coyotes, bears, and others) is necessary for alleviating the problems of the “rot that remains.” And while nostalgia plays a role in this salvage project to some degree, nostalgia has more to do with sometimes romanticized and idealized notions of wilderness as places that existed in the past, rather than being defined by the pining for what never was, as Stoler conceives the concept. Exploring reclamations is of special value as ruined places continue to “saturate the
subsoil of people’s lives and persist, sometimes subjacently, over a long durée” (Stoler 2008:192).

The Study

The Fresh Kills reclamation is part of a pioneering program for enhancing the city’s biodiversity. It is an especially complicated endeavor given that this site represents an intersection between waste and restoration. This ethnographic case study documents the responses of experts and the lay public as they interpret the meaning of biodiversity and work within their own fields of expertise to make the city more sustainable. For biologists, restorations like the one underway at Fresh Kills offer an opportunity to construct functioning habitats and promote biodiversity within NYC. For officials, the Fresh Kills cleanup presents a way to beautify the city and improve quality of life for residents by expanding parkland. For the public, the park’s significance is more mixed: for Staten Island residents suspicious of the city’s plans for the site raise mixed feelings. There is, however, significantly more enthusiasm among the rest of New Yorkers, especially residents of Manhattan and Brooklyn in particular (judging from attendance at outreach events in those boroughs in comparison to those held in Staten Island).13

The potential for beautification of this site, however, once again masks the very important matter of waste production and disposal methods as the city is able to construct a massive nature reserve only at the expense of garbage being buried in neighboring states with depressed economies and dependent upon landfilling for basic revenue

13 These differences in attendance could reflect some of the clan aspects typical of NYC and its diverse inhabitants, as well as transportation disparities between Staten Island and the rest of the city, among other factors.
Looking at the work of urban reforestation in the form of growing indigenous plants for restoration, populating city streets with trees to enhance the urban canopy and improve drainage, combating invasives in parks and beaches, and transforming Fresh Kills, this ethnography explores efforts to improve ecological management in an urban context from multiple perspectives. These improvements have the potential to enrich urban life for humans as well as other organisms.

This study is arranged in three parts. Part I “Preserving,” emphasizes the importance of preservation by showcasing the diversity of life forms inhabiting city parks despite the ongoing challenges these face. This section therefore also outlines some of the problems plaguing parks as well as the work that goes into managing their effects. Some of the problems include the predominance of nonnative species, soil compaction, and human disturbances. But despite these and other challenges, less landscaped areas hold a great deal of promise for preserving native plant varieties supporting related animal diversity. The final chapter in this section demonstrates that genetic diversity can still be found throughout city parks, however unevenly, among animal wildlife as well as plant varieties inhabiting parks.

In light of the more powerful storms predicted as one side-effect of climate change, increasing resiliency has fast become an aim for city government and encouraging functioning ecosystems is essential for this purpose. In 2012, Superstorm Sandy exposed the vulnerability of the city’s depleted coastlines. The Natural Resources Group (NRG) has been restoring many of the city’s forests, marshes, woodlands, and the other ecosystems. Part II “Restoring,” takes an historic look at parks and the environmental history of Staten Island. Parks are more than recreational areas and
provide invaluable infrastructural benefits as water catchments, in one example, as well as ecological ones by preserving biodiversity in cities. Staten Island’s rich diversity of plant and animal life represents a special resource for the rest of the city. What is the future of conservation in a dense and complex city? A conversation with the director of the Trust for Public Land, Peter Harnik, a parks and restoration advocate included in this section responds to this question and provides a look at future directions for urban conservation.

Following up on the previous section on the importance of restoring, Part III “Rebuilding,” traces both the lifetime of the Fresh Kills landfill and its current transformation into a park and reserve. The first chapter in this section documents the long struggles from the time of its siting to its closing. The imposition of environmentally damaging projects on Staten Island, the most ecologically diverse of the five boroughs, has persisted, threatening the very important natural resources the island has to offer. I was constantly reminded by informants how hosting a variety of unwanted land use projects has influenced Richmond’s environmental, political and social history. Understanding the cleanup effort in its full historical context contributes to a more complete and dynamic understanding of place. The evolving state of the park is reviewed from the vantage point of the first annual “Sneak Peak” event in 2010. Highlighted in this set of chapters are also accounts of the progress made at the site and the promise it holds for the future as a cultural and environmental good. Interviews with the former land use and outreach manager of the project and a borough naturalist earnestly invested in the landfill’s conversion to parkland are contrasted to provide an analysis of the varied perspectives on how an industrial ruin can be healed.
Finally, Part IV “Imagining,” presents a varied approach to engaging conservation from the vantage points of citizen scientists, to applied scientific research, and from an artistic perspective that explores the ways in which a conservation ethic can be fostered through the use of art. This set of chapters further elaborates on the preceding two parts by considering the workings of ecosystem services and how the enhancement of the urban canopy positively impacts residents’ health and improves city infrastructure. This section includes conversations with the arborist and Director of Education at TreesNY and an ecologist consulting on PlaNYC working to improve the program’s ecological goals. The TreesNY arborist and PlaNYC ecologist emphasize the importance of public participation in public works projects for ensuring their success. The work of a photographer and waste reduction enthusiast who looks at urban gardening practices around NYC and is involved in waste reduction through composting is also included here. Her photographs study urban ecosystem management at the smallest scale of private home gardens. Her work highlights ecological maintenance conducted by urban dwellers whose gardening manipulates outdoor places in more livable ways. Through her work, I seek to provide a glimpse of how art can contribute to understandings of urban nature and conceptions of outdoor spaces. From these multiple perspectives, this study seeks to underscore the importance of incorporating urban ecology in anthropology’s ongoing engagement with conservation.
Part I: Preserving

Current climatic conditions in cities are producing important adaptations in wildlife. The unique evolutionary changes taking place in parks are worth paying closer attention to for understanding the effects of climate change in cities. Enhancing biodiversity in an urban ecological context entails increasing the use of native plants in restoration projects aimed at decreasing invasive foreign plants that out-compete indigenous varieties. This opening set of chapters explores some of the ways in which different city personnel are maintaining and improving city parks.

Because eliminating invasives entirely is not necessarily feasible, does making peace with invasives present a viable landscaping option? While this question is currently being evaluated further by ecologists and biologists, the general consensus so far is that ultimately the city benefits from curtailing the spread of invasive species and showing a preference for native ones. Enhancing the urban canopy by planting more trees in streets, parks and private gardens also helps (the urban canopy will be returned to in Chapter 8). Emphasizing native plantings and coevolved plant and animal associations ensures more robust ecosystems that by extension also benefit humans. Beyond considering problems with invasive species, animals inhabiting parks demonstrate various responses to urban stresses. Adaptation can vary across the spectrum from increased genetic diversity resulting from habitat fragmentation to possible extinction. While some animals continue to be threatened by extinction, others are developing biological adjustments that are helping them survive and thrive under the stress of urban environments.
Reconciliation Ecology: Making Peace with Invasives?

But cooperation is not the only relationship in the forest. Piracy and exploitation are here also.

David George Haskell in *The Forest Unseen* (2012:5).

**Managing Natural Spaces**

It is a hot and humid day in July, and I am accompanying “Sylvie” and “Dahlia” on a field trip to collect cuttings of new growth for two shrub species that have been difficult to grow from seed. Sylvie and Dahlia are two plant biologists with the Native Species Nursery (NSN), one of the sites where I conducted ethnographic fieldwork from the spring of 2011 to the spring of 2013. Working with the nursery staff, I learned about the use of native plant species for restoration projects like that underway at Fresh Kills. Native plants are favored for planting at restoration sites for revitalizing this former landfill as well as for use at other remediation and reforestation projects in city parks and beyond. Emphasizing the use of indigenous plants as methodology for improving newly constructed habitats is a relatively new scientific specialization for ecologists, biologists and botanists. Fresh Kills will serve as a model case study for other large-scale cleanup projects nationally and around the world.

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14 The names of all neighborhood residents, naturalists, nursery staff and Parks personnel participating in this study have been changed to provide them anonymity. Real names are used in the case of public officials and Fresh Kills project personnel in close contact with the public whose work makes their identity more readily identifiable in spite of the use of pseudonyms. In the case of researchers who have agreed to participate in this study by sharing details of their work with me, whether published or presented in conferences, their names are included along with extended discussions of their research in an effort to enhance interdisciplinary conversations about shared subjects of interest. The name of the nursery has also been changed to further disguise the identity of participants who spoke freely with me about their work and the concerns that come with managing ecosystems.
On this day, the two plant scientists are targeting two types of *Viburnum* shrubs for propagation at the nursery for the various important restoration and maintenance projects conducted by the Environmental Protection Agency (EPA) in conjunction with city agencies managing New York City’s watershed and natural landscapes, like the Natural Resources Group (NRG) and the Department of Environmental Protection (DEP). These agencies work in partnership with the New York City (NYC) Department of Parks and Recreation (simply Parks for short). Infrastructural projects either on landscapes or urban systems conducted by city agencies, sometimes in the form of public-private partnerships, are the type of important maintenance work not generally visible to city residents. An invisibility of labor and management also applies to the work of sanitation—the parallel subject of this study. The department of sanitation is also one of the other agencies responsible for the Fresh Kills site along with Parks and the Department of Environmental Conservation (DEC).

Analyzing the “maintenance work” that goes into urban *infrastructure*\(^\text{15}\)—a term which in government parlance notably applies to both the built environment (in the case of sewerage systems and things like tree pits on city streets) and to living organisms like trees—underscores how interconnected the built and natural environments are in cities. In the case of parks, considered the “lungs” of cities and the sites of invaluable ecological processes, their built nature is often concealed. In NYC where many parks have been created literally out of waste vis-à-vis the use of sanitation fill, the connection between waste and nature is further overlooked. Moreover, urban characteristics like high population densities and a heavily built environment make management work crucial to

\(^{15}\) For general anthropological insights into infrastructure in the broadest sense, see Star 1999 and also Simone 2004.
the wellbeing of built and natural amenities. Broadening the way cities are designed and
cared for to include improvements to the lives of other organisms besides humans is an
approach not often considered but one that holds promise for urban ecological
management.

Sanitation, urban nature, and biodiversity more specifically, intersect in the
instance of one of the city’s most important land reclamation projects currently unfolding
at Fresh Kills on the western shore of Staten Island. This project is unique in terms of
scale and complexity requiring extensive innovation in a number of different and
seemingly disparate spheres including engineering, landscape design, and even visual art
(the latter is a theme analyzed further in the final chapter on conservation). All of these
areas have been critical for supporting this project which is also unique because it is
being carried out in one of the largest cosmopolitan cities in the United States and the
world. A cleanup of this magnitude, conducted on a site three times the size of Central
Park, represents a new arena of policy in urban governance.

In the past, cleanups have mainly been managed as isolated projects unrelated to
the health of ecosystems within city limits or to the state of biodiversity in the region.
Ecological interventions in the case of brownfields (landscapes with interrupted
ecosystems or plagued by pollution) and contaminated waterfronts, for instance, have not
been systematically addressed by local governments beyond individual remediation
projects conducted in isolation rather in more systematic ways as part of a broader
agenda.16 The Fresh Kills cleanup is much closely connected to commitments like that of

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16 For studies on more recent strategic greening of urban and suburban environments see Pickett and
Cadenasso 2007; Schilling and Logan 2008; Flynn et al. 2007; Wise 2008. Most of the literature on green
infrastructure is penned by planners, geographers, and ecologists, from different perspectives. City
overall enhancing local and regional biodiversity. Getting people to relate to this blighted landscape and encouraging residents and tourists to see it as a place of hope and restoration has been received with some skepticism. City officials and project personnel seek to counter residents’ hesitance to envision this site as one of hope by promoting its restorative potential.

Using indigenous plants for enhancing “ecosystem services,” a term regularly used by ecologists and explored in more detail in the following chapter, has gained increasing popularity in the last two decades. But what does it mean to enhance ecosystems and their services? What kind of work goes into managing nature in cities? The Native Species Nursery is conducting some of this important work by mining the city’s built-in reservoirs of genetic variety in the plant kingdom, or city parks as well as open spaces across parts of New Jersey and Long Island beyond Queens. By harvesting local seed and propagating indigenous plants to repopulate areas impacted by invasive species or otherwise significantly disturbed, the nursery makes the best of the space at their disposal at two locations (and soon a third on Fresh Kills itself) for breeding a variety of plants ranging from vines and herbs to trees and shrubs and flowers, including the little known native cactus, *Opuntia humifusa*, the eastern prickly pear. These genetically diverse plants grown from seed are being put to use for restoring such areas around the city as well as sites in Upstate New York where NYC owns properties for essential services, including the Croton and Catskills watersheds. The seed collecting trip I went on is part of the efforts to harvest, collect, store, and promote native plants for building healthier ecosystems and guarding against the effects of global warming.

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programs as concerted efforts aimed at making cities more sustainable is a new arena and the literature analyzing this development has yet to follow some of the more recent efforts currently underway.
Banking on Biodiversity

We come off Huguenot Avenue and ride around a suburban neighborhood in Annadale, Staten Island, as we near an EPA property labeled a “Forever Wild” site.17 We park on a residential street and walk into one of the many forests in the borough. From the moment our boots step off the concrete street and into the cool soft brick-red mud it is as though we are entering a parallel universe transporting us far from the more familiar cityscape. NYC is not known for its forests, swamps and wetlands, but one-eighth of the city consists of wilderness,18 spaces that have recovered from repeated transformations brought about by the axes and bulldozers that have transformed the city’s landscape. Instead, having been allowed to regenerate, these sorts of wilderness spaces are inhabited by rare species of animals like flying squirrels and plant life that has populated the region for millennia. These plants and animals continue to adapt to the challenges of city life reacting to stresses like high pollution levels, fragmented ranges, and a density of human population that further threatens their existence, to name but a few of the environmental pressures they face.

While we are there to collect two Viburnum species, Sylvie is also keeping an eye out for a few other plants with ripe fruits and ready seeds. Timing is crucial for seed

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17 There are 51 “Forever Wild” nature preserves around NYC including woodlands, wetlands and meadows. This program is an initiative spearheaded by the Parks Department to protect and preserve the most ecologically valuable areas around the city and to remind residents and visitors that the City is still a place with vital wilderness areas. This designation is not permanent, however, and does not guarantee preservation in perpetuity.

18 While many of these “wild” green spaces had been occupied or cultivated before becoming parks, they have since been repopulated by regional plant species and differ from traditionally landscaped parks cultivated as gardens or pastoral landscapes. Forever Wild sites have developed into young forests. It is these young forests, marshes, wetlands, and prairies that I refer to when using the word “wild” even while acknowledging they are not “original” mature forests, or untouched ecosystems.
collecting since there are a number of factors that could impede success, like seeds
having already dispersed by wind or by mechanisms built into the plant like “explosive
dehiscence,” which for *Impatiens capensis* means releasing seeds in a type of explosion
induced by touch that catapults seeds a few meters away. This feature gives *I. capensis*
their common name, “touch-me-nots.” Their Latin name also hints at this characteristic,
or the “impatience” of its seeds. Beating out birds and other critters that regularly
consume seeds and fruit and normally get to them first, is another challenge.

Figure 3: *Impatiens capensis* at Alley Pond Park, Queens (photo by author).

The forest shimmers and glows in emerald and jade hues in the heart of summer.
The further we penetrate the woods the more lush the landscape becomes, helped by
denser plant populations. The ferns covering the ground make the forest understory
appear to mirror the canopy the way water reflects the sky and appears bluer because of
it. Ferns wave gently in the breeze appearing like old-fashioned quills waiting to write
the stories of the forest. Last year’s leaves and fallen twigs give way under our weight
and crackle as we walk. The mosquitoes surround us in a rush. The woods can go for
long periods with few visitors, gauging from the appetite of the relentless mosquitoes. As
quick as lightening, a white-tailed deer (*Odocoileus virginianus*) scampers away out of
sight to the left of where we stand and its speed nearly makes me miss it as it gracefully and quietly leaps away. And though a deer in the forest makes for a picturesque sight, their expanding populations have detrimental effects: over-browsing poses a real threat to the native and endangered plants within the parks and natural areas of the city, and more deer mean more ticks posing risks to humans increasing the number of Lyme disease cases.\textsuperscript{19} This risk is further discussed below.

![Figure 4: Reed’s Basket Willow Swamp, Staten Island (photo by author).](image)

As Dahlia identifies the species we will be collecting cuttings from, I am surprised to see how different the two types of \textit{Viburnum} look from one another despite being members the same genus. Viburnum leaves are opposite, and in the case of \textit{V. dentatum} they are also simple and coarsely toothed on the margins. The leaves of \textit{V. acerifolium} look more like those of a maple tree. It can be mistaken for a young maple but maple-leaf viburnum fruit is different as arrowwood—its common name—produces a small purple berry completely unlike the dry winged seeds (called samara) of the maple tree. Dahlia shows both Sylvie and me where to cut, along the edge between old and new

\textsuperscript{19} The ticks carrying Lyme disease are also found on mice. Because deer populations have grown in recent years, particularly in Staten Island, the threat of the spread of this disease in relation to deer numbers is highlighted here.
growth, as we make our way through the periphery of the forest. She warns us to make sure to not over-collect either from any one individual plant or from each stand. It is important to make sure that the ability of all plants to reproduce in strong numbers is preserved for the health and vitality of the forests.

We split up to find different plant populations of these species so we can make sure we do not over-harvest from any one area. Soon, I lose sight of both of them and cannot hear them as I am enveloped by the sounds of the forest. Far from the hum of traffic I listen to the musical sounds made up of the whistling of the wind through the foliage, the singing of the birds and the buzzing and clicking of insects. I make as many cuttings as I can from the plants around me, swatting away at mosquitoes and wiping sweat from my brow, later walking in the direction my companions went in and find them at a clearing. Sylvie stands with a notebook taking inventory of the associated plant communities and Dahlia is helping her identify them as she collects more cuttings. Sylvie is new at the nursery, having just begun her job earlier in the spring. Dahlia therefore provides a bit of guidance to us both.

While Sylvie takes down an overall snapshot of the site by jotting down forest type and plant varieties, she wonders how she can most accurately record details like the soil types that support the plant species she collects. Dahlia tells Sylvie that she and Pete, the nursery manager at the time and her former field partner, consistently identified the soil throughout Staten Island as “sandy loam.” This is a safe identification because most of the soils around the island fall under this category. Sylvie is wondering about the subtle nuances between “sandy loam” and “clay loam,” the soil types found in wetlands and other habitats where she regularly collects specimens. Subtle distinctions like details
about soils and others leave her feeling unsure. Dahlia kneels down and overturns the thick blanket of leaves as they talk saying, “Well, it’s hard to tell because this whole top layer is worm castings.” Some of the castings come up on her fingers, worm poop in the form of rich black humus patterned like tiny dark beads clumped together. The underside of the leaves is covered in spores evident in the mottled discoloration of the heavy leaf blanket displayed while Dahlia holds it up, unsettling the thick mat. They note the soil would be down below some ways, beneath the leaves and the worm castings, making it difficult to identify soil types with more precision.²⁰ This is why Dahlia recommends going by the kind of “rule of thumb” fallback category she suggests.

Dahlia comments in passing that the worms in the forests are of a European variety. The glacial scraping of the land in this part of the continent as the ice caps retreated at the time of the Wisconsin meant that worms got wiped out and were reintroduced with the settling of Europeans and the introduction of their animals. This is one more of the many changes brought about by European settlement in the region. In *The Formation of Vegetable Mould Through the Action of Worms with Observations on Their Habits* ([1881]1989), Charles Darwin notes the cosmopolitan range of worms, existing just about everywhere in the world. His studies form the foundation of the little that is known of the secret lives of *Oligochaeta*, or segmented worms. These worms represent an instance of foreign organisms becoming indigenized and in numerous cases enhancing natural spaces. Their castings, along with mulching leaves, enhance forest soils and build up nutrients. The health of the forest is improved by worms and the

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²⁰ Sylvie provides additional details on this process of documentation in personal communications, saying: “In general this [broader descriptions made in the field] is sufficient for seed collecting purposes as we just try to establish an overall picture of the habitat the plant was growing in. To know the complete composition one would have to take a soil sample and send it out for analysis. [There is] no time and no resources for this at [NSN].”
process of decomposition, although more recent research has began showing that worms
can also be linked to depleting diversity as they overturn the soil nutrients too quickly.
Despite some uncertainties, field biologists aim to document as much detail about the
specimens collected, even noting small observations. All information about the
conditions each plant has adapted to is especially useful in ensuring increased success in
propagation. Details on all surroundings help in understanding each plant in a holistic
way.

Identifying plants involves all the senses. While in the field, Dahlia and Sylvie
touch and smell plants. Sometimes tasting them can also help ensure correct
identification. These sensory clues enable field biologists to make sure they are correctly
identifying the different varieties of any given genus, beyond relying on visual traits. I
learned this in one of the early botanical hikes I went on where our guide introduced
hikers to *Betula lenta*, black birch, a plant that tastes and smells like strong wintergreen,
surprising in its intensity especially because it comes from a source other than a mint
herb. The strong flavor is produced by the smallest piece of its stem. Ecologists, who
take the whole landscape into account also listen to the sounds in the environment to get a
sense of the birds inhabiting the ecosystem and look at insects and other small organisms
(as well as taking account of the surrounding plants), in order to understand habitats as a
whole. Sylvie mentions enjoying doing fieldwork with Frank, an NRG ecologist, who
has been teaching her a bit about the birds in the woodlands where they gather seeds
together so that she can better capture in a holistic sense the environments the plants
grown under artificial conditions have adapted to in the wild.
Can the work of restoration be effective in promoting the growth of native species? Aiming to control non-native plants by discouraging people from dumping plants in the woods and including exotic and invasive species in their gardens is a completely different approach from those advocated in the past when exotic plants were promoted via nurseries and botanical gardens. Promoting plant selections based on the exotic beauty of plants as garden varieties, ornamental plants for parks and plazas, and the use of foreign tree varieties and monocultures for street trees, has historically been the favored approach (Vispo and Knab-Vispo 2011). Restoration work faces multiple hurdles.

Some of the non-native species seem to be here to stay, representing 40% of the total flora in NY State (Teale 2011). At Council Hearing Meetings on community gardens and Green Streets, some gardeners argue for considering leaving some of the well-established non-natives alone as long as they do not spread wildly and become invasive and/or damaging once having adapted to this region. Preserving them ultimately contributes to diversity one way or the other, they argue, which is the best way of hedging our bets against warming and resulting mass extinctions. Dahlia is not sure whether she agrees or disagrees with preserving all plants but she does know that the value of natives expands beyond their ecological functions. She emphasizes their beauty when considering their value.

I think it’s a tough question [whether to “make peace with invasives”]. For me working here [at NSN] that’s something I always revisit. I try to be hopeful because I think especially in an urban area it’s important not only for all the living things that have evolved with, alongside of, these native plants that have been here for however long, but also I think aesthetically there’s just more beauty in natives and native habitats. So, if we can recreate these little—even just small bits of native habitat—I think that it has more beauty for people in the urban jungle (May, 2013).
And while sometimes she wonders how much of the work of NSN actually benefits the environment, she thinks it important to preserve and help our wilder surroundings. And though digging up invasive plants to try to give advantages to natives that have been out-competed by foreign species does not always seem feasible, she emphasizes that we are living in a very changed world, one that is always in flux. Constant changes to the landscape have promoted the spread of invasives, prior land uses have at times contaminated local soils or sometimes simply changed their chemistry, and problems like soil erosion and other challenges have made it so that habitats are especially in need of regular human management.

While helping native plants is beneficial, especially considering how these plant populations have been affected over time by the importation and promotion of foreign plants, urban development, and other factors, trying to set the landscape “back” to some prior stage after it has existed this way for several centuries is unfeasible. She acknowledges of course that “restoration” is her job but she sees “diversity” as potentially encompassing other introduced species, nevertheless kept in check by a helping human hand. Dahlia is reflexive about the value of “biodiversity” in whatever form.

There’s always going to be a mix [of species], but I think you have to realize there are certain things that have to be kept in check a little better because they can easily spread. Forsythia spreads like wildfire, it just roots like crazy, but yeah, it’s pretty. It blooms super early in the spring and people love it. It grows fast, plus it provides a hedge. I think there’s always—even me, I’m not a purist. I think there’s room for both [native and introduced species] but especially when you’re in an urban area and you’re trying to foster some sort of ecological [balance] … it’s so easy to let the most aggressive things take over, but if we can restore some of these habitats, we can help. Just creating a little more wildlife, shelter for wildlife, or a corridor for animals, insects, in urban space. … [I]n the end,
nature is gonna win out. I sort of feel like we can battle it as much as we will … it’s kind of like job security in a way, you know? [laughs slightly] But in the end I think, yeah, nature is, nature is tougher than we think (May, 2013).

Sylvie is still learning more about the region’s native species. Before she began working on promoting native plants, she used to work on the other facet of restoration, or primarily on combating or just studying the effects of invasives. Because of her work managing invasives species, she understands that these plants must be targeted considering they are changing landscapes in a way that climate change is exacerbating. And yet, while she appreciates restoration efforts, she also wonders how feasible it is as a key strategy. No matter what, after all, invasive plants and exotics commingle with natives due to both natural processes and human error. The monocultures of English ivy (*Hedera helix*) sometimes found in forests is one example of how benign landscaping in home gardens can have larger impacts on the regional biosphere in hidden ways that ecologists like those featured in this study are working to make more visible.

We visit two sites for collecting arrowwood alone and return to the nursery to process the cuttings as they cannot be left in black plastic bags for too long especially in the summer heat or they wilt and die. Dahlia stays behind at the nursery to prepare them for refrigeration with her team. So Sylvie and I head out to the third and last site of the day to gather seeds from a sedge variety. We arrive and make our way over a stack of decaying Christmas trees still relatively intact in July, surrounded by potted plants that have been dumped at the entrance of the Reed’s Basket Willow Swamp by the residents of the houses across the street. Sylvie tells me to be careful and keep from touching the surrounding *Aralia spinosa*, the viciously thorny “Devil’s walkingstick,” growing in a thick stand at our entry point into the woods. Noticing the sharp thorns, I have no
intention of touching them but I end up grabbing hold of one plant just seconds after her warning in order to break my slide as I stumble on a root stump Sylvie’s feet are better trained at avoiding. If not for the thorny stem, I almost fall down the slope into the pile of decaying Christmas trees. A sharp pain shoots up my arm but embarrassed at my misstep, I quietly catch up to Sylvie. She has already put some distance between us and I quicken my stride significantly to catch up.

As I reach her, she is commenting on the stack of Christmas trees noting the problem with illegal dumping that happens regularly in parks. Despite the City’s investment in promoting “Mulch Fests” every January for reusing trees as mulch, they continue getting dumped on curbsides and forests. At first, seeing the pile of decaying houseplants and trees is distressing. Thinking about it further, I wonder if disposing of organic waste in the woods is more thoughtful than putting plants out on the curb. The idea that a dead plant and its soil might actually serve a function breaking down in the forest is likely based on more thought than merely dumping living organisms in a bin to take out in a plastic bag for someone else to haul.

Sylvie tells me a story about being out in the field one day when she saw a man illegally drop off a wheel barrow of lawn clippings in a park where she was working. She and her field partner warned him against doing that, but he simply brought a second load instead of listening to them. She notes how dumping non-native grasses results in lawn varieties blending with or wiping out natives. This has the potential for dramatically remaking landscapes. In addition to the Christmas trees, plants like hostas and daffodils are common sights along the periphery of woodlands. In Forest Park in Queens, a plant biologist said that sometimes Parks workers plant extra bulbs around the
main paths. Thus the Parks Department itself also ends up promoting ornamental plants as a way of beautifying the grounds in aesthetic terms recognizable to most visitors.

We walk along main paths and hidden trails, looking for *Carex swanii*, the sedge we are collecting seeds from. Climbing to the tops of the hills and looking along sunny and shady patches of forest, finding this grassy plant is at first difficult. These plants have seed groupings that look a bit like foxtail though not as hairy or as long, with smaller and rounder seed clusters. The stem is triangular and the blades are a bright green with a hint of yellow. We are once again careful not to over-harvest especially since this sedge only sparsely populates this site. We have not gathered very much seed because some of them have already dispersed (which will hopefully mean denser populations next season). Sylvie mentions having a “gut feeling” about where we might find denser numbers so we head to the top of a hill where we find richer stands than on the side of the trails where she had been told to look. This plant seems to like drier conditions, she observes. I wonder about altitude as well but Sylvie thinks it is more about the particular soil conditions found at the top of the hills than about altitude. We collect what we can and head back.

Figure 5: *Carex swanii* growing from seed at NSN (photo by author).
Once we return to the nursery we continue processing the cuttings just collected. We wrap them in damp newspapers, stacking them within Styrofoam coolers with the longer cuttings in large plastic bags we mist lightly with water; after tagging them all, we refrigerate them. *Viburnum* is difficult to propagate from seed, as are other plants that are a bit temperamental, so for now the nursery has been growing this species from cuttings as the propagation team experiments with other techniques until they can get the seeds to germinate.\(^{21}\) Dahlia cuts off the top leaves and buries a third or more of the stem in soil, after they have spent some time in refrigeration, and then rotates them to warm-moist conditions in the greenhouse so the plants experience the normal winter to spring cycles before generating new growth. Once the cuttings root, aided by a growth hormone dabbed on the part of the stem in contact with soil, they are planted in the tubes commonly used for shrubs. The seeds of the sedge collected will be harvested from the pods, weighed, and labeled once the plants dry. Some will be stored in the seed bank and others will be sown in a mix of peat moss, perlite and soil before further individuating each plant into single cells in trays.

A great level of care goes into cleaning the seeds in the fall and sowing them. Some seeds are sown in autumn and others in the spring, depending on when plants are scheduled to germinate based on their phenological stages, or life phases. The work of the nursery to provide diverse plants for restoration sites occurs in a small converted farm house with six greenhouses and multiple sets of quansets, or outdoor open-air structures with a sprinkler system where the plants are placed once they mature enough and become

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\(^{21}\) In the spring of 2013, Dahlia was able to produce radicals (small roots) for these shrubby plants through a technique she tested for propagating them from seed. She processed their seeds similarly to how she treats acorns, in a lightly damp mostly peat moss mix placed for six weeks in the seed cooler, followed by three weeks of warm-moist conditions in one of the hot houses.
established as individuals. The nursery operation as it exists today happened almost by chance as the property was saved from real estate development. Ben, the Nursery’s Director, recounts the history of the site this way:

If you go back into the history of how we came about, there is a native plant nursery here, yes. This was a privately owned family operation [since the 1950s] doing commercial—the last thing they were doing was commercial greenhouse production of things like cut flowers and poinsettias and things like that, so it was a business until the late 1980s and then the family was getting ready to sell the property and in fact they had offers from developers to buy and put up some housing stock on this property and as you probably saw when you were walking around, we are neighbors to the Fresh Kills landfill. This nursery will supply the plants for the Fresh Kills site, already under construction and opening in parts over the next three decades. … [The owners at the time of the sale] were the third generation in the family so it was a bit of the same thing, the classic story [of long time farmers changing trades] and more and more cousins at that point, wanting to live off this land and it not being possible anymore, just too many hands. So, I think that the prices that were being offered were, I’m sure, hard to resist [chuckles a little] … (October, 2010)

Selling the property to the City instead of private developers, however, allowed the farmer to stay in business continuing to work at the nursery and later consulting with city personnel until reaching retirement age when he moved to New England.

The process of restoration at Fresh Kills, looked at from the different angles of plant biologists, government officials and the public, intersect and diverge at various points given the very nature of the place shaping the different foci of the multiple groups involved with its transformation. With a mountainous terrain consisting of four mounds made up of approximately 150 million tons of solid waste, bordered by streams and wetlands along its coast and suburban neighborhoods, commercial areas, and reserves along its inland borders, a new park and nature reserve is a complicated place to build. Moreover, because the landfill has long blighted the borough, Fresh Kills has long posed a political problem for over a century and continues to be so today. Not everyone is
convinced that this clean up will be a guaranteed success. Opinions about the feasibility of this transformation range from skepticism to optimism. Ultimately, however, everyone I encountered during my time in the field agree that anything is better than an open landfill.
“The War on Plants”: Battling Invasives

Japanese Knotweed (*Fallopia japonica*): This large herbaceous plant perennial native to Japan, and other Asian countries, is one of the most persistent invasives around NYC. It has hollow stems with raised nodes that make it look like bamboo, especially after it has died back for the winter when hollow shafts of a pale color are left above ground once the plant has died back. Its leaves are broad and oval, its flowers small erect racemes, cream or white in color, blooming in late summer to early fall. …

* See Appendix II

After Sandy

We pull together as a group of three on a tough, brightly colored root we just exposed at the base of a short stump poking above ground. The root looks a bit like a vein revealed when the skin is pulled back, colorful, with offshoot arteries ranging in size and running in different directions. But partially exposing the root has not loosened its grip on the sandy soil and we find it still clinging firmly to the ground. Two of us dig deeper, below the sun-bleached topsoil to the dark charcoal colored layers just beneath the paler sand. The beach front where we are working makes it hard to dig and the root’s firm hold is unexpected given the slippery texture of the soil. We grab the orangey root again and pull to no avail.

One of the NAVigators—what participants in the Natural Areas Volunteers (NAV) program are called—says he can use the shovel as a lopper since we do not have

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22 The Natural Resources Group (NRG) works collaboratively with the Parks Department and is responsible for managing the Forever Wild sites, areas within the parks system receiving special attention, targeted for restoration projects and invasives management. NRG trains volunteers in identifying weedy species and regularly calls upon this pool of volunteers for help with special projects. Following training, volunteers are encouraged to participate in regular weeding at a site closest to their homes where projects are
that or hand clippers available for cutting the roots. He deftly slices into the robust roots of *Celastrus orbiculatus*, Asian bittersweet, with the worn, mud-encrusted shovel we are using. We grab hold of the root again and pull. It begins to come up quickly like a loose string coming free when pulled from knitwear. Suddenly it stops abruptly and breaks off and our excitement shifts to frustration. Various invasive weeds must be pulled at the root or they will grow back the following season despite volunteer efforts. Oriental bittersweet, as it is also called, grows thickly along the periphery of newly planted trees of a number of restoration sites. It is found in robust clusters where we are working at Conference House Park, located in the westernmost part of Staten Island just across the waterway from New Jersey. This invasive variety has become naturalized in the ecologically disturbed, temperate moist forests of the region.

The Natural Resources Group (NRG) heading this post-hurricane clean-up effort regularly calls on volunteers for help with invasives removal and plantings for restoration. The turn out on this cold, windy January morning totaled about 30 people once a local youth group arrived a little after the start time. Running a three-pronged clean-up, volunteers are broken up into groups to complete the three tasks scheduled for the day. The first is instituting anti-deer measures for preventing the growing ungulate population from feasting on the new saplings recently planted. The second entails pulling invasive weeds, namely the Japanese knotweed (*Fallopia japonica*). The last group is tasked to clean up the beach still littered from the hurricane. Though Japanese knotweed is the target species this day, no weed is ignored and Oriental bittersweet along with the dry stems of the common reed that have died back for the winter but protrude above
ground and are found throughout the area are also pulled. The group in charge of

cleaning up the beach front quickly disperses to the shore to clean up litter, debris, and

household items washed ashore following Superstorm Sandy on the October 30, 2012.

Sandy was particularly devastating for the eastern coast of Staten Island along the

New York Bight of the Hudson River facing the Atlantic Ocean. While recovery in
terms of rebuilding the built environment can be advanced at a controlled pace, a full
recovery of the shoreline’s natural buffers like seafront dunes and plant life holding sand
in place will unfold at a different pace, following the successional stages of the habitats
impacted most. But while cleanup efforts and reforestation have been slowed by
extensive damage to parts of the city’s shoreline, this has raised valuable questions about
zoning and development. What role do parks play in urban sustainability? How can the
urban canopy mediate the damaging effects of ever stronger storms? What invasive
plants pose the more serious threats to urban ecosystems? And what management
strategies are being implemented for responding to climate change? This chapter
addresses these questions by highlighting the work of urban reforestation in city parks
and beaches for enhancing ecosystem services.

We keep digging but the roots of the invasive bittersweet stubbornly hold on,
even while in the midst of winter dormancy. Its vines grasp the treetops less vigorously,
weakened by the storm and the death of the trees they grow on after they have been
undermined by the parasitic vines. The first cold winter in a few years and the multiple

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23 Sandy’s damages include a 44 person death toll; power outages in downtown Manhattan, Breezy Point-
Queens, and parts of Long Island; State and City Park closures particularly in Staten Island and Long
Beach-Long Island; flooding in tunnels and lack of access to the tip of Manhattan for several months
(especially in the case of the No. 1 line); downed trees and much more. The cost to infrastructure was
estimated at $19 billion dollars in damages to NYC alone, and $32 billion to NY State. The damage to
New Jersey was especially intense. Parts of southern Connecticut, too, suffered damages.

24 The term refers to the benefits obtained by people from the environment. A more detailed discussion of
this ecological concept follows in Chapter 8.
cuttings performed by the NRG team make it easier to free the smothered trees from the vines’ clutch even while uprooting them is more labor intensive. The volunteer slicing roots with the shovel trammels the bittersweet and common reed on every inch of beach he covers, ripping vines off tree branches, picking up litter and dislodging lawn furniture and other personal objects from the trees surrounding us, meters away from the water. Much like the weeds we are targeting and the furniture wedged in trees, the plastic bags we are collecting as part of the cleanup are woven into trees like eerie blossoms on the urban canopy that are just as difficult to disentangle and extract as are invasive vines.25

Trash and invasive species are hard to extricate from urban open spaces. These traces of city life persist throughout unbuilt areas in the festering litter blending into plants and soil. At Conference House, the bivalve shells sprawling across the beach blend with pieces of plastic and glass and other sometimes unrecognizable matter, adding to the colorful mosaic that glitters under the sun moistened by the encroaching waves, subtly reminding beach visitors of the ways in which ecosystems exist within urban landscapes. While the destruction inflicted on human habitat is highlighted in recovery efforts, the cleanup of parks and coast lines has received less attention. Storms not only

25 The problem of plastic bags ending up in trees, sewers, and in the oceans is a persistent one leading cities around the world to ban the use of this convenience item. While there has been talk of a similar ban in NYC, no serious bill has been proposed so far. In April, 2014, the media began reporting that the City Council will soon be proposing a bill implementing a small fee for plastic and paper bags at supermarkets and other convenience stores. This has not come to pass at the time of this writing. The effects of plastic bags on entire ecosystems are mainly studied by biologists and environmentalists who emphasize the problems with the ways in which bags shred and become litter making it difficult to collect for disposal. More ominously, whether in tact or shredded, bags end up in the stomachs of marine animals that mistake them for food especially given their likeness to jellyfish when submerged in water. Most notoriously, the Great Pacific Garbage Patch has called attention to this pressing problem, receiving significant attention from the media. The way bags clog urban sewers poses a more direct threat to infrastructure in the context of NYC, further exacerbating problems of pollution caused by sewerage overflow in beaches following intensive rainfall. For more on the hazards of plastic bags, the Worldwatch Institute and Greenpeace (2006) have compiled useful resources on this problem. Also see Hawkins (2001) on plastics. Additionally, Max Liboiron’s Discard Studies sources provide a useful and current survey of the latest research on the hazards presented by plastic.
uproot trees and wipe out coastal buffers, but also compound the problem of persisting rubbish in natural areas. As the main case study of this work, the Fresh Kills landfill, also demonstrates rubbish transforms landscapes. Mediating pollution problems has become necessary in post-industrial cities as a result. Restoring environments has taken special importance as predictions of more frequent and more powerful storms become a reality. Following the city’s experience with “Frankenstorm” (as hurricane Sandy was nicknamed for its unusual formation and timing around Halloween), the urgency of enhancing, maintaining, and restoring NYC’s natural buffer zones has only been underlined.

This has led the Native Species Nursery to focus on *Ammophila breviligulata*, or American beachgrass, for the city’s concerted efforts to build additional dunes in strategic zones around the city. Places along Manhattan’s coast, Jamaica Bay, and the easternmost coast of Staten Island, where the devastation was especially intense, will be aided by taller dunes held in place by beachgrass. This plant’s intricate roots systems form a dense weave that helps keep sand in place. Taller and sturdier dunes and increased trees—whether in city streets, parks or forests—will help absorb water also relieving the city’s aging sewer systems. This is part of the ecosystem services provided by natural infrastructure. These services are discussed in more detail later in this study in the context of Dr. Timon McPhearson’s research. His ecological insights on ecosystems services are being applied to enhance the sustainability goals of PlaNYC.

The rising interest in recreating at least some of the city’s coastline into natural buffers in the wake of this latest devastating hurricane is just one of the ways in which enhancing the city’s ecology has become a policy concern. Cleaning up brownfields and
transforming polluted places like the city’s closed landfills and industrial waterfront are benefitting from the undeveloped places that have not fallen prey to real estate interests and a preference for human access. Managed natural spaces contain the resources for greening NYC. The seeds of the plant communities found in forests and marshes contain the possibility for alternative approaches to remaking the city’s ecology and maybe even bringing some semblance of the landscape that existed centuries ago. More than this, these spaces absorb run off preventing soil erosion, and sequester carbon.

But genetically diverse native plant communities face threats not just from human disturbances and invasive plant species. They are also at risk from wild animals as well, mainly deer. White-tailed deer (*Odocoileus virginianus*) have no natural predators in the metropolitan setting, enabling them to thrive in the regional forests by feasting on the plants needed for enhancing ecosystem services. Deer deterrents thus must be used by the NRG team. These deterrents are small plastic pins that look like short white and blue plastic pens that can be clipped to the smallest branches of saplings and shrubs. Volunteers are given “keys” to open the clips before pinning them to the branches throughout the designated area. Once the volunteers open the pins, the scent of garlic wafts over us while we work, smelling much like freshly baked garlic bread. When asked if he knew why the garlic scent deters deer, one of the NRG workers leading the team says deer simply do not like the smell.26 “More for us,” he adds as he shrugs, after expressing his enthusiasm for garlic in its many uses.

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26 Deer have a very sensitive sense of smell and the scent of garlic irritates them enough to avoid the area emitting the smell altogether.
Deer-proofing does not take very long, and soon the volunteers in charge of that task head to the beach front to pick up trash joining the rest of the group already working there. Ranging in size and quantity, the bulkier trash includes larger items like plastic children’s pools, patio furniture, even parts of a boardwalk. Plastic bottles, bags, and other conventional litter are also strewn along the shore. More personal objects and everyday things like underwear, kitchen wares, buckets, gift bags and other items stored in family basements or garages, are scattered throughout. Lacking the context of a home in this open beach, these objects are reminders of the dislocation of lives and the objects that support those lives following Hurricane Sandy.

The area just a few feet from the coast had just been reforested with species of pine (*Pinus*) and softwood trees like maples (*Acer*) and oaks (*Quercus*) before the hurricane. The new pine trees contrast with the deciduous trees in the adjacent forested areas leading up to the shore. The salt from the sea water that rose 15 feet flooding the beach and the forest has not been kind to the pine trees and they are all brown. Hoping they will recover in the spring, the NRG team is maintaining the site without pulling up any of the saplings, instead targeting the difficult Japanese knotweed (*Lonicera japonica*)
that has been choking the reforested areas. Beyond the saplings that took a hard beating from Sandy, stretches one of a number of free beaches within city limits. But despite the available and free beaches on the island, residents still drive to neighboring New Jersey and pay a small fee to use that state’s waterfront. “Daniela,” a first generation and life-long Staten Islander in her late twenties, grew up with warnings about the island’s beaches. Daniela is one of the first Staten Islanders I got to know during fieldwork. Her love for her home borough’s history and the humorous memories she likes to share about growing up in Staten Island have helped me better understand “the forgotten borough.” She recounts those warnings to avoid the surrounding waterways this way:

I never went to the [Jersey] Shore really as a kid but my cousins had a summer home [there] so we would go visit every now and then. I remember growing up and being told not to go to the island [Staten Island] beaches because they were dirty and the water was bad. As I got older my friends and I would go to the Shore for a couple of days to the beach. We never once even thought of going to the beaches on Staten Island. It was just something that was understood. You did not go swimming in the water. Even to this day I really don’t go to the beach on Staten Island. I will go to the Boardwalk over by South Beach but that’s really it. I guess it’s hard to break old habits. Most of the Jersey Shore is probably filled with Staten Islanders (May, 2013).

Though pollution problems are long-standing and the beaches and its wildlife present risks some still dismiss the potential hazards and continue fishing and crabbing. The residents especially dependent on marine resources for supplementing their diet tend to be lower income residents and newly arrived immigrants, oftentimes with a traditional dependence on the sea.
Towards the end of the shift, the group pulling invasive species has cleared a small circular patch on the periphery of the restored area, between the mature forest and the edge environment being rebuilt. The work is difficult, limiting the pace of progress made during the shift. The area is ringed by fallen trees and reed shafts from the mighty *Phragmites* also blanketing the space. The end of the work session creeps up on us and we feel discouraged by what seems like little progress. The NRG crew leaders assure us in cheerful voices that every little bit we accomplish counts. The work of reforestation depends on getting a little bit done every day. It all matters in the end, they emphasize. When it comes to restoration, whether on the scale of the project underway in Fresh Kills or smaller ones around the city, patience is imperative. In the case of natural processes, they do not follow the city’s quick pace but progress at their own time. This pace stands in stark contrast to the rate of consumption producing the mounds of waste that form a counter-narrative to this study. This chapter demonstrates the difficulties involved in creating and maintaining beloved parkland and keeping this type of “infrastructure” in good shape.
At the End of the Day

The sand along the waterfront glows with a blueish hue. The blue tone is produced partly by the brightly colored clam shells everywhere, including on the floor of the nearby forest. Hints of the clam and oyster beds that made Staten Island famous in centuries past along the southern shore near Raritan Bay are still evident today. The concrete debris so ubiquitous throughout city parks and beaches disappears markedly at this beach and the prominent matter along the shore consists of the remains of mollusks, some of more dazzling shapes and colors than others.

I pick up the shiniest black shell with a lapis-like colored middle and it breaks as I lift it from the sand. I locate another beautiful shell and try to free it from the sand it is embedded in only to have it meet the fate of the first shell. I try a few others and notice a pattern: the shells are very brittle and thin and break at the slightest touch. Not knowing much about mollusks and marine life, their fragility alarms me. I remember collecting shells as a kid in Tela Mar, on the northern coast of Honduras. The shells were tough and hurt our feet, sometimes feeling more like rocks than shells. While the wildlife is significantly different here, Rachel Carson’s ([1964]2002) warning about the effects of chemicals on the density of birds’ egg shells comes to mind. Knowing that small oil spills have just taken place on Raritan Bay from the ships destroyed by Sandy, gives me further pause. Repeated and under-reported oil spills have been common in this area. Sewage flooding from the city’s old-fashioned single pipe system, industrial pollution from industries along the coast, and periodic oil leaks from recreational or merchant boats in the city’s surrounding waterways, have exacerbated environmental contamination around the greater metropolitan area. John Waldman, a conservation biologist at Queens
College-CUNY, provides a sampling of such regular oil spills in his book *Heartbeats in the Muck: The History, Sea Life, and Environment of New York Harbor*:

During its first six months more than one hundred spills and mishaps discharged over one million gallons of oil onto the Arthur Kill and Kill Van Kull. The wildlife of the Arthur Kill greeted the New Year assaulted by the largest of these releases, which lasted until January 2, when an Exxon pipeline ruptured and leaked 567,000 gallons of No. 2 fuel oil. The cleanup effort included sixty thousand feet of boom, 680 people, seventy vessels, forty vacuum trucks, and 10 skimmers, but still only recovered about one-quarter of the spill. The remaining oil created a slick that poisoned the salt marshes around the breeding islands for the harbor herons and killed at least 650 ducks, geese, and gulls, 28 muskrats, innumerable invertebrates, and broad stands of Spartina. This was followed about two months later by an explosion on the Citgo Petroleum Corporation’s barge *Cibro Savannah* that resulted in another 127,000 gallons of No. 2 heating oil coating the kills. On June 7 the tanker *BT Nautilus* ran aground and spilled 260,000 gallons of No. 6 oil near the Bayonne Bridge on the Kill Van Kull (Waldman [1999]2013:63-4).

I abandon the idea of doing some last minute shell collecting and run back to the Parks truck.

![Figure 8: Bivalves on the beach, Conference House Park, Staten Island (photo by author).](image)

The wind whips everything around as we tie up large black trash bags and pile about 30 of them together by the truck. Despite it being a cold windy day, the heavy work prevents us from feeling the chill in the air. Once finished, we walk back through
the forested lane where we had first entered the beach front. It is the only open path after the park closed following Sandy. From the path’s vantage point, it is unclear how large the forest is. Reminders of the city setting are everywhere, from the paved tar road we end up on, to the light posts along it, and the random fire hydrants that seem out of place in the forest. We soon reach a clearing and the panorama opens before us. The earth’s texture changes, from sandy to a dark coal black, to black tar. Soon, there is concrete under our feet again and the suburban homes bordering the park displace the trees.

**Learning how to Wage War On Plants**

New York City’s natural areas include an array of different ecosystems, including 28,000 acres of parkland, 11,000 acres of forest, woodland, salt marsh, and fresh wetlands. Among these spaces, 1,879 are protected areas. The Natural Resources Group (NRG) has managed to restore 15% of these lands and volunteers have been crucial for providing maintenance support to completed restorations, keeping them from sliding back into disrepair. The Natural Areas Volunteer program (NAV) is the most recent plan for supporting this work. Of the different plants around the city, trees are especially in need of volunteers’ help especially given the city’s MillionTreesNYC program which has put hundreds of thousands of young trees in the city’s streets, making educating residents in basic forestry especially important. In other cases, participants are also trained in identifying invasives and on overall landscape management. Instructing independent volunteers who will in turn teach others about reforestation and management is an additional city objective for which special programs have been created and are constantly promoted.

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27 Details on the make up of NYC’s parkland were obtained from NRG ecologists during NAV training.
Parks Department policy is to prevent the public from tampering with wildlife and the landscape, making harvesting any plants without a permit illegal. But budget cutbacks and ambitious city goals for reforesting the city have made it necessary to rely on the public’s help more than before. The importance of getting volunteers helping the city take care of the grounds is expected to provide the necessary help the Parks Department needs. NAV work takes three different forms: 1) “Drop in” days, where online registration is necessary, even while the programs are free of charge; 2) Corporate and other group service days where businesses bring teams to work on the various project areas NRG needs help with; and 3) Trained long-term stewards. The third scenario is especially important because restoration efforts are most successful when people take long-term interest in the work and can commit to maintain the changes made.

NRG’s involvement with urban ecological restoration through the NAV program helps engage the public in these restoration efforts. NAV work involves planting, collecting data for Parks about plant species and to some extent space use, and most importantly, pulling invasives. The latter is the focus of current projects. The MillionTreesNYC campaign, an example of a public-private partnership, has planted 250,000 trees so far. NRG has planted about 60,000 of these trees in park land as part of reforestation projects at sites like Clove Lakes in Staten Island, Alley Park in Queens, Hunter Island near Pelham Bay Park in the Bronx, Van Cortland (the fourth biggest park in the City) also in the Bronx, and Marine Park and Floyd Bennett Field in Brooklyn.

New trees provide infrastructural improvements beyond those we tend to associate with trees like pleasant breezes and shade. More trees can mitigate the effects of climate change besides providing shade. They stabilize soils and serve as erosion control.
Moreover, they help catch and absorb water and by extension keep our waterways cleaner as they relieve the sewerage system and prevent overflowing into surrounding waterways after storms. So increasing the number of trees around the city is a response to several effects of climate change like more intense storms, flashfloods, and increasingly common and more intense heat waves.

Volunteers are taught “how to fight the war on plants,” as one instructor put it to a group of trainees being introduced to weeding. Not all plants are good for the environment so it is important to constantly manage and control landscapes, especially urban ones that given polluted soils and diminished species diversity tend to limit the proliferation of sensitive native plants that are out-competed by invasives which are better adapted to harsh conditions and have no natural predators in the new ecosystems where they settle. So while city agencies fight this war with chemicals, volunteers are taught to do so by performing the hard work of pulling weeds by hand. Fighting this war is necessary because though forests are complex, they are disadvantaged by invasive species. Northern forests differ from rainforests in that they have only five layers from canopy to forest floor, while those in warmer climates in the south like the Amazon can have up to twenty. Some of the layers of northern forests include the canopy, the understory, shrubs, herbs and forbs. The threats to these forested areas are multiple.

Some of the weeds wreaking particular havoc include Oriental bittersweet (Celastrus orbiculatus), Japanese honeysuckle (Lonicera japonica), and porcelain berry (Ampelopsis brevipedunculata). While Celastrus orbiculatus has killed off or hybridized with the region’s native bittersweet (Celastrus scandens), Japanese honeysuckle and porcelain berry are taking over parks and natural areas. Although, the fruit of the
porcelain berry plant ripen in the summer and provide birds with additional food, they are not an important food source. The nutrient content of these berries is not very high so birds cannot get a nutritious diet from them. Porcelain berry is referred to as “grape’s evil cousin” by some of the NRG staff. Birds defecate the berry’s seeds spreading them as far as 30 feet in every direction. The berries look like porcelain, giving the plant its common name. Japanese knotweed is referred to as “the superman of evil weeds.” It is unusually difficult to exterminate. Mugwort (Artemisia vulgaris) is another common weed species that grows extensively in disturbed sites where invasive species tend to thrive. It is targeted for its prolific nature.

![Figure 9: Lonicera japonica growing densely along a park path (photo by author).](image)

The impact invasives have on indigenous plant communities include strangling, smothering, weighing down, crowding out, and chemically damaging habitats through allelopathy. This last term refers to plants making soil uninhabitable for native plants through the release of noxious chemicals that deter the growth of other plants and alter soil makeup. And lastly and most importantly, invasive species out-compete natives for resources like nutrients and water. Biologists’ bias is therefore in favor of native species. Dr. Munshi-South, whose work on animal genetics and evolution is discussed in more
detail in the following chapter, says about opting for natives even while sometimes also making peace with invasives:

You go on a case by case basis depending on the invasive species you’re talking about. … [Y]ou have to weigh the benefits of removing them versus the costs and effort involved and what you’re going to get at the end, and whether it’s going to be sustainable to keep managing it that way, so, I don’t know, it’s a real issue everywhere and people are dealing with this. But of course, our bias as ecologists and our training tells us that everything should be native, and it should be from the successional stages to the climax community we want to see at the end but I think there’s this small movement that’s growing amongst ecologists that some people call “Reconciliation Biology” or “Reconciliation Ecology” where we just try to reconcile these invasive species with our management designs and just the ones that aren’t that bad, just leave them or manage them lightly and let things take their course and you’ll end up with the unique urban forest that’s composed of this mix of species and that’s the best we can do [laughs slightly] … (August, 2011).

But choices about what plantings should be included in restoration sites are countered by the prolific nature of certain invasive species. Vines, for example, are full of water so during storms they can become so heavy they can bring down mature trees. Restoration techniques for battling invasives include several options. One of them is repeated cutting and pruning to weaken invasive plants. Selective herbicide application is also an alternative. Erosion control incorporating logs or coconut fibers used in meshes spread out over affected areas also helps. And finally, planting beneficial species either in terms of native plantings or trees that do well in given spaces, in particular the MillionTreesNYC plantings also helps with checking the spread of invasives.

The damages caused by invasives are compounded by related problems caused by people. From compacted soil produced by motorized vehicle trucks, bike jumps, and the public walking in off-limit areas (called “desire lines” by Parks personnel), to illegal dumping of construction debris sometimes containing chemicals that kill plants beyond
smothering them, the problems typical in parks are difficult to manage. Illegal dumping mars the forest floor with bricks and broken concrete, reminders of the human and urban context in which wilderness areas within city limits exist. Setting old cars on fire was until fairly recently an all too common practice in city parks. The nursery staff assures me there is an abandoned car in every forest, and I was able to find several of them on visits to various sites. One informant suggested half in jest that there may be a possible typology that can be constructed based on car models for characterizing each park and its surrounding neighborhoods but no one has attempted this exercise.

While all of the human-induced problems are harmful and difficult to eliminate, the single biggest problem continues to be invasives. Invasives stop regeneration and this is precisely how volunteers can help. Volunteer labor helps landscape management and lessens the use of herbicides since Parks does not have to rely on chemicals to do the type of large-scale work required to keep invasives under control. Relying less on chemicals is always advantageous since herbicides and pesticides have lasting effects as they become embedded in the cells of plants and animals and affect their biology, as well as contaminate waterways through runoff.

There are a number of risks associated with the work of volunteering for the war on plants. NRG trainers warn volunteers about the hazards involved in this work, instructing participants on how to limit exposure to poison ivy, ticks, thorns, uneven ground, bad weather, and even exposure to medical waste like syringes and other sharp objects like glass found in parks. One of the most important hazards to guard against is ticks as they cause Lyme disease. Lyme disease has been on the rise where deer populations have grown. The deer population has risen in Staten Island as animals swim
in from New Jersey, posing an increased risk. The nursery staff takes regular care to inspect daily for ticks. Identifying ticks is made relatively simple for volunteers: ticks have eight legs and therefore belong to the class *Arachnida*. Their eight legs make them hard to confuse with insects even while they can resemble well-fed bedbugs (belonging to the Class *Insecta*) when fully mature.

The effects of Lyme disease are described as similar to Bell’s Palsy which brings the onset of facial paralysis that one NRG trainer put bluntly for volunteers to quickly recognize the symptoms: “If your face starts looking like Sylvester Stallone’s, get to the hospital!” Program participants are warned to be extra vigilant and wear appropriate clothing, always looking before grabbing anything and washing up after being in the woods with oil-cutting dish soap for getting rid of the oil from poison ivy that triggers the rash induced by their chemical coating. Committed volunteers are not deterred by any of these risks and happily participate in the program. Their efforts are recognized annually by a celebration held in their honor usually at the Arsenal, the headquarters of the Parks Department, located near the Central Park Zoo.28

NRG training emphasizes that fragmentation is as dangerous to habitats as cracks to healthy skin compromise wellbeing. Unbroken skin protects our bodies from contaminants and disease much like corridors protect the constancy required for healthy environments. Continuity is essential for strong ecosystems. Many of the projects therefore seek to reestablish continuity between natural spaces in a city covered by so

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28 In 2013, the last year of Mayor Bloomberg’s tenure, the annual event celebrating the work of volunteers was held at Gracie Mansion. Historically, this mansion is where the city’s mayors live during their terms in office. Mr. Bloomberg invested in its restoration over the years looking to preserve it as “the people’s house,” in his words, rather than a private home for incoming mayors. Opening up Gracie Mansion for this event further underscores just how important parks and the tree program have been for the Mayor and his program for sustainability.
much concrete. A loss of connectivity, or habitat fragmentation and compromised peripheral boundaries essential to healthy core environments, are ongoing threats to the wellbeing of forests. Because the stability of forests depend on it, central to forest management is establishing and maintaining continuity, something that is uncommon in urban areas. In fact, sites are prioritized for restoration based upon high levels of fragmentation.

Pulling natural areas together operates under this same principle of combating fragmentation for enhancing ecosystem viability by providing corridors for wildlife to spread. These corridors are essential for genetic diversity as the molecular studies of white-footed mice and salamanders conducted by Dr. Jason Munshi-South demonstrate (more on this in the following chapter; see Munshi-South 2012; Munshi-South and Pehek 2013; Munshi-South and Kharchenko 2010). At this stage of restoration efforts, the main task for volunteers is killing weeds in order to make room for future plantings. So far, results for restoration work are mixed. Some sites have been successful while others have failed. Collaborative work like the NAV program will help ensure better outcomes. In the case of the Fresh Kills restoration, scientists and designers aim to establish continuity and plenty of corridors in order to promote the functionality of the space created.

One NRG plant scientist said, “Not all plants are good for the environment. It’s kind of a mind trip for some people to think this.” People often think that pulling up plants is bad for the environment, an attitude that the staff works to prepare volunteers to address. Volunteers will have to respond to concerned park goers who object to weeding
and cutting down plants not realizing that this work is necessary for maintaining vibrant ecosystems.
Reservoirs of Biodiversity: Evolution at Work in Parks

Garlic Mustard (*Alliaria petiolata*): This native to Europe, parts of Africa, central Asia, and others was imported here by the Dutch as a biennial herbaceous culinary herb that increased available food during early settlement; it provided a real advantage during the periods of hunger endured by new settlers. The leaves get bitter the longer they mature. They form clumps of round dark and textured leaves growing close to the ground in their first year that are used as salad greens or for pesto sauce. In their second year, they form densely clustered, white cross-shaped flowers. Each plant contains seeds in rows where there can be 1,000 seeds in one plant. This vast quantity of seeds is released in mid-summer so it is important to pull the plants before they go to seed. It is one of the plants on the list of most noxious plants in this part of the U.S. …

* See Appendix II

Adapting to Cities

While conducting fieldwork, I paid close attention to news coverage on NYC’s parks and Fresh Kills in particular. Notable stories underscoring the “wilder” side of NYC featured discoveries of four new species of native bees (one of them named *Lasioglossum gotham* while the others are still unnamed), as well as a local species of the leopard frog (also yet unnamed) discovered in Staten Island. These stories remind the public of unique life forms that can be found in the Empire State. These discoveries represent some of the highlights of coverage on nature over my fieldwork season.

Then, in the summer of 2011 an article entitled “Evolution Right Under Our Noses” written by Carl Zimmer appeared in the *NY Times* (July 25) featuring a story on the work of two biologists and their students studying urban evolution in NYC’s parks. One of those scientists, Dr. Jason Munshi-South, an evolutionary biologist who teaches
environmental science in the Department of Natural Sciences at Bernard M. Baruch College-CUNY, is studying the impact of the urban environment on white-footed mice 
(*Peromyscus leucopus*). I reached out to him to find out how he went from working with Proboscis monkeys in Borneo and elephants in Central Africa to doing research in New York City with mice, salamanders and frogs. More importantly, I wanted to learn more about what his findings among mice populations reveals about wild animals’ adaptations to the peculiarities of city life.

I meet with Dr. Munshi-South at his office in Baruch College. It is an especially hot afternoon in August and he is dressed comfortably for the hot day in a light tee shirt, sandals and shorts. He smiles when I ask about his radical shift in research sites, from the African continent and Borneo to NYC and he responds that his decision to conduct studies closer to home has been both personal and professional. In addition to complications like receiving and renewing permits to work in some countries making data collection and analysis lengthier and more difficult, taking DNA samples out of countries for studying them in labs elsewhere is difficult to navigate internationally. In Borneo where there is a lab for conducting studies in-house, things are less complicated than in the case of analyses involving African elephants. But these types of hurdles, as well as the time away from home with a new family, make this work difficult to do right now. The questions he was engaged with when studying Proboscis monkeys are similar to those he is studying here at home. But working in the NYC context also enables him

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29 In countries lacking labs for studying DNA, samples must be taken back to researchers’ home countries or nearby labs in other countries with the necessary facilities for conducting genetic analyses. Because of the complicated histories colonized countries (like those in the African continent) have with researchers from the industrialized world, the processes for removing materials and taking them abroad can be convoluted and lengthy. This can mean longer field seasons for researchers. Navigating complex bureaucratic measures can further lengthen research time.
to investigate new questions regarding the effects of an urban environment on the adaptive responses of evolving animal populations. The data he is collecting is especially useful given that cities are where most humans live today.

Dr. Munshi-South describes the layout of City parks as arranged like island archipelagos, separated from each other much as actual islands are, albeit by concrete rather than water. When he first moved to NYC, he was surprised to know that there are a variety of native species still present. The common assumption is that when environments are as disturbed as they are in cities, native species die off, so it is easy to assume a significant reduction in biodiversity and even expect an increase in the types of opportunistic foreign species or invasives that thrive in disturbed environments. But in fact, native inhabitants like white-footed mice are well-represented throughout the city. But while mice have found ways of taking advantage of urban environments, other species have indeed followed expected patterns of population collapses, or are barely hanging on by a thread. This is the case for the salamanders (*Desmognathus fuscus*) he is also studying, a species that makes for an interesting contrast to the white-footed mice. Unlike the mice that have developed adaptive responses, the salamanders have gone in the opposite direction and are becoming inbred and dying off. The contrast between these two species underscores the fact that responses to stresses vary greatly across a wide continuum ranging from various biological adaptations to potential extinction.

The built environment creates barriers to populations, isolating them in such a way that can produce either increased variation or lessened genetic diversity. Dr. Munshi-South explains how genetics among *P. leucopus* are affected by the environment
depending on the existence of features supporting conditions for the necessary exchange of alleles promoting genetic diversity:

Well, it seems that when you have parks that are relatively close to each other and there are little pathways with at least 60-80% canopy cover, mice are distributed all along there and probably other species, too, so they don’t become genetically differentiated. When they get farther apart and the canopy cover breaks down, then they can’t move anymore and they’re just stuck in these little pockets. And that’s probably true for other species as well but the effects would be different, depending on the biology of the organism. And so we [he and his research partner(s)] built these models of connectivity just based on canopy cover for the whole city, and we looked at how well the genetics is associated with those models, and they’re associated very well. So, theoretically if you wanted to, you could do your tree planting or your ecological restoration in ways that would reconnect the parks from the perspective of white-footed mice or other species. Then you could create these greenways throughout the city that actually function biologically in terms of animals and plants being able to move around and be more connected to the ecosystem.

Shifting development decisions from human priorities to include those of other organisms sharing our habitat is a radical proposition, however, particularly when it comes to the species involved. City officials would likely not be interested in promoting the number of mice living in NYC, whether they are genetically fascinating or not. Dr. Munshi-South and his team can promote their ideas for conservation based on more charismatic animals instead:

I have a graduate student who’s going to be working on other species—short-tailed shrews, maybe coyotes, maybe something else—other people in the city would be interested in other organisms, so you could sell it as creating an interconnecting ecosystem throughout a city that would function for animals, plants, and ecosystem processes, but also just beautify the city as well and improve the green infrastructure of the city, and have these other benefits … like reducing the heat island effect, reducing storm water runoff, all those things would improve if you had more green space. … [in addition to shrews and coyotes that might gain popular support for promoting habitat construction] migrating birds, maybe, people seem to really like those a lot. Or, butterflies. Pollinators. And you can even integrate things like community gardens and rooftop gardens into those. They won’t have benefits for a lot of the species I’m
talking about, but they’ll have benefits for pollinators and insects, and so forth (August, 2011).

White-footed mice in NYC exhibit as much diversity as mouse populations throughout the southeastern U.S. living in less fragmented landscapes. This is not simply the case at the level of NYC’s various boroughs, but sometimes across parks within the same borough. These results are important for programs intended to enhance biodiversity around the city. The changes Dr. Munshi-South has been documenting are valuable indicators of the effects the environment has on an organism’s evolution. This kind of insightful finding is what attracted the attention of The NY Times reporter who sums up the matter of changes in a range of animals succinctly:

White-footed mice, stranded on isolated urban islands, are evolving to adapt to urban stress. Fish in the Hudson have evolved to cope with poisons in the water. Native ants find refuge in the median strips on Broadway. And more familiar urban organisms, like bedbugs, rats and bacteria, also mutate and change in response to the pressures of the metropolis. In short, the process of evolution is responding to New York and other cities the way it has responded to countless environmental changes over the past few billion years. Life adapts. (NY Times 25 July, 2011)

But in addition to novel mutations in the form of new biological adaptations, much genetic diversity has been lost by the hemming in of animal populations by the built environment. His salamanders study is more recent than his work with mice so his conclusions are more tentative. Mice are well known and very well documented in scientific studies so it is easy to study them in order to feature this species as a central component in studies on evolution and the impacts of urban environments on change and adaptation. But as his work with salamanders is now concluding, results are demonstrating that salamanders have lost genetic diversity and their future in urban ecosystems is not terribly optimistic judging from their current populations.
Elaborating on the case of the salamanders, Dr. Munshi-South has found that there are healthy and growing populations in Staten Island but they are on the decline elsewhere around the city. There is a small population in Highland Park that is at risk of extinction due to interbreeding and a shrinking habitat. He has been studying a group next to a golf course in a park where bike lanes have been proposed to run right through the stream where the salamanders live. This would further delimit their environment. Significant disruptions to this population’s surroundings could put salamanders at risk of disappearing given that they are already inbred enough and lack robust population numbers. This bike lane is only one example of the detrimental things done to habitats hurting animal populations and ecological processes. Managing the environment in more “sustainable” ways or in a perceived “eco-friendly” style is much more complicated than creating bike lanes or having green spaces like golf courses. One “eco-solution” like bike riding can compromise another valuable ecosystem asset like native salamander populations living in leaf litter and small streams. Balancing the “good” for the environment not just for humans is contingent upon detailed knowledge of this sort. 

Management practices are improved upon by emerging findings.

Other everyday practices have proven to be harmful disturbances as well. Grass clippings from mowing the golf course are deposited in the stream also negatively impacting population numbers. Urban ecology can be enhanced by putting knowledge about animal environments to practical use: knowing more about what is happening with animals can make for an applied angle on urban ecology. Dr. Munshi-South also reflects on the challenges of protecting the city’s natural resources. Despite the value of the work conducted by the NRG staff, the organization managing natural resources for parks, this
group operates with less than 10 people managing all parkland. This makes it difficult to protect the city’s valuable natural resources. And though Urban Park Rangers are also involved in managing mammal and bird populations, the small number of employees performing this work is stretched thin.

At the crossroads of genetics, ecology, and evolutionary biology, Dr. Munshi-South’s research points to significant evolutionary traits informing the ways in which humans, too, could be reacting to urban living. Buildings and the predominance of concrete generate a heat island effect that has been productive for species like white-footed mice that thrive in warmer climates. The landscape and the effects of warming are producing changes in their phenological phases, or their life stages and development. What can this tell us about human adaptation to urban living? What can it tell us about the stages of plants and other organisms as well? Evolutionary change is constant and bottlenecks and founder effects steer evolutionary processes in new and unpredictable directions. His findings underscore the importance of thinking about the environment from multiple perspectives, highlighting the relevance of connectivity models, canopy cover and how these correlate with animal populations having implications for policy. By implications for policy he explains that he means specifically planting strategies for tree cover. So far the city has done without a focused approach beyond the overarching aims of planting more street trees in targeted neighborhoods and donating trees to private individuals. The use of trees, shrubs and other plants that provide connectivity for some species can help human inhabitants who benefit from an urban canopy for mediating the heat island effect. Enhancing corridors so populations of animals can spread plant seeds and interbreed is critical to healthy ecosystems.
Despite his lab having sequenced 10,000 genes—almost half of the amount in mice—Dr. Munshi-South is a little bit cautious with his assessments about how study outcomes can be interpreted when devising policies. One of his students has found different kinds of gene sequences (some involved in metabolism, others involved in growth, and so on) reacting directly to environmental pressures. But this is not immediately translatable to human experience. The one factor he feels equipped to emphasize is that while the expectation is that species will go extinct in cities just based on comparisons of diversity in a place like the Adirondacks to that found in NYC, the assumed logic is not necessarily true. What is happening within cities in terms of change is happening at an accelerated pace and there are still many things to be learned from urban contexts.

Expanding on his point about the rapid pace of evolutionary change happening in cities, he points to a board hanging on the wall in his office. He had just been working on this before I arrived. On that board, he has three columns: “Writing,” “Data,” “Analysis.” Under these categories, he lists the things he needs to get done or has already completed for a new hypothesis he is testing. He gives me a preview of his follow-up study, telling me that in addition to his analyses of urban animals, he wants to get out of the city from time to time so he has started working with *Hyla*, particularly *H. andersonii*, the Pine Barrens treefrog. He pulls out a book on frogs and shows me their range, a picture of them, and tells me more about why and how he became interested in them.

The Pine Barrens treefrogs are interesting because while many species thrive in neutral water with a pH of 7 or slightly above, these frogs are living and breeding in a 3.2 pH, conditions thousands of times more acidic than neutral water. There seems to be
some gene that might have developed in their gills and elsewhere that allows them to exist in conditions that amount to living in something like soda or orange juice which are pretty acidic. What is also interesting about *H. andersonii* is that they are generally geographically distributed across the southern states but there is a genetic variety that has been rather isolated in the southern New Jersey Pine Barrens. They live in peat bogs and shallow ponds and are easily identifiable by the purplish-lavender band on their sides. The species of frogs he is studying now will be compared to non-pine barren species, or other *Hyla* occurring in southern New Jersey. These comparisons will yield more insights into adaptations to pollution, climate change, landscape development, and urban life, all features influencing the lives of human beings as well. There is still much to learn from organisms sharing our habitats, even those we are not well acquainted with.

*What species is “Plantae indigenousii”?*

As this first section highlights, the radical refashioning of the landscape in the case of cities that has resulted in covering entire regions in concrete, steel, and glass can produce swift changes in the biological makeup of the animals inhabiting this type of environment. Deforestation first for farmland and later for real estate development, along with chemical pollution to soil and water alike, have produced dramatic examples of evolutionary changes to the region, as the case of the Hudson River marine life demonstrates. Some animals have shown mutations that threaten their survival. Both the introduction of plant species that have become persistent problems as invasives and the human interactions with these species have gone under-studied by social scientists who
have left analyses of plant and animal life (beyond the Primate Order which is an area of anthropological research) primarily to biologists and ecologists.

Attention paid to plants has centered on commoditized varieties playing vital roles as food stuffs and trade goods forming parts of extensive networks and imperial expansion that has earned them special status and interest among social scientists. Sidney Mintz’s seminal study of sugar cane (1986) remains a classic study of the role of sugar in world trade and consumption, showing how this carbohydrate changed diets and fueled industrial growth. However, the main focus of Mintz’s argument is not the plant itself or the relationship people have with it, but the commodity product derived from it.

One rare study that more directly analyzes the consequential role of plants on western civilization is that by Lucile Brockway. Her book *Science and Colonial Expansion: The Role of the British Royal Botanic Garden* ([1979]2002) traces the expansion of the British Empire, made possible by three plants in particular: species *Cinchona*, *Hevea*, and *Agave*. Cinchona is the “fever bark” that forms the basis of quinine for treating malaria, while *Hevea* refers to the material rubber. The third, *Agave*, is sisal fiber used for making twine, rope and other materials. The history of the Kew Botanical Garden’s involvement in empire-building illustrates its multi-pronged approach. By amassing knowledge about plants of different sorts and professionalizing botanical knowledge, British traders were able to move plants all over the world to colonies where mass production could be carried out in the cheapest possible way. Native to the Amazon region, rubber production was moved to south-east Asia at least in part to avoid public relations nightmares associated with the genocidal effects the trade was having on indigenous peoples and for slashing production costs. The critical role of
rubber as raw material underwriting the growth of the auto industry propelled the United States into a privileged position among other developed nations, as well as having a central role in the power struggle during the Second World War in the Pacific.

Plants as sources of foodstuffs also underwent radical mobility and indigenization in foreign lands. Coffee from Africa, for example, was naturalized in Central and South America to the point that many Latin Americans think it a native crop. Tracing this intentional movement begins to hint at the dramatic flow of plants and animals around the world. But many more plants with no real trade value were also intentionally moved to new settlement areas. And while Brockway’s study reveals the flows and vital uses of select plants, it does not consider the movement and impacts of “hitchhiker” species like garlic mustard and others that have also permeated the whole of ecosystems throughout different parts of the world. This is understandable given her focus on plants supporting colonial expansion. In the case of NYC, some of these foreign plants have now become invasives. Traces of their wild spread are still visible in parks across the city. Garlic mustard (Alliaria petiolata), a plant the Dutch liked to cook with, presents an unrelenting problem in parks all over the city. This plant is very commonplace and its allelopathic characteristics are deleterious to native plant life. The smell of garlic can sometimes be so pungent visitors can get the impression that someone is sautéing food in the heart of the forest.
People moving to distant new places brought with them familiar species illustrating the need for expanding the application of Donna Haraway’s term “companion species” (2003, 2004). But charting humans’ relationships with “Other” species is difficult, especially the farther away we get from more familiar life forms. Moving beyond our closer relatives in the Primate Order or our close friends in the Canine (Canidae) Family is difficult to do, particularly when it entails jumping from one kingdom to the next. And yet, Haraway’s work emphasizes precisely that, or moving beyond our closest “companion animals” to “companion species.” This is necessary not just because “one must include such organic beings as rice, bees, tulips, and intestinal flora, all of whom make life for humans what it is—and vice versa” (Haraway 2003:15), but because understanding life requires a general widening of the tent to make room for other companions so that their value can be understood in their own terms. In following Haraway’s advice for broadening the tent, the literature review that follows moves from the more familiar to ever smaller scales, to the less well-known, going beyond animals to plants and bacteria. The anthropological literature along with that in Science and
Technology Studies explores the socio-cultural connections between people and other animals and plants and can serve as a call to conservation.

Though it is easier to relate to species that are most like us and are not threatening, and it helps if the species is cute or has symbolic significance to humans, concepts like “relatable” and “cute” are social constructions with historical and social particularities. Finding some animals “cuter” than others seems to be determined by the expressions on their faces, as Darwin’s studies have shown (Darwin [1872]2009; Haskell 2012:196). Human evaluations of factors like “cuteness” are influenced by facial structures (i.e., the way animals’ eyes are set, the roundness of their faces, etc.), in short characteristics relating to neoteny, or the juvenalization of characteristics. Diminutive sizes, a round shape, or furriness, also contribute to our assessment of their cuteness. Whether we relate to them or not can be based on how closely their social structure resembles ours, in other words, whether we relate to the social stratification of ants (Wilson 2004; Kirksey forthcoming) more so than the insect-like eusocial behavior of an animal like the hairless and long-lived rodent the naked mole rat (*Heterocephalus glaber*). Naked mole rats are found in the horn of Africa and live in strict caste systems in a mysterious underground world.

Jane Goodall’s conservation work has led her to underscore the well-known fact that the more charismatic a species is the more attention and enthusiasm it receives, improving its preservation success. Her collection of essays with Thane Maynard and Gail Hudson (2009) is replete with stories about a range of species, including less popular animals like the American burying beetle, that run the gamut of success stories, sad tales of loss and works in progress. Goodall et al. discuss how insects have proven to be a
difficult sell for conservation efforts considering they are normally understood as existing in antagonistic relationships with humans whether as lethal consumers of the crops raised for food, as vectors of disease, or simply as pests.

Hugh Raffles’ work, on the other hand, illustrates the types of close relationships humans have with various insects, defying common conceptions of them as pests. But despite the varied stories included in his collection, these different animals still represent only the tiniest segment of the insect population, much of it still largely unknown given their diversity and how radically different their habitats are from our own which can in some cases make them difficult to study. His book *Insectopedia* (2010) is a cultural foray into the world of insects and the people who love them. Raffles’ unique contribution to studies of the animal/human interface tilts perspectives to the level of insects and tries to favor the vantage point of an “insect’s eye view” of the world in order to understand what Uexküll calls an organism’s “umwelt” (Uexküll [1934]2010). An animal’s *umwelt* refers to its biological surroundings as these are shaped by animals as “simple” as mussels or as complex as social animals, in more interactive and active processes than humans typically assume. Ecosystems after all, do not merely exist in static ways. By using Uexküll’s concept, Raffles is able to open up insects’ worlds to humans. Paying attention to organisms so unlike human beings advances Haraway’s call for broadening the tent in human/Other interactions.

And while studies of radically different species analyzed in the context of companion species of sorts are scarce, one more attempt to look at another tiny life form—this time in the plant kingdom—is a fascinating study of moss by Robin Wall Kimmerer called *Gathering Moss: A Natural and Cultural History of Mosses* (2003). A
bryologist by training, Kimmerer’s work tells the evolutionary and reproductive tales of the “social” life of mosses, including their interactions with pollinators like slugs and chipmunks. Kimmerer’s own personal tale is entwined with the stories she tells about mosses, further highlighting the personal relationships people have with plants no matter how “alien” to humans they may seem. Her quest to find human uses for mosses leads her to the unexpected finding that their intimate uses include gender-specific ones with mosses being used as early absorbents especially useful to women during their menstruation cycles and as an organic form of diapers for infants. These uses were almost never recorded by scientists, for they exist outside the domain of science emphasizing medicinal uses.

One of the compelling aspects of Kimmerer’s book is that she frames her study by accentuating indigenous ways of knowing organisms—a way of knowing the world that informs her approach to moss studies. Knowing must include all four aspects of our being: life forms must be known with our minds, bodies, emotions and spirits. She provides knowledge of mosses from a scientific perspective as well as one based on her Amerindian background. Her sensual experience of mosses of different types, those inhabiting bogs, caves, and other homes, illustrates how environment promotes variation among these primitive plants. Further, this work shows how human emotions are related to the experiences of mosses in their habitats and looks at their meanings historically. She also looks at their cultural relevance and usefulness despite them being so often overlooked by science and social science research alike. Moreover, this book is also about scale. Her exploration of these plants demonstrates the importance of looking at
microenvironments in the context of the larger whole. This provides a further useful tool in thinking about individuals and communities for natural and social scientists alike.

As her work shows, people’s relationships with plants are rich and complex. Understanding the complexity of life and our relationship with other life forms is a matter taken up by Lynn Margulis and Dorion Sagan in their book *What is Life?* (1995). Margulis and Sagan provide an intricate analysis of how the chemical basis of all life acts like a connective link tying all life forms together. Interacting matter reproduces itself through metabolism, sexual reproduction, and chemical reactions, all parts of an “autopoesis,” or a self-making, that is life-transforming where “[l]ocal ecology becomes global ecology” (Margulis and Sagan 1995:23). In their attempts to answer the broad question that gives their book its title, a theme that has preoccupied philosophers for centuries, they pay close attention to the minutest organisms, eukaryotes and prokaryotes. These organisms’ tendency to reproduce to the limits, producing shortages and pollution (99), has resulted in the promulgation of the “primeval sweets” that have made diverse life on earth possible. These “sweets” include an oxygen-rich environment promoting the evolution of oxygen-consuming life forms that displaced the bacteria thriving on other gases and predating the types of plants and animals abounding today. The oxygen-hungry organisms have benefited from the synthesizing of other chemicals by simpler life forms, a process that has turned this planet into the blue-green gem it is today. This analysis serves to bring the plant and animal kingdom much closer together, particularly as the authors remind readers that more distance exists between prokaryotes and eukaryotes than between plants and animals.
A recent book on plants and the senses by Daniel Chamovitz (2012) explores plants’ “knowledge” and their sensory experiences. His survey of plant experiments further reminds us that we share an evolutionary trajectory with them, evidenced in some of the ways in which plants process stimuli. While they may appear and seem very different from us, we in fact share more in common with plants than we normally acknowledge. And though plants are not “intelligent” per se, they do have experiences shaped by their senses in similar ways to our own. Chamovitz concludes his detailed study of the history of experiments into sensory perceptions in plants by reiterating a similar point to that made by Haraway in her different works by saying this:

What we must see is that on a broad level we share biology not only with chimps and dogs but also with begonias and sequoias. We should see a very long-lost cousin when we gaze at our rosebush in full bloom, knowing that we can discern complex environments just as it can, knowing that we share the common genes. When we look at ivy clinging to a wall, we are looking at what, save for some ancient stochastic event, could have been our fate. We are seeing another possible outcome of our own evolution, one that branched off some two billion years ago (Chamovitz 2012:141).

A genetic past held in common does not reverse eons of separate evolutionary trajectories, however, as Chamovitz also points out. “While plants and humans maintain parallel abilities to sense and be aware of the physical world, the independent paths of evolution have led to a uniquely human capacity, beyond intelligence, that plants don’t have: the ability to care” (ibid.). The “ability to care” thus in many ways serves as a call to action for humans.

My observations at the nursery reflect a complexity in people’s relationship with plants and varying levels of caring. The plant biologists introduced in Chapter 1 have a love for plants that stems from a love for the natural world as a whole, an attitude echoed
by other environmental neighborhood activists I interviewed. Dahlia grew up on a farm in Upstate NY with parents who are artists. They bought their family farm as part of the 1960s movement to draw human existence closer to nature. She did not know that plants would become central in her life until she went to college and was immediately drawn to plant taxonomy. She notes that looking after the plants she is responsible for growing at the nursery is based in a type of nurturing labor that is pleasurable and unlike other type of work. While making goods provides a sense of pride in one’s work that has been well documented, caring for living beings feels to her more special than that.

Sylvie’s fascination with plants and animals also finds roots in her father’s art. A Belgian “tinkerer” and maker of all things from clocks to tiny model replicas of places around Antwerp, she fondly shared a special memory with me one afternoon on the bus riding back to St. George Ferry terminal. She recalled an animated story her father once produced on flip cards that she would play with as a child. She later replayed that story often in her mind as she got older. She described it as featuring the displacement of a forest by a growing city. Those images stayed with her until she enrolled in a university in NYC where she pursued a degree in biology specializing in plants and insects. Going to forests regularly to collect seeds and berries is her dream job and she enthusiastically acknowledges how lucky she feels to be able to do what she does for a living.

Deanne and Donna, two members of the propagation team at the nursery, have their own ways of relating to the plants they care for. Having worked with plants for almost two decades, they found this work as they transitioned to part-time work at a pool where they were employed on a landscaping team. This led them to the farm that is now a nursery where they first worked for the farmer who owned the site before he sold his
operation to the Parks Department; they are happy to have jobs with Parks. They often talk to the seedlings as they plant, coaxing them to grow and do well, sometimes calling them “little babies” and using other terms of endearment when transplanting them from sowing trays to the containers they will inhabit until planted at their final destinations. They regularly instruct volunteers and interns to plant the smallest individuals in pairs within any one tube or cell because the little ones “need help” or “company” when they are still very little and are not strong enough to make it on their own, adding that it also helps them out if the smallest plants do not make it, in which case they do not have to go back and refill the empty cells.

Deanne and Donna also demonstrate favoritism among different plants with some falling under the category of “ugly shits” for Donna, who regularly uses this category especially for thorny species that have occasionally left her covered in thorns. She and Deanne still laugh at the time Donna wound up with thorns on her tongue after desperately trying to extract them from her fingers with her teeth. She is equally as emphatic about her regard for other species she admires for their beauty or cuteness, like the oak seedlings (*Quercus coccinea*) we planted together one warm afternoon. She checks on them regularly. In the cases when plants are picked up for specific projects, they sometimes express sadness when orders are filled. When we check on “our” oaks she always marvels at the way in which the plant emerges from the acorn, turning red in stark contrast to the creamy root, making the plant look like a human vein, as it grows a sturdy stem and fuzzy green leaves with hints of red on their edges.

People’s relationship with the outdoors in general—whether with parks or wilderness spaces—is multifaceted and relating to plants as individuals they come to
know helps foster conservation attitudes at a time when “blasted landscapes,” to borrow a term from Eben Kirksey et al. (2013), have become a common reality especially in cities. Blasted landscapes, as the authors call polluted places, can be reclaimed by nature and culture at once. Kirksey and his colleagues’ research shows how life in post-Katrina New Orleans and post-BP oil disaster in the Gulf reflects the intimate interspecies care that goes into imagining and organizing for improved and healthier landscapes that can once again offer hope to humans, other animals and plants. Artists concerned about the spill and its effects on animals rallied to the rescue of both charismatic and uncharismatic species. One artist shares her stories with these authors, telling them about her work with hermit crabs, animals typically ignored in favor of birds and other more attractive species:

Jacqueline Bishop found hope in this initiative to care for another species. Against the nightmarish landscape of the oil slick, Bishop grounded her desire for a livable future in the figure of the hermit crab. “We had this makeshift lab and we would collect about a thousand crabs a day.” Caring for the hermit crabs involved edging Q-tips into their shells without injuring their delicate bodies. “I felt so comfortable cleaning the hermit crabs.” Jacqueline reminisced as we gazed at Trespass in her studio, “Swabbing with the Q-tip was same gesture as painting, except I was taking oil off instead of applying it.” As Jacqueline’s seasoned hand traced the intricate recesses of hermit crab shells, legs, and claws, she found modest hopes for specific animals stirring with each of her concrete, repetitive and meditative actions (Kirksey et al. 2013:234, 236).

The Fresh Kills site that was once an attractive wetland and meadow came to blight the borough during its lifetime as a landfill. It is currently viewed by some as offering hope to plants, animals and humans. And though suspicion and resentment linger over the risks and safety of the site, the possibility for restoration drives the concerted cleanup efforts today. This study thus further explores the evolving meanings
of this site, the complicated thoughts and feelings of its closest neighbors towards its wildlife and contents, as well as traces the ecological and social histories of place.
Part II: Restoring

Poor air quality and abundant sources of pollution in soils and surrounding waterways have plagued the city in different ways since the earliest settlement period. Ocean dumping, the growth of industry and ever-growing numbers of automobiles and related exhaust, have impacted water, soil and air quality. Programs like MillionTreesNYC along with the city’s sustainability program called PlaNYC are intended to ameliorate such long-standing problems as well as those caused by large-scale development.

But current conditions characterized by pollution contrast starkly with the rich environmental histories of the city’s boroughs. The ecological history of NYC has not always been well-known but efforts to disseminate this history have recently become more common. Highlighted in this next part of the study is the environmental history of Staten Island in particular. This is an island that has managed to preserve some of its biodiversity thanks in large part to the dedicated home-grown conservationists and local naturalists and historians. Preserving parkland prior to and following the city’s incorporation has resulted in the successful conservation of biodiversity. Some of the most diverse biota once commonplace around the whole of NYC has continued to thrive in Staten Island and now represents a reservoir for the rest of the city. While conservation is necessarily different today than it was at the time of consolidation in terms of the lessened availability of open spaces for preservation, new opportunities are still possible. These newer opportunities include the transformation of old industrial infrastructure for promoting biodiversity in the heart of the city.
4

Forever Wild: Parks and the City

Conservation is not often associated with the built-up portions of our nation. Yet in this era of unbridled metropolitan expansion it has become a critical urban problem. Conservation, after all, is for people, and in the Tri-State New York Metropolitan Region, the largest concentration of people in the United States, the need to conserve open land has become a matter of urgency.


If the people wish to retain in their midst the natural surroundings which no one fails to appreciate they have only to make it their will and it can be done.

From *Proceedings of the Natural Science Association of Staten Island*, Vol. IV No. 18, June 8, 1895.

Vitals: The Lungs of the City—a Short History of NYC’s Parks System

While some parks, especially Forever Wild preserves, possess the necessary genetic diversity for improving the city’s overall environments, their ecological merits are less emphasized than the recreational services they provide. Forever Wild sites remind New Yorkers that wilderness areas, from vibrant woodlands with rare plants and unexpected animals, to accessible waterways where visitors can paddle are never the less a critical part of the city. Parks have historically been an essential component of city life as progressive reformers from the 19th century believed open air and sunlight were cures for various social maladies, from physical ones to spiritual (read, moral) ones. Urban planners were among the first to include parks in city planning before the occupation had a name and became professionalized. Their ambitious visions for shaping the urban
landscape included lavish parks offering residents health benefits. The ideal of
democratizing the citizenry through physical space was part of how parks also enriched
bodies, minds and souls according to idealistic city planners. Nature’s curing qualities
and the contact facilitated by shared spaces between groups of people who otherwise
lived in segregated places was how healing and moral uplifting occurred.

These assumptions were partly based in transcendentalist ideals about nature’s
civilizing effects popularized by those who found enlightenment in the wilderness and set
in motion a literary genre that has come to be considered one of the central tenets of the
American way of thinking and being. Ideas about a rural and natural nation have collided
with notions of an urban and industrial country, dating back to Thomas Jefferson and
Alexander Hamilton. And while wilderness areas as unbuilt spaces had largely
disappeared from the landscape in NYC by the early 1900s, some semblance of “nature”
within the city was nevertheless sought at the time of the consolidation of the city’s parks
system in the 1920s.

But beyond experiences of nature like those made famous by Henry David
Thoreau at Walden Pond, more specific to NYC are experiences of nature associated
with the jewel in the crown of the city’s park systems, Central Park. The creation of
Central Park was one response to the need for opening up urban space as population on
Manhattan Island increased rapidly. Frederick Law Olmsted, one of Staten Island’s best
known residents (though he did not live there long and his fame beyond Richmond is not

30 Despite the mythological quality that Walden Pond has achieved in Americans’ collective imagination, it
was not a site of “pristine wilderness,” but rather bordered by a railroad that Thoreau could hear from his
cabin, owned at least in part by one of Massachusetts’ landowners, and farmed for wood (Thoreau
[1854]2010; Sterba 2012). While Walden is not a constructed space in the way Central Park is, it is not
“wild” in the way it is often portrayed. The central contrast made here is the distinction between popular
notions of “wilderness” usually distinguished from built environments rather than whether Thoreau’s
landscape was truly wild, or pristine, in contrast with Olmsted’s and Vaux’s constructed nature.
for being a resident of that borough), emphasized the value of creating parkland. He explored his landscape design techniques at the farm bought for him by his father where he grew exotic species of trees as well as foodstuffs. The farm is situated on the southern end of Staten Island and is preserved as an historic site and maintained by the Parks Department. He found the estate impressive enough to warrant a name so he called it Tosomock Farm.\textsuperscript{31} Thanks to Olmsted and Calvert Vaux’s work (his under-appreciated partner and the trained architect of the team), NYC also benefited from places constructed to look natural like Central Park, Prospect Park, Morningside Park, among others in other cities from Boston, to Chicago, Cleveland and elsewhere.

Predating the consolidation of NYC, Olmsted headed the Staten Island Improvement Commission in 1871. At that time, he wrote what served as a Master Plan for conservation around Staten Island. The present day Greenbelt was a centerpiece of Olmsted’s proposed plan. It would also become a cornerstone of the recommendations that followed in the early part of the next century as suggestions made by William Thompson Davis and his colleagues and friends. William T. Davis is Staten Island’s own version of Henry David Thoreau. Davis was a naturalist who achieved world renown for his knowledge of Cicadas (\textit{Cicadoidea}). He collected specimens of this insect from around the world. He became the leading expert on cicadas and his collection is one of the world’s best assortments and a little-known treasure still housed in the institution he

\textsuperscript{31} The name “Tosomock” is a corruption of the name “Tesschenmakr,” the last name of Petrus Tesschenmakr, the original occupant of the 125 acre farm (Martin 2011:54). Overlooking Sandy Hook and Raritan Bay, Olmsted and his younger brother lived at this site at different times after Olmsted Sr. purchased the land in 1848. This farm had other famous owners, including another borough naturalist and philanthropist, Dr. Samuel Akerly, founder of the New York Institute for the Blind. It is an important site not just for its historically notable inhabitants but because sites with local history value have often become park land falling under the jurisdiction of the Parks Department. Other notable examples of houses preserved and maintained by Parks are the Edgar Allan Poe house in the Bronx, the Hamilton Grange in Upper Manhattan, the Alice Austen house on Staten Island, among others.
and his colleagues founded, The Staten Island Institute for Arts and Sciences (SIIAS). SIIAS is now the Staten Island Museum. During Davis’ lifetime this institution encompassed what are today the Staten Island Zoo, Botanical Garden, and a number of other organizations. These institutions currently function more or less independently throughout the borough.

The Greenbelt that Davis and his friends mapped would become part of the parkway system Robert Moses would enhance and—in his mind at least—“perfect” in the 20th century. The proposed trails running through parts of Staten Island’s Greenbelt today commemorate Olmsted for his visionary contributions to the existing parks system and are called the “Olmsted Trailway,” honoring more than the years the famed landscape architect lived on the island but also his invaluable contributions to parks around the city more broadly. Another one of the preserves on the island honors William T. Davis as well. The wildlife refuge named after him abuts the Fresh Kills landfill in the Travis neighborhood on the island and consists of marshes and woodlands.

Figure 11: The William T. Davis Wildlife Refuge in the Travis neighborhood of Staten Island (photo by author).

Olmsted and Vaux were builders who set the standard for park construction for a long time to come (Rybczynski 1999). They designed and constructed nature like no one
before them. Sometimes their creations were intended to appear as natural forests, at
other times as well-planned gardens, or domesticated natural spaces reflecting a social
aesthetic which in their case followed the English Garden model. Central Park was not
designed in the likeness of the landscape that stirred the Transcendentalists and the
conservationists they inspired (though perhaps the Ramble comes closest to that ideal).
Instead, Central Park was built in a pastoral style reflecting a domestication of the
landscape familiar to Olmsted as a farmer and reminiscent of his hometown Hartford,
Connecticut, a growing city still dependent on farming and bordered by forests in various
stages.

Central Park was created in the heart of Manhattan Island in some ways to
simulate the proximity to nature Olmsted had experienced as a boy in Connecticut,
teaching him the value of having natural spaces close by and available for replenishing
body and mind (Martin 2011). But Olmsted’s ideals for a civilizing landscape were
premised on a pastoral notion of natural landscapes rather than the wild places
romanticized by American naturalists. A “wilderness” in the transcendentalist sense was
not common on Manhattan Island, or really around what would become the greater
metropolitan area.
Even across Staten Island, the least developed of the five boroughs, the woods are secondary forests, albeit not as manipulated as the Central Park landscapes. And given the disappearance of open space, concerns over this prior to incorporation resulted in efforts to conserve and preserve natural areas and in making new parks. Clearing out communities for creating open space became a response to overcrowding in ever-growing Manhattan island. Seneca Village, an established community of African-Americans and recently arrived Irish immigrants, was uprooted for constructing Central Park (Wall et al. 2007, 2004). Concern over the loss of open and/or natural spaces would also lead to the preservation of Inwood Park on the northernmost tip of Manhattan and the last un-built space on that island. It is still a well-loved park containing not just forests but a view of the stunning Jersey Palisades, and Cliffside caves utilized by the Native Americans of the region made of Manhattan schist, sandstone and other rocks.

Prior to consolidation, residents around the city had been surveying their home boroughs and putting together plans to propose to city officials for the purchase of tracts for preservation. By the time of the city’s consolidation in 1898, residents from what would become the city’s five boroughs had a chance to respond to hastening growth and
concomitant disappearance of open spaces. The loss of open space in Manhattan became a lesson to the rest of the city, Central Park notwithstanding. Farmland and other undeveloped spaces were critical for creating parkland across Brooklyn, the Bronx, Queens, and Staten Island. Part of the shoreline in the Bronx was also preserved and today constitutes the largest area of parkland in NYC. Manhattan’s adjacent islands also became incorporated to expand the park system for that borough, even while some of them had been the sites of dumping operations throughout the 1800s and early 1900s.

It is obvious that there are no such areas left in the Borough of Manhattan. There are, of course, no tracts of fifty acres which are not built upon or which could be bought for a reasonable price. So far as the city-wide park program is concerned, and excepting possibly Ward’s and Randall’s Islands, the people of Manhattan must look to the recreation areas in the other boroughs and in the suburbs for additional facilities. But on the other hand this borough should receive special consideration in the acquisition of small playground areas. Similarly in Brooklyn the opportunities for additional parks of more than fifty acres are small because, although there are considerable areas which are not built upon, the cost of these areas is prohibitive or they are in zones which should properly be developed for commercial and industrial purposes. On the other hand, Brooklyn has large park areas which have not been developed, which require the expenditure of considerable sums for improvement and which also require connection by means of new arteries (Program for Extension of Parks and Parkways in the Metropolitan Region 1930:5).32

Davis et al. produced lists of places that they proposed to the city for purchase as parkland highlighting the natural geographic, geologic, and ecological features offered by the different sites. In addition to local surveys, conferences were held among surveying committees throughout the metropolitan region for identifying the best plots of land.

32 The Program for Extension of Parks and Parkways in the Metropolitan Region was submitted to the Mayor and the Board of Estimate and Apportionment of the City of New York as suggested projects within the city. It was also provided to the Governor and Legislature for State recommendations. The construction of local and state parks were endeavors supported by the federal government and in some cases were dual or triple state projects whenever lands slated for conservation shared borders with neighboring states and required state collaboration for expansion and management.
Events like the Great Depression that nearly bankrupt speculators eager to sell real estate to the city also enabled a rich assemblage of spaces to incorporate into a parks system as the city bought real estate from owners eager to sell. Moreover, residents also wrote their local papers expressing strong interest in seeing everything from local oak trees to open land preserved. The creation and preservation of parkland across the city was a grassroots effort. In a Letter to the Editor as early as 1895, one writer to the paper *Staten Islander* notes:

> [W]e need a park system, not simply an open square here and there dotting the built-up portions of the Island, all well so far as they go, but hundreds of acres connected with each other and traversed by drives and paths for vehicles, wheelmen, horsemen and pedestrians—woods, ponds, amusement grounds, botanical and zoological gardens, etc. … My suggestion is, to combine the two objects, establish the park system coextensive with the more picturesque and suitable portions of the water shed, and plan for it at once, putting the one commission in charge of both divisions of the subject, allowing sufficient expenditure for surveys, plans, estimates and competent advice to enable a full, intelligent presentation of the case to the people for ratification and authorization (“The Sanitary Aspect” in *The Semi-Weekly Staten Islander* of November 27, 1895).

In large part, what is today known as the Greenbelt running along the spine of Richmond County was a centerpiece of the proposed plan. The quote above points to questions about the nature of space that had to be considered in what would become an organized construction of urban ecosystems that later came under consistent attack, whether from neglect or from the forces of privatization.\(^{33}\) Citizens generated extensive lists even

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\(^{33}\) In one very current example of such ongoing attacks on public space, especially on parkland, the flagship park in the borough of Queens, Flushing Meadows/Corona Park, was aggressively pursued by Major League Soccer (MLS) with the backing of the NY Yankees and then Mayor, Michael Bloomberg (*NY Magazine*, May 2013). MLS sought to build a soccer stadium atop existing soccer fields available free to the public. Facing public opposition, the plan is now under consideration in the Bronx adjacent to Yankee Stadium. Despite MLS’ change of plans, a proposal to expand the U.S. Tennis Association’s (USTA) footprint on parkland and a new mall are still in effect. Building another mall within the park is considered redundant by many residents from surrounding neighborhoods battling the plan, given that another new mall was built in neighboring Main Street-Flushing in 2011 only one stop away on the No. 7 line. These additions would further shrink the borough’s most heavily used park, which already
while aware that city administrators might not oblige. This stage of planning is an example of the important impact grassroots efforts have had on preserving today’s vital green spaces.

And despite the variety of parks produced by these multiple efforts, Central Park was and remains the quintessential park in the popular mind, as its revered place among the city’s attractions illustrates. It also epitomizes Olmsted’s and Vaux’s vision of public space, a model that persists. In *Empire City* (2002), an analysis of the ways in which boosterism has shaped the contemporary city David Scobey discusses how Central Park came to stand as a type of “anticity” in its idealized and stylized form within the world’s largest metropolis in the 19th century:

It [Central Park] was intended to serve as an anticity, a pastoral otherworld within which Manhattan’s “noise, bustle, confinement and noxious qualities” would be replaced by “an opposite class of conditions … remedial of the influences of urban life.” To enter that world was literally to overrule the grid: to go through the looking glass into a therapeutic space where confining streets gave way to sinuous drives, crowded sidewalks to peaceful promenades, atomistic competition to refined sociability. At the same time, the park remained indubitably an artifact of the metropolis against which it was designed. Celebrated as an emblem of New York’s urbanity and metropolitan grandeur, it would have been out of context—useless and unrecognizable—anywhere else (Scobey 2002:230).

Development and space use have always been fundamental concerns for city residents, government officials, and real estate investors who benefit from well-designed cities with amenities like state of the art parks. But though parkland enhances real estate value, preserving natural spaces in all their diversity has not been a related priority.

houses not only the USTA’s Arthur Ashe Stadium within the Billie Jean King National Tennis Center, but also Citi Field, home of the NY Mets. Other buildings are also found within this park, institutions like the Queens Museum and Queens Theatre, relics of the 1939 and 1964 World’s Fairs respectively. Instances of donating public parks to private interests abound, most famously in the case of the new Yankees Stadium for which that franchise has not provided alternative park space as promised at the time of the original negotiations.
While Olmsted’s vision for park construction was inspired by English landscape design and formal European gardening conventions, William T. Davis, in contrast, valued preserving spaces as they were, either as estuaries, meadows, or forests. Davis saw Staten Island as a unique place for conservation precisely because the whole of the new borough was an island environment. Islands present unique environmental conditions generally, and more specifically, Richmond’s extensive flora at the time of the parkland survey at the turn of the 19th century included 1,320 plants out of about 1,800 in the whole State, making the borough an especially valuable reservoir of biodiversity in a region under continuous development. There was an interest in preserving disappearing native plants early on. The local naturalists were not only documenting existing species throughout the island, but actively preserving endangered species by sending them to local and distant botanical gardens for further breeding as well as keeping an eye on local populations in situ. Additionally, SIIAS was reporting in their publication *Proceedings of the Natural Science Association of Staten Island* as early as 1895 that traditional parks in the style of Olmsted were being modified to display native wild plants and flowers growing within 25 miles of the city (ibid.).

Robert Moses became the first Parks Commissioner of a consolidated Parks Department incorporating all five boroughs in 1934. Moses had a fondness for refashioning entire shorelines and reclaiming ground from below water levels through the use of landfilling and draining of waterways. His stress on recreation over conservation would result in the largest expansion of parks, playgrounds, pocket playgrounds,

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34 These numbers are from *Proceedings of the Natural Science Association of Staten Island*, Vol. IV No. 18 (June 8, 1895). This record is found at the SI Museum’s Archives and History Department in the Staten Island Parks—Philosophy, Planning, and Policy 1895-1979 Collection, Box 1/9, Folder “Parks: Policy, Systems, Development, Clippings 56.”
parkways and peripheral ribbon greenways, as well as beach construction, NYC would ever see before him or afterward.\(^{35}\) As the city grew and became more populous, finding open places where residents could go to for relaxation, to get out of the city, and breathe clean(er) air became all the more important.\(^{36}\) But large parks on the margins of the city require a reliance on the automobile running counter to today’s “green” ideals like lessening dependence on fossil fuels and limiting construction of parking lots and roadways that chip away at green space.

Constructing large parks on more distant spaces was not an approach pursued by the Bloomberg administration because doing so would have been antithetical to his aims of having city residents living no more than a 10 minute distance from a local park. But even in the age of Moses, opening up parks outside city limits was not always a solution. Creating parks close to residents who could not rely on cars became a focus for neighborhoods who lobbied Moses for playgrounds, and more commonly done today, community groups who lobby the city for garden spaces on empty city lots.

While filling for making land dates back to the early settlement of lower Manhattan before its expansion northward in the 18\(^{th}\) century (Rothschild [1990]2008), landfill parks date back to 1916 before the coining of the word “landfill.” The old Rainier Dump in Seattle, the first of its kind, was transformed into Rainier Playfield

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\(^{35}\) Under Mayor Bloomberg and former Parks Commissioner Adrian Benepe, the city underwent the largest park expansion since Moses. This more recent growth still pales in comparison to that under Moses’ tenure which remains unparalleled. In the past ten and a half years, New York City’s parks system grew adding over 730 acres of new parkland plus the 2,200 acres at Freshkills Park soon to open in Staten Island. Over the course of his tenure, Mayor Bloomberg budgeted $4.5 billion for building new parks and renovating existing ones of which $3 billion has already been spent. Parks increased from a mere 119 when Moses first became Commissioner to 777 by the end of his term in office. Moses constructed a system of state parks that covered 40,000 acres linked by parkways totaling an amount of 2,567,256 acres out of 5,799,957, or the total acreage of state parks in the 50 states—in other words, 45% of all the state parks in the country (Caro 1974:10).

\(^{36}\) This quest for expanding the parks system under his control led Moses to construct parks not just in NYC but particularly across Long Island’s counties given their proximity to NYC.
(Harnik 2010:90) leading the way to the construction of parks on former landfills. At a
time when space is at a premium, old landfills provide potential locales for nature-making
for three big reasons: their size, location and cost (ibid.). But problems like those at Mt.
Trashmore, in another example, offer an important lesson in park construction: building
on landfills is a complicated process. Constructing natural systems on that site has not
been easy and its mounds have had to undergo multiple cappings.

Peter Harnik, Director for the Center for City Park Excellence, now with the Trust
for Public Land37 has been working in the sphere of conservation for the past three
decades and is especially well known for his rails-to-trails conversion advocacy. Such
projects include a range of plans, including failed efforts like the one aimed a closing
down Wisconsin Avenue in Washington, DC, for use as plazas and bike lanes, to
successful projects like the Elroy-Sparta State Trail in Wisconsin. His studies find that
landfill conversions have varying success rates.

Despite the many successful individual examples, there is not yet a
seamless landfills-to-parks movement in the United States. Numerous
challenges remain—technological, political, and legal—all of which drive
up costs (Harnik 2010:93).

The Fresh Kills conversion is slated to present a type of blueprint for future projects of
this sort not just because of the magnitude of the site but also because the practice of
restoration ecology has come a long way in the past 20 years. Advancements in that field

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37 The Trust for Public Land is a national non-profit land conservation organization based in San Francisco. Since its founding 40 years ago, it has completed more than 5,200 park and conservation projects and conserved more than three million acres in 47 states, and has helped generate more than $33 billion in state and local conservation funding. In the newly created role of Senior Vice President for City Park Development, former NYC Parks Commissioner Adrian Benepe will oversee the Trust’s “Parks for People” program which, just like Mayor Bloomberg’s PlaNYC, seeks to ensure that “no city resident should be more than a ten-minute walk from their local park, garden or safe green place to play.” Benepe is based at the Trust’s Lower Manhattan office and also directs their Center for City Park Excellence, based in Washington, D.C.
are benefiting this particular reforestation program. This project will, in turn, yield further lessons about best practices for remediating postindustrial sites.

After hearing Peter Harnik speak at the Arsenal, the Parks Department headquarters in Central Park where he gave a lecture on his research on NYC’s parks, I contacted him to learn more about his thoughts on the Fresh Kills park construction as well as on what his research says about how people relate to disturbed spaces in particular. He said of the conversion from an old landfill to a nature reserve:

I’m not sure how many other uses could be made from the landfill. Landfills have a tendency to settle and sink for many years, so they are very expensive to redevelop for housing or offices or factories. There are probably portions of Fresh Kills that were never used for landfill and perhaps could be used for housing; I don’t know if this has been considered or not. I am generally in favor of having relatively high-density housing in close proximity to urban parks so that more people can enjoy the parks without driving. I don’t know if the Fresh Kills geography allows this. … I think positive realities can overcome negative memories. Many beautiful parks that people now love were built on spaces that were ugly and polluted—railroad yards, shipping piers, factories, etc. This should not be a problem (August, 2011).

And while creating habitats on sites that are sometimes characterized by pollution problems should be one of the features of brownfield remediation, like that going on at Fresh Kills, according to Peter Harnik this site should also include “sports fields, gathering areas, ornamental places, trails, etc.”

As Harnik further explains, parks’ functions and their locations can mean a tangle of regulatory frameworks. In other words, there are differences between a “community park,” a “neighborhood park,” a “district park,” and a “regional park.” These categories are significant for planners and politicians even while they do not always mean very much to the public. What these labels represent to planners and politicians can tie up discussions and change the terms of debate. After all, “regional parks” might not serve
the needs of all residents alike, and factors like distance and tolls can prevent residents from making use of parks in other communities. But addressing people’s needs in terms of making parkland available is imperative because parks are more than places for recreation and serve a number of other purposes. They are valuable infrastructural, ecological, and cultural amenities as well. To illustrate his point, Harnik points to black and female tennis superstars that discovered their love for the sport of tennis in their neighborhood parks, in one example.

In his book he also discusses some of the class dimensions made visible by access to park space. He reports that the wealthy tend to have less need for park space and therefore tend to vote for local representatives based less on issues like parks than the poor, though in terms of donating money to parks, wealthier residents make their commitment to park space evident as the Central Park Conservancy demonstrates. His research explains why the poor more often vote closely for parks-related issues by pointing out that

… wealthier neighborhoods have less need for nearby parks than poorer areas; … the rich are likely to have bigger yards, grander trees, and more private amenities like barbeque grills and even pools and tennis courts. Or, if they live in apartment buildings, they may have the use of workout rooms, game courts, rooftop decks, and swimming pools. The wealthy own more second homes and have longer vacations during which to get out of town. A larger percentage of the wealthy belong to private clubs that provide swimming, golf, tennis, and other sports. Between backyards and the ability to eat out more often at restaurants, they have less need for picnic spots. Poorer people, on the other hand, need and seek the many collective benefits provided by publicly supported parks. This is evidenced every analysis of voting patterns in park referenda around the nation—lower-income citizens vote most strongly for park funding measures (Harnik 2010:39).

When I asked Mr. Harnik about the racialization and classed nature of space in his analysis, he said:
Poorer people get more benefits from parks than richer people—I go into this in my book. I don’t think it’s racial—I probably shouldn’t have written it this way—I think it’s income-based. Probably rich blacks vote less for parks than poor whites (August, 2011).

Real estate is a valuable commodity particularly in NYC. Geographer Neil Smith’s work illustrates the production of value in terms of both exchange and use values by showing how value production is tied up with the land as capital is “continuously withdrawn from the built environment so that it can move elsewhere and take advantage of higher profit areas” (Smith 2008:6). The uneven development of capitalism as a geographical expression of the contradictions between use and exchange values is thus made visible in cases like park construction and the related effects on surrounding real estate. As Smith’s work also outlines, rather than cultural preferences it is speculation and urban real estate prices driving the production of space in cities. This point is further underscored by Tim Edensor whose theoretical work on industrial wastelands explores another part of the value-making process in postindustrial contexts. Edensor says:

The production of spaces of ruination and dereliction are an inevitable result of capitalist development and the relentless search for profit. The quest for more profitable products, expanded markets and cheaper ways of manufacturing things, together with the inexorable quest for producing new goods and services, produces periodic crises (Edensor 2005: 4).

Harnik’s research on parks offers caution in regards to the corporatization of public space. He warns that “[w]hile allowing too much entrepreneurial politics turns parks into thoughtless play things for the rich and powerful, too little politics makes park systems moribund” (Harnik 2010:54). Moreover, people’s engagement with parks is essential to their well being. Research for this study shows that involvement with conservation in varying forms including participation in citizen science and landscape management form a central part of the public’s engagement essential to the maintenance
and success of parks. A cooperative combination of individuals in different functions is necessary to grow and maintain parks. As Harnik’s work underscores: “It is politics that makes a great park system—politics based on the muscle of grassroots support, the brains of sophisticated leadership, and the nerves of elected politicians who know when to stand firm and when to compromise” (Harnik 2010:14). This study’s findings indicate that in addition to political and grassroots muscles, political leadership, and the work of civil servants, the public’s engagement with open public spaces also contributes to their health and future. Commitment to parks further promotes a conservation ethic that has been essential for improving the ecological health of regions as a whole.

Shifting Conceptions of Landscape Design: Turning the Corner after Olmsted

While NYC’s densely built environment is sometimes assumed devoid of space for future conservation efforts and park expansion, more unconventional opportunities for park construction have emerged. A project like the reclamation of the old elevated train tracks in the Meat Packing District on the west side of Manhattan transformed into the High Line Park has popularized the idea of transforming defunct urban infrastructure. Building this type of park contrasts starkly with the Olmstedian style of park construction that has been the norm in NYC before and after Robert Moses constructed playgrounds and other facilities. Moses’ promotion of leisure resulted in more uniform parks representing a mix of recreational amenities and landscaped pastoral spaces considered to have a healthful effect on the citizenry.

The type of reclamation common under Moses, however, was not guided by an environmentalist ethic even though the public tended to associate Moses with
conservation in his role as Parks Commissioner.\textsuperscript{38} Robert Caro’s influential and unmatched biography of Robert Moses, \textit{The Power Broker: Robert Moses and the Fall of New York} (1974) suggests a different motivation for making land. Caro’s well-documented book points to Moses’ deep desire for expanding his own sphere of influence instead. The more land directly under his control in the form of parks—as well as expressways, bridges, and adjoining greenways—the more authority he had over the course of NYC’s development. But expanding greenways in the Moses-style of park construction, especially reliant on the use of fill, is different from conservation. Falling instead perhaps more closely under the sphere of “reclamation,” this type of construction finds continuities with that of contemporary projects like the creation of the High Line Park. This park presents a marked turn in landscape construction and management. If industrial “wastelands” are the new frontier of park creation, the High Line has become an icon for such pioneering efforts because of its success in terms of popularity rather than because it is the first or only example of its kind. The transformation of this site has served as catalyst for gentrification of the area as a whole.

\textsuperscript{38} Robert Moses papers found at the main branch of the NY Public Library are replete with letters from private citizens and newspaper clippings explicitly praising Moses’ environmentalism and hailing him as a conservationist. These perceptions contrast starkly with the documents supporting Caro’s claim that Moses’ drive to build was his way of pursuing power. The interviews Caro conducted with Moses shortly before he passed away further support Caro’s claims.
Figure 13: The High Line Park’s Section I on the west side of downtown Manhattan (photo by author).

A defunct set of rail tracks, the High Line is an old freight line transformed into an elevated park. But this is not the only novel and unique feature about this new park and green space: the plant life and spatial design it showcases are also elements departing from conventional park building. A number of the plants that had grown on this vacant stretch are indigenous to the area. The species colonizing the tracks sparked a vision for a park centering on native varieties and related plant and animal associations. In their recounting of the birth of an idea to the creation of a park of growing popularity, Joshua David and Robert Hammond, the neighborhood residents behind the vision and construction of the High Line Park, describe how the early successional plant species served as inspiration for their plan. Robert Hammond recalls:

… The plants were so hardy. There were areas where we’d stop working for some reason, and the plants would immediately start colonizing the place again, growing out of the mountains of bulldozed gravel … Keep it simple, keep it wild, keep it quiet, keep it slow (David and Hammond 2011:95-96).

Though David and Hammond emphasize how the wild plant species that repopulated the tracks inspired them, the first two sections of the park have primarily relied on more
conventional horticultural selections, including a sprawling lawn space in one section of the park.\textsuperscript{39}

But the nature of the site itself presents a number of challenges to plant survival. Common at reclaimed industrial sites are extreme conditions that make balancing the environment ongoing work. One of the peculiar growing conditions found on the tracks in this park’s case is shallow to no-soil, in one example. This contributes to roots freezing, as does the excessive wind blowing from the street below that acts like a wind tunnel. This windy environment combined with thin soil layers often mean drought conditions for plants as these factors translate into diminished water retention. Plants must therefore be adapted to difficult environments in the broadest sense. Besides drought and freezing, plant varieties must also be used to crowding, among other elements. While some of the plants best adapted to difficult conditions like these can mean a number of invasive species, wild regional plant populations can be quite resistant, too, especially when genetically diverse. Making sure that invasive species are limited in their spread then becomes essential for fostering habitats in new spaces.

As a result of the different conservation efforts in support of growing all types of green spaces, NYC today enjoys a range of habitats for animals and plants. Despite variety in ecosystems, these spaces make for a patchy system of habitats. Fragmentation can be detrimental to species but it can also produce interesting genetic mutations particular to a given park based on the workings of natural selection and population.

\textsuperscript{39} On June 10, 2013, in an article entitled “High Line Offers a Walk on the Wild Side,” the \textit{NY Times} Lisa Foderaro reports that construction for the third section of the park is underway. This final section will differ from the style of the other two and will be the section that showcases native plantings, reflecting a “wilder” aesthetic than the sleek, modern construction of the prior two areas of the park. The NSN is currently working with the High Line’s designers to transplant the original plants growing on the last section of the tracks as the site undergoes construction. These rescued plants will be replanted back in the park at the time of landscaping.
genetics, as Munshi-South’s work demonstrates, discussed in Chapter 3 (Munshi-South and Kharchenko 2010; Munshi-South 2012; Munshi-South et al. 2013). Moreover, some of these areas contain the kind of plant diversity necessary for understanding and planning for climate change. Fragmented habitats result from barriers posed by buildings, streets, expressways, and other urban structures, produce variations in micro-climates. These factors have important effects not just on animal genetics but also on the development phases of plants. Their successional stages determine the types of landscapes that will thrive over time. Controlling invasive species is therefore all the more important if healthy and diverse ecosystems are to be fostered in cities.

Disturbed landscapes are especially vulnerable to the spread of invasives because early colonizer species tend be invasives that do well in harsh environments. Invasives soon come to dominate those landscapes. Their presence impacts soil composition and can have additional effects on the ability of later successional species to migrate and adapt. From blocking sunlight to changing soil compositions, invasive species can prevent the proliferation of native varieties. In this way, landscapes are transformed.

With climate change producing more extreme conditions, the concern for various groups managing the city’s open landscapes is that the advantages enjoyed by invasives will mean a dramatically altered biosphere where monocultures and parasitic species will make habitats not just less diverse but also less functional. Measuring the responses of these colonizing species is providing preliminary hints as to how different environments will respond to a warming climate with increased fluctuations. Maintaining biodiversity in whatever form in parks and preserves is made all the more important in cities where these spaces are reservoirs of biodiversity.
The concept of biodiversity is a social good that can both be preserved and used. It is not just dependent upon conservation but can also be achieved through landscape management. In an article written jointly by Redford, Brandon and Sanderson called “Holding Ground” published in The Environment in Anthropology: A Reader in Ecology, Culture, and Sustainable Living (2006), the authors outline some of the myths surrounding the term “biodiversity” and the limits of conservation. In that essay, they make two important points in regards to the potential for creating biodiversity in what are otherwise wildly varying types of wastelands. Among the number of myths they outline, the end of the frontier for parkland is rejected by shining a spotlight on the more systematic focus on “reclaiming” polluted urban spaces. About this misperception that the parks frontier is closed, they say:

According to the logic that produced this cliché, empty spaces are gone, so there can be no more parks created. But, increasingly, we realize that there was very little empty space to start with, and that parks and other types of protected areas have almost always been created on top of existing populations or areas used by someone. When this cliché is used, it is often in a hopeful sense—hopeful that the political will does not exist to generate new parks in areas occupied or claimed by people. Yet recent statistics show that the number and extent of protected areas created in 1990-94 exceeded that of any previous five-year period (Redford et al. 2006:237).

In the case of the myth that the idea of biodiversity is a social construct, they reject the notion that manipulation of the concept leads to conservation, saying:

“People have created biodiversity, so they are essential to its survival.”

As with many of these clichés, this one contains a grain of truth. Biodiversity is a social invention; people are its inventors as a meaningful concept. However, that does not mean that manipulation of biodiversity leads to its conservation (ibid).

While “biodiversity” as a term is rooted in biology, it has also been appropriated by political actors interested in allocating uses and values to parks, adding a layer of
complexity to the term. Whether the context of biodiversity and parks is analyzed from biological or political angles, the connections between people and open spaces are intricately bound up with one another. Parks need people and people need parks. These same authors put it this way:

Parks may be jewels in the crown, but they will not survive in isolation. Parks aren’t a failure any more than they are a success. They are a hope, a hope to be realized at single sites where a scientific understanding of biodiversity is married to the management of human progress and dignity. They are a reflection of the human desire to not completely destroy that which sustains us (Redford et al. 2006:241).

Parks then can face challenges when not visited enough as well as when they welcome too many visitors. Urban wildernesses need special care and management under various conditions. An additional challenge is therefore funding the necessary regular maintenance required to manage these ecosystems. Managing the city’s ecosystems also includes caring for the city’s canopy. Individual trees also pose special challenges in the context of city life. The special needs of trees as individual life forms living outside more complex plant communities and in particularly harsh conditions is a topic dealt with in Chapter 8.
The Citification of New York City’s Most Rural Borough

**NY Fern** (*Thelypteris noveboracensis*): The base of the plant’s stem tapers back from its broadened leaves closest to the base, similar to the ostrich fern which is the only other native fern with this type of tapering pinnae. Its fronds are pale green above and brown and scaly at their base. This fern is most common in open canopy patches allowing it to benefit from extra sun light. It does best in moist woods with filtered light. This fern is a wetland indicator …

* See Appendix II

An Environmental History of “the Forgotten Borough”

When disembarking the ferry at St. George Terminal on the North shore of Staten Island, visitors used to be greeted by a sign across one of the exits that read “Welcome to the Borough of Parks.” The island hosts a significant percentage of the city’s parks, with about 2,800 acres of open space. Part of this total acreage (two square miles) features a fraction of the Gateway National Recreation area, an urban park system within the federal program for natural preserves. The different sites included in the Greenbelt are managed by New York State’s Office of Parks Recreation and Historic Preservation, the State’s Department of Environmental Conservation (DEC), and the City’s Department of Parks and Recreation. Besides this mix of constructed and secondary growth preserved parkland, there are green spaces like golf courses and cemeteries and other undeveloped areas that further break up the built environment. New Yorkers are

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40 This sign has been replaced by a large map highlighting the borough’s cultural institutions in an attempt to lure international tourists who take the ferry for the free ride past the Statue of Liberty to stay and visit some of the attractions the island has to offer. Staten Island’s cultural centers remain relatively unfamiliar to the rest of the city in general, as much as does its parkland.
generally unfamiliar with the borough’s extensive parks system. This lack of familiarity with the cultural amenities found in the borough is one of the factors presenting a challenge to the Fresh Kills planning team who must also work hard to get people to see the site as more than the place where the city’s garbage went. The transformation of Fresh Kills into park and nature reserve will grow the Staten Island Greenbelt by an additional 2,200 acres, totaling a little over 5,000 acres of park space. This will further enhance the connectivity of natural areas, making this the city’s largest contiguous parkland.

The richness of Richmond County’s natural open landscape has been complicated by landfilling. Colin Campbell summed up this contrast back in 1981 reporting in *The New York Times*:

[Staten Island] was once a place of woods, marshes and clay-bottomed ponds inhabited by mallards, muskrats and other wildlife. But after the 1948 closing of a large landfill at Great Kills—a dump on the other side of the island that had supplanted an old Riker Island landfill—New York City needed new spots for dumping.41

The diverse natural spaces on the island inspired three generations of scientists and conservationists beyond naturalist William T. Davis. Davis trained and worked with various naturalists and professionals who furthered the collective work started, including historian Charles Leng; Nathaniel Lord Britton, botanist and founder of the NY Botanical Garden; and paleontologist and paleobotanist Arthur Hollick. Inspired by the rich landscape, they formed a core of conservationists who preserved not just wild spaces but knowledge about the Island that continues to inspire the nature-loving residents and local historians I met during my years in the field.

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Staten Island has always been the least populated and most suburban borough in New York City, consisting of large farms owned by Dutch settlers in its earliest period of European settlement. Staaten Eylandt, as the Dutch called it, remained sparsely settled by Europeans. Before the arrival of Dutch farmers, it was populated by the Lenni Lenape, meaning “original people” (Paterson 1962). This group was one of the Algonquian speaking peoples inhabiting the northeast coast whom European settlers would come to refer to as one group referred they called the Delaware. Remains of fluted projectile points created by Paleoindians, some Clovis points and others Rossville points, provide insight into the lives of the earliest inhabitants on the Island. The Rossville points were identified by Alanson Skinner and they came from the Rossville section of Staten Island, giving them their name. Besides these lithic points, there are indications of lodgings suggesting the island featured as a regular site of habitation in the region, evidenced by longhouse architecture from the Woodland Period (1500 BC to 1500 AD).42

Pollen studies and analyses of botanical residue on prehistoric tools for processing plants for food and medicine provide a biocultural perspective on a very complex region for which Staten Island provides a snapshot. The existence of non-native species besides corn, beans and squash, along the Delaware River Watershed supply additional information on the intensification of landscapes in the northeast coast around this period and onwards, showing that ecosystems built around human needs is not entirely a new development (Messner 2011). Shifts in adaptation from riverine migration routes to concentrating on forest resources, as well as the intensification of seed harvesting or fish exploitation, demonstrates the flexible uses of the landscape by its Paleoindian

42 The SIM outlines the borough’s Paleoindian past in its permanent exhibit, found in the bottom floor of the building at 75 Stuyvesant Place, Staten Island. General information for this section is collected from this source as well as from archival records.
inhabitants from very early on (Lindner 2011). Beyond native plant uses, archaeological indices of contact period shifts in plant communities (Grossman 2011) further inform some of the changes to the landscapes that are today presenting special challenges to landscape management.

The island also provided a vast array of animal species including bivalves, sturgeons, birds, and larger mammals that seasonally nested on the island prior to the arrival of European settlers. Early research conducted on Paleoindian life by Seton Hall University researchers underscores the value of the marshes. Herbert C. Kraft, New Jersey archaeologist and researcher with Seton Hall, has documented the borough’s prehistory, saying:

Trails were created and worn into the marsh. At the end of these trails lay rich clam beds. Large shell deposits point to the importance of shellfishing. Remnants of hard clam, soft clam, oysters, scallops, whelk, and periwinkle are often discovered. Whether from canoe or otherwise, shellfishing served two purposes, being a source of food and also (in early European contact period) providing material for the production of wampum beads (Kraft, date not recorded).43

The marshes were a key source of value for survival and economic growth. But the Lenni Lenape’s forays into the marshes eventually came to an end following the arrival of Dutch settlers (ibid; Hunter and Hunter 2010) at which time Native Americans were continuously and systematically forced off the productive lands then settled by Europeans. Elizabeth Barlow who has written on the natural history of NYC, especially its wetlands, fills in part of the story of removal of the Indian population saying:

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43 This chapter draws heavily from the archival record of Staten Island, a collection of exhibitions, photographs, artifacts, primary and secondary records compiled by the Staten Island Institute of Arts and Sciences housed at the Staten Island Museum situated both at 75 Stuyvesant Place and at Snug Harbor Cultural Center. Some of the documents, from pamphlets to scientific research compiled by the Institute’s founders, are not dated but the collections include material especially from the mid 1800s until the present.
When the Dutch ruled New Amsterdam, fitful attempts at colonization were begun, but they were doomed because of the repressive policies of Director William Kieft. On January 5, 1639, the patron David Pietersen De Vries, to whom title to the island had been granted, sent over a group of people to settle it. A few months later some of De Vries’ swine were stolen by New Jersey Indians, the Raritans, and Kieft, against De Vries’ wishes, sent 100 troops from Fort Amsterdam to exact revenge. According to De Vries’ description of the incident, several Indians were killed and the brother of the chief was captured and “misused … in his private parts with a piece of wood.” He adds that “such acts of tyranny were … far from making friends with the inhabitants.” Another patron, Cornelis Melyn, also attempted settlement, but his colony was twice wiped out by Indians. … (Barlow 1971:69).

The early European agriculturalists would also benefit from the wealth of local resources maintained and enhanced by the land management practices of native inhabitants that made the soil especially fertile for farming. As William Cronon has shown in one of his seminal texts in environmental history entitled *Changes in the Land* (1983), the richness of resources found by colonists in the New World were the result of Native Americans landscape management practices. Native Americans customarily altered and managed the landscape to increase the fecundity of the soil and the abundance of plant and animal life.

The geological traits are part of the borough’s natural wealth of resources. The spine running across the whole of the island is formed of serpentine rock, a unit that “appears to be the alteration product of some original igneous rock that contained only ferromagnesian minerals and hardly any nonferromagnesians” (Schuberth 1968:98). The richness of this formation, as the quote points out, enabled a small mining industry early on that the Dutch took special advantage of. The Staten Island sources of *artinite*, a magnesium carbonate mineral associated with the serpentine rock, rank among the best in

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44 The term “serpentine” has roots in the Latin word for “serpent,” alluding to the greenish, brownish, sometimes spotted appearance of a group of minerals containing a medley of elements including manganese and nickel that are used as sources for magnesium and asbestos.
the world, alongside those found in California and the Italian Alps. The whole of NYC’s geology reflects a complex geologic history that does not often come to mind when people think of this American metropolis.

The area’s sedimentary deposits also proved an asset for settlers. Though mostly covered by forests at the time of contact, cattle-grazing was made possible by the lushness of the marshes. Cattle quickly fattened on marsh grasses, even while the marshes also proved treacherous, sometimes costing farmers members of their herds. One 17th century account of animals moving through the green fields along creeks points to the riches and the dangers of this new land:

Since it was the main and most landward creek in the marsh, it carried freshwater from land runoff as well as tidal water. Except for the muddy banks on the main creek, the marsh had developed into high marsh, drier than wet. It was decided early that this excellent pasture should be used for the cows that made the trip across the ocean with them. The cow was a tired skinny animal when it arrived, but she and the heifer she dropped grew sleek on the marsh grass. … IN THOSE YEARS THE GREENER PASTURES WERE THE MARSHES. … Frequently, a cow would slip on the soft sides of a tidal pool. Each time the animal would try to regain its footing, it would slip further and further into the soft ooze. Consequently, many of the animals would have to be shot (Emphasis in original). 46

The wide availability of Spartina, lowland and upland native cordgrass varieties, provided rich feed for grazing domesticated farm animals. S. patens, commonly referred to as “salt hay,” is especially useful as feed and provided farmers with a rich source of nutrition for their animals. The resource-rich ecosystems these grasses support also produced a complex food web that came to provide subsistence for impoverished former slaves who settled along the southern shore of the Island particularly on Sandy Ground (Askins 1988) after escaping southern plantations. These freed men and women grew

45 This data is from the Staten Island Museum minerals exhibition.
46 From a report on the Port Mobil site nearly destroyed by the construction of oil storage tanks and retaining walls near Charleston overlooking the Arthur Kill that is part of the archival collection at the SIM.
strawberries and feasted on what once made NYC famous, its native oyster beds of the species *Crassostrea virginica*.

This ever-evolving natural history of the borough has been captured by various authors, mainly by William T. Davis and John G. Mitchell who have written especially descriptive books about nature on the Island. The streams, ponds, forests and hills created by glacial retreat formed places conducive for longer settlement making the Hudson Bay area an especially rich place to live. The replacement of boreal forests with deciduous growth, the availability of wetland habitats and estuaries rich in diverse grasses and plant life feeding large populations of arthropods has made for complex ecosystems. John G. Mitchell, one of the borough’s more recent naturalists, documents this rich natural history, especially that of High Rock Park. This site serves as the “belt buckle” of the borough’s sprawling Greenbelt. He captures the intricate processes forming today’s landscape in the following passage, a poetic synthesis of the island’s long history summarized into a layered snapshot of the place as it exists today.

Periods and epochs, up through the Cretaceous, the Eocene, the Miocene, the Pliocene, the Pleistocene. And then the ice. Two great sheets grinding down from the north, covering all the first time; the second, the one called Wisconsin, terminating with its moraine heaped high along the eroded escarpment. The final architectural touch. Only yesterday, 20,000 years ago. The ice retreats. The land is littered with boulders. The new forest springing from the peat is boreal, all spruce and fir. In the hollows, ice pillars fractured from the receding glacier melt in the sun to form a chain of ponds, or kettles, along the top of the escarpment. The days grow warmer. The conifers grow sparser, succeeded by birch. In time, the birch succeeds to oak and hickory; the oak and hickory to hemlock and maple and beech to the forest primeval, the climax community which can be altered now only by fire or new ice. Or the axe (Mitchell 2011:11).

Appreciation for the environment by a very dedicated group of longtime residents has made for an extensive history of preservation efforts and vigorous campaigns against
the siting of a variety of projects that have threatened what from the earliest time of its settlement was described as a “healthful” place. Enchanting for its sweet smells, its vistas, waterways and hillsides, Staten Island had a reputation as a healthful place especially for the quality attributed to its air. This resulted in making this the home of institutions like quarantine facilities which are among the earliest unwanted land use projects. These types of projects would later significantly shape the borough’s political landscape.

Staten Island’s many other natural marvels also include what William T. Davis calls “gifts from the sea” in his book *Days Afield on Staten Island*, a modest classic in nature writing. Mr. Davis introduces readers to these treasures in the following way:

> What a marvelous hoard of dead creatures the sea casts up to the land! Many poor mussels that seemed securely anchored in the morning, ere night are dying on the shore. It seems useless to throw them back, for the waves, with a roar, bring them again and cast them at your feet (Davis [1892]1994:22).

This passage reflects the bounty and the beauty found along the shores of the Island, and more, it showcases the features that enchanted naturalists who would work so tirelessly to preserve a record of the island’s environmental history and the species of flora threatened by unbridled growth.

But this bounty did not just include foodstuffs for animals alone at the time of publication of Davis’ meanderings around the Island. The sea had also by then started yielding more than the blue crabs and hermit crabs that still draw birds to the Island’s shores. While Davis beautifully details the patient birds sitting in long files facing the water as though asleep waiting for the sea to deliver its riches, he also describes other marks of life in the sea:
Of drift wood there is no end, neither is there of old shoes, mousetraps, brooms and all other household utensils. Even coal and metal objects are washed ashore. I found a table one day, with a full complement of legs, and a friend discovered a coffee pot, cover and all, and with a blameless bottom. One might become quite a connoisseur in bottles, for the Frenchman, the German, the Italian and the Irishman each throws his bottle overboard, and coming ashore they mix with the American bottles on the beach. So various in shape and general appearance are they that one to given them supposed qualifications, such as phlegmatic, sanguine and bilious bottles ([Davis 1892]1994:23-4).

These objects hint at the blending of populations and changing settlement patterns already evident at the end of the 19th century. These changes are reflected in the material culture left behind. The colorful inventory of waste washing ashore was the result of growing populations in the area dumping at sea. Ocean dumping contaminated beaches so regularly that landfilling became the primary means of managing waste following the Supreme Court’s decision to uphold a lower courts ruling ordering NYC to cease its practice of dumping municipal waste at sea (Melosi 2000, 2005; Rogers 2005; Royte 2005). Incinerators were later rejected making landfills the main form of waste disposal for a relentless waste stream that transformed the Fresh Kills meadows into a landfill with mounds of rubbish ranging in height from 90 to 225 feet. Throughout the 1980s, the peak period of the life of the landfill, residents feared that at least one of the mounds would exceed 500 feet if Fresh Kills was to be kept open for an additional 20-50 years beyond the 35 years it had already been open. Had waste piled to 500 feet, the highest point on that mound would have exceeded the elevation of Todt Hill measuring 390 feet. Todt Hill is the highest natural point on the Island. It is the result of glacial retreat and tectonic activity on an ancient fault line that upon settling over time has produced mountains and valleys along the whole of the eastern shore north to Connecticut.
This snapshot of the diverse ecosystems generated over extended periods of time through natural processes contrasts starkly with the environmental degradation brought about by landfilling at three different sites around the borough. The following chapter traces the history of these three sites, with a special focus on the complicated siting of Fresh Kills with the Brookfield and Great Kills landfills serving as backdrop.
Part III: Rebuilding

Political decisions can result in disastrous environmental conditions impacting and at times dramatically altering the course of successional stages in ecosystems. Such was the case at the Fresh Kills meadows, a wetland habitat designated for development for mixed industrial and residential uses, where landfilling destroyed complex ecosystems and radically shaped future development of the site and its surroundings. The history of that siting decision is outlined in the following chapter. The series of drawn-out conflicts leading to the opening of the Fresh Kills landfill recounted here illustrate how socio-political events can fundamentally transform ecologies. A history of pollution and its concomitant health impacts provide a stark contrast to the kind of healthful environmental conditions summarized in the previous chapter.

But this history of dumping and related pollution is in the process of being transformed. The following section lays out the progress completed so far at Freshkills Park and what the associated environmental gains signify to one local resident and naturalist invested in the conversion process. The habitats thriving in Freshkills and around Staten Island today offer an opportunity for healing not just the landscape but also the strained relationship between Richmond County and the rest of NYC.
A Dump by any Other Name … Would Still Not Smell as Sweet: How Landfilling Changed Staten Island

Four times in less than a century, Staten Island has rebelled against outside oppression and come off the victor, and the stories of those events are glamorous chapters in its history.

“History Shows Residents Ready to Keep Autonomy By Extra-Legal Methods” in SI Advance (Frederick J. Welsh; August 3, 1934)

The refuse which has made New York known as the dirtiest city in the world soon may be its pride.

“There’s Gold in Your Garbage Can” in The Daily News (Sydney Mirkin; August 26, 1954)

Treating a Sealed Sore on Nature: Sailing and Seeing at Fresh Kills

I arrive at the St. George Ferry Terminal with my husband, a reluctant visitor to Staten Island, and find the taxi terminal where we ask the dispatcher in the booth for a cab to “the landfill” to which he responds with a look of disbelief. “The landfill?” he repeats. “Yes, Fresh Kills …” is Lenny’s response. He says, “That’s a first! I’ve never had someone ask for a cab to go to the landfill before. What’s the address?” “There’s no address. It’s just the landfill” Lenny replies. Looking at the directions given to us by the Fresh Kills team, Lenny then tells the dispatcher we are looking to get to the Muldoon entrance. That seems more satisfying to the dispatcher and he hails us a car. While we wait, he asks us what we were going to do there and when we tell him we are going kayaking, he replies laughing, “Kayaking?! Just don’t fall in the water!” We ask him if

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47 This quote refers to a proposed waste-to-energy method developed in the borough’s own Wagner College that sought to make waste productive rather than merely a source of blight. The system was never put to use though methane collection was finally implemented about three decades after this announcement. The facility for capturing methane is still in use today.
another cab will be able to find us later because we will need a lift back to the terminal. He gives us his card and tells us to call if we “make it back.” He is still chuckling as we climb into the cab.

Figure 14: St. George Ferry Terminal, Staten Island (photo by author).

About 25 minutes later, thanks to unusually light traffic, we get to the parking lot where the kayak groups are meeting up. Carrie Grassi, then Land Use and Outreach Manager of Freshkills Park, greets everyone warmly. Two groups of 24 people will kayak that day in two shifts, in the morning and at noon. We do not know what we are in for but everyone is giddy as they pick up their paddles and head to the shore. Getting into the kayak is unexpectedly messy. Salt marshes have a very soft shore; I have never walked right up to the water in marshland and in the process nearly lose my shoes as I begin to sink into the smelly grey mud before taking off. It turns out to be a somewhat physically grueling trip, particularly on a slightly misaligned kayak during low-tide. We row from the foot of the mound still under capping to the William T. Davis Wildlife Refuge, about an hour round trip.

We pull away from the shore and group together to get basic instructions on how to navigate the kayaks. As we do so, we suddenly hear a splash as someone tips over.
The person taking a plunge is a life-time Staten Island resident in his 20s named “Anthony.” I did not expect anyone to actually tip over despite the warnings we were given and the instructions to be careful not to move too abruptly or tilt too much to any one side. I have an irrational moment upon seeing him suddenly fall in the water where I expect him to dissolve into bones and then vanish in cartoon-like fashion in a vat of acid.48 But he emerges from the water intact and athletically jumps back into his kayak laughing with others who snapped pictures of him splashing into the water. We set off on our tour once he is securely back in his kayak.

![Image](image.jpg)

Figure 15: The Fresh Kills mounds seen from the waterway (photo by author).

The landscape looks other than “natural” from the waterways, in the conventional sense of the word used by the great naturalists and Transcendentalists Thoreau, Muir, Leopold and Pinchot in their writings about natural places. From the waterway, the view contrasts with the stunning panoramic scenes visible from atop the capped mounds. The word *natural* in this context echoes William Cronon’s use of the term. Emphasizing the gamut between “natural” spaces and “urban” ones while distinguishing between “first

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48 My crazy thought turned out to be not so uncommon. When I tell one of my informants about this incident a few weeks later, he expressed a bit of surprise at the recent increase in access to the waterway and wondered aloud what Anthony had left covered in, saying wryly, “Someone went home with a third nipple!” People often uncomfortably joke and speculate about what is in the environment at the site.
nature” and “second nature” (Cronon 1992; Smith 2008), Cronon’s work demonstrates that natural features and human-built structures exist in a close continuum. Cronon’s history of Chicago illustrates how metropolises exist in this kind of relation to nearby hinterlands. His careful history of this city shows how surrounding waterways and other natural features and resources provide cities and their neighboring areas all sorts of additional benefits.

Cronon’s history of Chicago also demonstrates the ways in which powerful urban areas impact their hinterlands, absorbing outlying areas and shaping their environmental conditions. Staten Island provides an example of this effect as well. The transformation of meadows and marshes began under the assumption that swamps could be made productive by a “sanitary landfill” but in spite of the word “sanitary,” the site was in fact for a while simply an open “dump.” Throughout the years, debates over its use would not be entirely settled and suspicions linger over future proposed projects that could possibly be polluting. Staten Island, as a type of hinterland to NYC, became tied to the city’s growth in the same process described by Cronon, albeit as a depository of waste rather than a source of extraction for materials promoting growth as in the case of Chicago and its neighboring regions.

The contrast between “first nature and “second nature” in this instance also marks the different landscapes that have existed at the Fresh Kills site. Some have been more intensely managed than others. The socio-political history of the landfill is outlined here in order to better understand changing landscapes in a long historical context. It was not until the construction of Great Kills Gateway National Park,\textsuperscript{49} situated on the island’s

\textsuperscript{49} Much like Fresh Kills, Great Kills was a landmaking operation devised by Robert Moses using “sanitation controlled fill,” as Moses referred to it in documents and speeches. This material was used for
eastern shore, that large-scale urban nature-building would begin on Staten Island. Once a place named by the Dutch for its fresh water inlets and channels, or what the word “Kills” refers to, the borough’s waterways were significantly lost to the expansion of ports and industry. Because the marshes and meadows were once flat and the site is now mountainous, it has a significantly different set of micro-climates at different levels of the landscape. This makes the idea of “restoration,” a term commonly used by city officials, an especially complicated one. In one example, a wetland not initially windy now presents a potential natural resource for the harnessing of renewable energy. The administrations of former Mayor Michael Bloomberg and former Staten Island Borough President James Molinaro have proposed setting up windmills on top of the mounds. As of this writing, the intentions of the current Mayor Bill de Blasio and Borough President James Oddo have not yet been made public.

The water that normally shimmers in sparkling blue shades when viewed from the mounds appears a charcoal grey from the kayak. The marshes make the air so salty my lips are chapped by the end of the tour and my clothing and camera case are decorated with faded scattered salt water stains that look like a pattern of islands amidst different colored seas of textiles. There are old tires strewn about the shoreline as well as drifting pieces of plastic so thick they serve as habitats for barnacles that have attached to them as they float just below the water’s surface. These pieces of plastic range in textures, sizes and colors and are found just about everywhere, reminders of the contents of the mounds.

creating additional park land (the park opened to the public in 1949). Great Kills is located on the southeastern shore of Staten Island. Great Kills Harbor and the Lower New York Bay used to flow into each other until the land was filled in at this site. The park was transferred to the National Park Service in 1972. Trace deposits of radium have been found in the park and about half of the site has been closed to the public during a cleanup mandated by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), otherwise known as the “Superfund” law.
Plastic is a new and unpredictable substance; there is no way of knowing just how long this material can exist in water or land. Other bulky trash that looks almost like fabric drifts idly in the water. Upon returning to our starting point, we find a razor blade on the ground that volunteers caution everybody about as they come ashore. Garbage follows us. Found in all natural spaces around the city, it is an ever present feature in any natural landscape and especially in this landscape built on rubbish. Stories of residents’ interactions with their natural spaces can be pieced together from the litter found in parks and woodlands throughout the boroughs.

Whether because we set off during low-tide, or because the waterways have shrunk due to filling, our paddles sink into the sand below that comes up almost black, sticking to our paddles like oil. A couple kayaking ahead of us scrapes the greasy residue off each other’s paddles without successfully rubbing it off. The diverse wildlife that has made the site home certainly suggests that the ecosystem’s health is improving (some of the wildlife now common at the park is inventoried in the following chapter). The numerous seagulls that pestered residents before the landfill’s closing are largely gone.
and there is much more diversity in bird population than in other green spaces across the city.

Some of the shoreline looks as though it is expanding with native *Spartina* grasses reaching far into the streams. *Spartina alterniflora* creates and enhances habitats along the lowland marshes by functioning as a habitat “engineer” that holds sediments together. In doing so, it enables other creatures like mussels to settle the area, providing rich food sources for them and encouraging the colonization of the higher marshes by *Spartina patens*. This habitat also attracts vertebrates of varying sizes to participate in the food web, promoting wetland habitats which are one of the most productive ecosystems in the world (Teal and Teal 1969). The smell in the air at Fresh Kills is fishy but in the way the ocean smells fishy and salty, a rich scent made more powerful by the sun and the mild breezes. This is the smell of a functioning ecosystem, not a sick one. The smells produced by “sick” marshes are the odors of an ecosystem spoiled by dumping, the primary threat to tidal lands around the country and the world. The history of dumping that produces malodorous smells is explored in more detail below.

Figure 17: *Spartina alterniflora* (left) and *S. patens* (right) in winter dormancy (photo by author).
As outlined in the previous chapter, prior to the opening of the Fresh Kills landfill, Staten Island’s environmental history was characterized by richness in diversity of habitats and in the biodiversity mosaic habitats support. The opening of landfills on Staten Island like Brookfield, Great Kills and Fresh Kills would change this, instead making the history of the Island in large part one characterized by pollution. This instance of socio-political decisions and human processes resulting in marked alterations to ecological conditions reflects what A. P. Vayda has called “event ecology” (Vayda 2008, 2009). Vayda’s work shows how political processes can set off chains of events in environments that forever transform natural processes. Such events and unfolding outcomes must therefore be understood in the context of socio-political and economic decisions. However, Vayda warns that despite human actions, it is nevertheless necessary to understand places ecologically as well. He argues that too much emphasis is placed on the “political” side of research falling under the category “political-ecology.” His work is designed as a corrective, drawing from ecology in multi-disciplinary ways. By using the social concept of “events” for understanding unfolding ecological processes, he bridges the gap between social and biological sciences. This analysis of brownfield cleanups thus attempts to contribute to studies of ecological processes embedded in contexts of human actions and their resulting effects on human health and community cohesion. This chapter traces the socio-cultural and political shifts shaping Staten Island’s ever-evolving environmental history over the course of the last century.

* A History of New York City’s Garbage Wars: the Last One Hundred Years
In order to make this very local, complicated history clearer, this short section introduces the stages of the struggle in the broadest of terms. The full narrative is further outlined and documented in more detail below. This section summarizes the predominant themes at each stage of the opposition to the siting decision, with dates and other details elaborated on below.

While comparisons between Staten Island and the rest of the city are often framed in terms of cultural and political differences in relation to race and class, the siting of unwanted projects (in this case, landfills) can provide deeper insights into the political differences so often glossed over as mainly cultural or class differences. Richmond’s political culture is after all, well rooted in the history of the borough’s conflicts over garbage, a factor missing from analyses of Staten Island’s marked socio-political differences in comparison to the rest of the city. An analysis of political conservatism in the borough of Richmond informed by development decisions pertaining to waste provides richer insights into the city’s political dynamics enhancing analyses of race and class.

Fights over where New York City’s waste should be buried have taken different forms over the years. Proposals with Staten Island as the main host for waste have been advanced for the last 115 years beginning with a plan for a rendering site presented as

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50 While other boroughs have also had their own garbage wars, those fought on Staten Island took on a distinct character, enhanced by residents’ sense that they have borne an unequal share of the burden of waste, according to what informants regularly told me. Staten Island’s garbage wars have not been analyzed in terms of urban environmental justice. This is likely not entirely due to the borough’s mainly white demographics considering present day struggles over transfer stations in the Upper East Side are discussed in these terms. Though this Manhattan community has not had to bear the burden of waste, making use of this language as a preventive device has been common. And yet, white working and middle class Richmond residents lacking the political clout of wealthier white residents like those of the Upper East Side have not been considered a case of environmental injustice. It is curious that the Staten Island case has not been discussed in these terms. I have not found reasons for this so far articulated by scholars or borough residents.
early as 1898. These proposals have spurred ongoing struggles beginning in the late
1800s to the closing of Fresh Kills landfill in 2001. The sections on the history of Fresh Kicks that follow below are organized chronologically and divided into three main periods: 1) peak resistance to the waste siting from the late 1930s up to 1946; 2) the landfill’s growth throughout the 1960s into the 1990s (peaking in the 1980s); and 3) its closing in 2001. Also included among these sections is a discussion of the main topic significant to everyone I spoke to: memories of the stench produced by the landfill.

Struggles against garbage sitings began with strategies aimed at raising awareness and promoting solidarity among groups at the time of the earliest fights in 1916 and in 1946. Campaigns against waste facilities then centered on a tireless circulation of data in the form of reports on pollution along with comparative accounts between different communities hosting dumps and landfills. This was done to forge an opposition based on alliances including business interests, civic organizations like the Kiwanis Club, and church organizations. But little citywide solidarity materialized. Despite sustained local resistance throughout the early part of the 20th century, Staten Island eventually came to live with three garbage dumps and the ever-impending threat of garbage facilities growing, reopening, or being turned into other waste industries.

At the time of the most intense efforts against the proposed plans in 1946, elected officials began to seek potential legal channels to block the siting. Local politicians appealed to the state and federal governments, framing the case against dumping in preservationist terms since these had enjoyed some level of success under President Theodore Roosevelt.51 While the rest of NYC did not ally itself with Staten Island,

51 While places like Yosemite and other National Parks were preserved on the West Coast, the argument for saving wetlands and marshes on the east coast did not bear as much weight as preserving forests, soaring
communities in New Jersey did. Bayonne, Carteret, Elizabeth, Woodbridge, and Perth Amboy established ties more readily with the borough given the direct impacts pollution at Fresh Kills had on these neighboring areas. Collaboration with these neighborhoods resulted in lawsuits against the City of New York. This partnership with its neighbor state was considered logical since Staten Island shares geographical “family ties” with New Jersey, even while there has historically been competition over ports and fishing. A number of borough residents have argued over time that the Island should have long ago joined New Jersey, seceding from NY.

In addition to turning to the courts, residents and officials also sought the support of civic organizations and hobby groups beyond Staten Island. Organizations involved in preservation like the Audubon Society and other nature groups were asked for help, but these did not result in the powerful alliance of interests hoped for and Staten Islanders generally faced the fight alone. The history of how Richmond became synonymous with Fresh Kills is pieced together below from early written records and archaeological surveys conducted at Fresh Kills and other dumping sites across the island with an

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52 Staten Island is across New York Harbor from the southernmost tip of Manhattan, about 12 miles (9.31 km) away. It is separated only by the thin waterway called the Arthur Kill from the state of NJ. In terms of proximity and geology, Staten Island is continuous with NJ. Moreover, Staten Island is an entirely different rock type from the rest of NYC and shares common flora and fauna with New Jersey’s Palisades and other formations (Schuberth 1968).

53 This is the opinion expressed in an article from the August 3, 1946 edition of The Staten Island Advance, “Bayonne Speaks Up.” It is a recurring topic throughout the archives, a reflection of the theme’s persistence throughout Staten Island’s history. Most of the archival material cited in this chapter is from the Staten Island Museum’s History and Archives division. Three collections have been exceptionally useful. Those are the William Thompson Davis Papers: A Special Collection in The Archives & Library of The Staten Island Institute of Arts & Sciences and the Shirtbox Collection “Utilities”—Garbage no. 3 (also WTD’s files). Pertaining to the history of Fresh Kills in particular, there is a box on the environmental hazards and landfilling that documents the history of Fresh Kills called “Environmental Issues Folder (FK File) – Landfill. 1887. 1913-June 1946. RC 6 February 7, 1877.”
emphasis on the siting struggles starting in 1946. The past 100 plus years are especially important because this period is a pivotal moment of rapid change. It is at this time that the most rural borough was briskly transformed into a suburb with an industrial shore facing the infamous Chemical Coast of the northeast.\textsuperscript{54}

Managing waste on the scale produced by New York City—12,000 tons of municipal waste a day according to the Department of Sanitation’s statistics (the real number is three times this amount)—has significantly shaped urban development in ways that can go underappreciated. In the case of Richmond County, the impact of waste has always been at the center of local discussions about development. But this discussion has gone largely unheard by the rest of the city. The Island residents I spoke with still resent that sense of isolation they have felt for generations resulting from landfilling operations. Today, cleaning up this site is in part depicted as amends for the decades of pollution inflicted on the island.

*The Promise of Progress: Promises Not Kept*

Promises were made to the borough in exchange for hosting the largest landfill for municipal waste. These promises included an airport, additional park spaces, a beautiful shorefront to match one of Moses’ jewels, Jones Beach on Long Island, and added parkway arteries to ease growing traffic congestion. None of these proposed projects materialized quite as promised, or not at all, including the plan for another Jones Beach on the southern shore.

\textsuperscript{54} The Chemical Coast runs along the shore of the Arthur Kill, a heavily used waterway, spanning sections of Union and Middle Sex counties in New Jersey, across from Staten Island. Standard and Shell Oil are currently two of the companies with operations along this coast, though following World War II there were a number of other companies including the Singer Manufacturing Company and brick-making operations, among other industries.
According to Robert Moses, Crooke’s Point at Great Kills Park was to be filled to create a first-rate beach within city limits. Older beaches in the other boroughs had been constructed along the urban aesthetics of Coney Island and Rockaway Beach. Rockaway Beach was already serving very large crowds and Moses considered Coney Island less than acceptable for its cheap mechanical amusements. Moses’ dislike for Coney Island is illustrated in a letter he wrote to *The New York Telegram* on October 8, 1949 where he tells the Editor that “… the bizarre history of Coney Island, Rockaway and Long Beach, … largely owned by the old townships, […] were handed over to speculators for a song,” allowing for the spread of seaside slums behind boardwalks. Recapturing them for the public could only be achieved at enormous prices after private speculators had exploited every inch of the area, he states in that same letter. His dislike for Coney Island is further underlined in his argument for limiting its amusement resorts. But these mechanical amusements were a beloved staple of the life of the working masses. The public’s love for Coney Island is reflected in an article in *The NY World Telegram* printed on October 7, 1949 titled “DON’T CHANGE IT!” This article so annoyed Moses, he sent an immediate response to that paper. The author describes Coney Island’s popularity in this way: “The very name Coney Island brings a smile the world over as a symbol of uninhibited fun. In the loud gayety of its carnival atmosphere the stuffiest are the better for surrendering to the rowdy streak in the most of us.”

In a letter to Mayor William O’Dwyer on July 1, 1949, Moses says: “Patterned after Jones Beach, the plan for [Crooke’s Point’s] development as one of the great future shorefront recreation areas of the City was suggested a long time ago and was strongly
endorsed by the Metropolitan Conference on Parks in 1928 and 1930."55 From the perspective of Staten Islanders, Moses’ “gift” to Staten Island was the opposite of beautiful sites, but the offscourings and leavings from millions of New Yorkers.56 But Moses’ vision of the Island was one of great potential. In that same letter to the Mayor, he frames this vision thusly:

In many ways, Staten Island is more fortunate than other boroughs, not only because of its great areas of undeveloped lands still available for public recreation, but also because there is an opportunity to do a first rate job without the compromises and restrictions which provide handicaps in other boroughs.

For Crooke’s Point at Great Kills, he took credit for reclaiming land underwater for the City to build up shorefront for the recreational use of residents.57 He saw filling operations at Fresh Kills as continuous with the work he was conducting on the eastern shore. Angered by a comparison made by the local papers favoring Newbold Morris—fellow member of the City Planning Commission and President of the NYC Council who would succeed Moses as Parks Commissioner—over him, he wrote the Editor to emphasize his role as problem-solver. He explains the work at Fresh Kills as necessary:

Coming now to the question of similar filling operations in the vast, vacant meadow lands of Fresh Kills, I know of no other way of reclaiming this area for municipal and industrial use than to use sanitation fill …

He goes on to condemn Morris for failing to offer more useful or practical solutions to the city’s waste problems than those Moses himself was proposing (i.e., the use of Fresh Kills to develop productive land). He dismisses borough residents’ ire as simply the

55 Robert Moses’ Papers, a collection housed at the NY Public Library’s Manuscripts and Archives Department, Box no. 99.
56 These are the terms used in an article from The SI Advance of June 24, 1946 entitled, “What We’re Getting.”
burden of being the person forced to make the tough decisions, the result of being the man who “Gets Things Done,” as Robert Caro points out in his definitive biography of Bob Moses, *The Great Builder* (Caro 1974).

For Moses, Staten Island presented a type of a blank canvass, an area he referred to as “the most attractive part of the whole city,” where the very ocean could be pushed back and the land extended, where roads, bridges, and parks could be built on a massive scale to make way for the tens of thousands of cars hitting the roads every year. This open space on which he could make his mark energized Moses much as his work on Long Island had at the start of his career. Filling in and reshaping the Fresh Kills meadows to build industry, address the perpetual housing shortage in NYC, and add to the tax rolls was a plan continuously voiced not just by Moses but by officials who succeeded him after his power declined throughout the 1960s.

Following Moses’ Letter to the Editor, residents responded with heartfelt letters objecting to his plan. In one such personal note, Helen Watkins, from Richmond, says to the Commissioner:

Now you propose to dump, for the next years, your foul-smelling garbage practically on my doorstep, not only polluting my air and bringing rats to my neighborhood, but overpowering the sweetness of the air perfumed by honeysuckle and meadow spice bush with plain stinks (Helen A. Watkins’ Letters to the Editor in *The SI Advance*, no date listed).

Her words echo what a number of the environmentally-minded residents of the city felt both about a development-focused agenda and dump sitings in particular. She continues:

Let the Fresh Kills alone. They are lovely as nature made them. Why all this industrial mindedness? It means nothing in the development of the spirit … it does seem to me that you, a man of many good points, should realize more than many that man definitely does not live by bread alone (ibid).

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58 From the same Letter to the Editor cited above in the article “No Other Way of Meeting Problem.”
But arguing for the good of plants and animals was something Moses disdained and dismissed, referring to environmentalists, naturalists, and local activists as “daisy sniffers” (Mitchell [1976]2011).

Robert Moses would not entertain so much as a hint of interest in conservation from personal friends either. In a letter to Iphigene Sulzberger, the heiress of *The NY Times* and *The LA Times*, philanthropist and friend to the Moses family along with her husband, Arthur Hays Sulzberger, Moses says to her:

> It is simply ridiculous to approach this program from the point of view of the preservation of small clay pits which are dirty, dangerously deep, presently inaccessible, surrounded by tired shrubs and in any event lost in a program in which conservation is a major principle.59

He assures her that building tide gates at navigable creeks will result in the creation of fresh water lakes so immense that they will serve as exceptional conservation areas with room for hunters interested in fowl game that would be more important than Jamaica Bay. He saw his work as always improving existing conditions, including unique natural features like the clay pit ponds and their distinctive ecology.60 He referred to these as “death-traps” and in that way justified further filling.61

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59 Quoted from a letter to Iphigene Sulzberger from Moses dated December 28, 1951 in response to her letter to him regarding the numerous complaints she had received [likely sent to the *NY Times*] about the Park Department’s activities at Fresh Kills.

60 Clay Pit Ponds is the only State Park on Staten Island. Located on the southern shore of the island, it is a place that includes a range of habitats, from sand barrens, woodlands, wetlands, ponds, and more. It was saved from development by the very active conservationists with the Protectors of Pine Oak Woods, an organization responsible for preserving parkland around the borough. The site is home to a variety of snakes, turtles, a plethora of birds, and other animals. The ponds are a result of mining for clay for brick-making, one of the borough’s early industries. A similar ecosystem was found near Fresh Kills but was destroyed by landfilling operations.

61 *The SI Advance* published a story on October 2, 1978, entitled “The Fresh Kills landfill—Thank Robert Moses for idea of transforming marsh to park” where by Janice Kabel sums up events in the following way: “In March 1951, Moses had promised that the ponds would be preserved. But in November he said they would have to be filled in. He said they were ‘death-traps’ (there had been one drowning) and breeding grounds for mosquitoes. They would be replaced with ‘beautiful lakes’ upon completion of the
Evaluating some environmental features as more prized than others was not always based on the valuable ecosystem services natural areas provided. Instead, aesthetics for a type of scenic nature was prioritized. This is evident in the example of Florida’s Everglades: marshes and the complex ecosystem services their high levels of productivity represent were not understood or valued until more recently. It was not until the 1970s that misperceptions about marshes being more than mosquito breeding grounds would start to change as more attention was paid to their ecology. The important contributions in the study of marshland ecology made by John and Mildred Teal (1969) set in motion a shift in perspective. Previously, swamps were commonly perceived as unproductive, or worse, nuisances. This perception supported the case for filling swamps and marshes on Staten Island and elsewhere around NYC and beyond.

This battle over preservation and conservation manifested itself both at the local and national levels. Visions for development and wilderness preservation were conceived differently around the nation, including in NYC, a place not immediately associated with such debates given limited availability of space and heated disputes over real estate values. Ideas regarding the environment and wilderness, in contrast to developed and domesticated areas were silenced during the Moses era as the city was quickly built over to try to keep pace with growth in population, traffic, and economic expansion. Other letters focus their frustration and disappointment in President Hall’s decision to support the siting (whether implicitly or explicitly), while others just voice concern over the future site especially given that information was not forthcoming on the details for the project.

The environmentalists, then not a very large or influential group on the Island, tried everything they could to prevent the ponds from being filled with garbage.”
The battle waned significantly after reality set in that Fresh Kills would be opened for dumping despite resistance. The papers maintain their reports on Fred Schick’s continued struggles to block progress on the Fresh Kills project. But his voice, too, faded, and the length of the articles on the subject also grew shorter over time.

*From Greenfields to Brownfields: the Protracted “Garbage Wars” and the Official Siting (1938-1946)*

Prior to its siting as a landfill, the Fresh Kills meadows had already seen its share of controversy. Though a rendering plant sited in 1897 was blocked, a plant came to be in operation there between 1914 and 1917. Further expansions of waste-related industries were successfully blocked by a concerted effort from organized residents working through their civic associations, churches and social clubs. Launching dedicated letter writing campaigns to their local papers as well as to city officials, organizing marches, and successfully applying additional pressure from the Island’s business sector on City Hall were initially effective. Early struggles anticipated the ongoing resistance that would unfold throughout the first half of the 20th century over waste disposal destinations, eventually resulting in the most significant citizen defeat: the opening of the Fresh Kills landfill in 1948.

These ongoing “garbage wars” as the local papers tagged repeated fights, would generate such acrimonious battles between borough residents, their representatives, and dominant politicians at the center of political power headquartered in Manhattan, that

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62 A dedicated Councilmember Alfred Schick is sometimes called the “Silent Knight.” He worked on very local matters, including proposing new names for plazas, playgrounds, and parks honoring neighborhood people. Commissioner Moses consistently shot his proposals down sometimes with explicit irritation, especially because Moses did not support the naming of places after particular individuals as he expresses in his letters and memos.

63 From an article on the 20th of October of 1938, “Garbage War Begun: 10,000 to Organize; Vigilantes Prepare” printed in *The Staten Island Advance* written by Maurice Bland.
proposals for secession from New York City by Staten Island officials were periodically floated as recently as 1992. Plans for secession fit into the larger political landscape of conflict between Manhattan and Richmond, crystallizing around the garbage wars. Calls for secession coincide with arguments made by vigilante groups lauding local control and self-determination.

One of the early documentations of this will to secede dates back to 1916 as headlines in the local papers quote a speaker at the town meeting held on the topic of siting a rendering plant on the island. Mayor John P. Mitchel is called a “liar” and is denounced for “trickery,” prompting an early secession call. The newspaper The Evening World documents strong opposition against that rendering plant, including from the borough’s business sector. Protests revolved around two key objections: 1) the Board of Estimate’s decision to build the new garbage disposal plant for the City on the meadows near the Kill van Kull without allowing Island residents a say; and 2) Mayor Mitchel’s declaration that the outcry against the plant was manufactured by Barren Island64 contractors who were in charge of disposing some of the city’s garbage at the time. The article reads:

Mayor Mitchel’s left ear must have pretty nearly burned off while the people of Staten Island were giving their opinion of him last evening. Seven hundred of them filled the rooms of the German Club at Stapleton and denounced him without reserve … The make-up of the meeting was the best proof of the indignation … the bank and every building and loan association as well as every society for civic betterment was represented on the platform. The house was jammed with well-to-do householders and their wives. The speakers were frequently interrupted by the arrival of civic clubs from distant sections of the island marching in with bands and banners (April 15, 1916).

64 Barren Island was one of the preferred dumping sites before the Fresh Kills siting. This island, now attached to mainland Brooklyn, hosted open dumps, rendering plants for processing horse carcasses, and fertilizer plants utilizing fish bones.
Such potent calls for each community’s responsibility for handling its own waste were expressed at this same meeting. Citing Ex-Commissioner of Public Works Louis Tribus, an engineer of long experience, the article reiterates his emphasis on communities’ responsibility for their own waste. His comments were received with “long and loud” applause. But the loudest applause was reserved for Francis F. Leman, the leader of the Vigilante Committee (one of the early vigilante groups that would form against garbage facilities) calling for secession when he said,

“If the rest of New York city insists on making Staten Island its garbage disposal place then the parting of the ways has been reached,” he said. “Staten Island must be divorced from the rest of the city. We must go it alone.”

Calls for a more equal sharing of the waste burden did not resonate then but would eventually reverberate across the country in the 1980s. This message was especially relevant for communities engaged in environmental justice movements mobilized against Marine Transfer Stations (MTS) and later incinerators throughout the 1990s when these movements came to garner national attention.

Some of the rhetoric advocating for vigilante justice is surprisingly similar with today’s conservative movements. In a Letter to the Editor, a group of residents choosing to stay anonymous put it this way:

“Let us not forget them when election comes around. Let us not forget their candidates. Thumbs down on all of them! They, like their other borough friends, take us for suckers. Are we suckers? And when that garbage starts coming from Fresh Kills, maybe a little ‘Boston Tea Party,’ in some manner or form, will teach Mr. [William] O’Dwyer [the Mayor at the time], the City Council and their smart kind something.”

—Irate Citizens (July 24, 1946)

65 New York Herald from Saturday, April 15, 1916 entitled “Staten Island Threatens Violence in Fight on Garbage Plant; Mayor Mitchel Is Called a Knave.”
66 Quoted from The SI Advance’s Letters to the Editor series, the installment from which this is quoted is titled, “Political Clubs, Mum On Dumping, Rapped.”
Angry rhetoric and calls for immediate action—either voting representatives out of office or engaging in on-the-ground forms of resistance—have become familiar political tactics on Staten Island especially those associated with struggles over land uses and the threats these present to people’s homes and/or real estate values.

By October, 1938, journalists at The Staten Island Advance, one of the borough’s local papers and the most active publication leading the struggle against various unwanted land uses proposed for the Island, were alerting residents that another struggle was brewing over waste disposal at the same site. The smokestack building where the rendering plant was planned but blocked in 1917 presented an added advantage to the site since existing preliminary infrastructure was already available. The journalist covering that story could not get a direct answer from Sanitation Commissioner William F. Carey on the future plans for the site. The details of the siting were covered obliquely this way:

Carey gave only a general idea of the location of the site he has selected for the proposed dump on Staten Island. He said it was a tract of about 500 acres of “marshland” in the Fresh Kills section, “near the old brickyard.” The site is west of Richmond avenue [sic] and north of Arthur Kill road [sic]; according to the commissioner, the city does not own the property but has assumed a tax lien on it, and title can be acquired by foreclosing on this lien (October 20, 1938, The Staten Island Advance).

This lien on the property transferred the land to the city from the state. Moses had requested the title for the purpose of creating more park space. This then paved the way for the siting of the landfill in what many residents reported feeling as though something they woke up to over night. The marches, protests, and other forms of opposition that had succeeded in the past appeared to be working until the last minute backroom deal was reported the next morning in the papers and Island residents had to confront the impending siting of another dump on their shore.
The decision to site Fresh Kills on the western shore of Staten Island was connected to Robert Moses’ creating the grounds for the 1939/1940 World’s Fair in Flushing Meadows-Queens. This project required that no more dumping continue in and around Flushing Bay, given that dumping on nearby Rikers Island would produce malodorous wafts that might sicken Fair goers who would smell and see the mess in the near distance. Barren Island and Jamaica Bay on the southern shores were also off limits for dumping. Staten Island was distant enough to serve as a feasible alternative. Mount Corona, at Flushing Meadows, was a dumping site for ashes where ash and dredged material were later used to rebuild the site into the flagship park for the borough of Queens.

Because of Moses’ evolving plans for Brooklyn and Queens, he insisted that Carey explore options on Staten Island. Carey did not like the idea of moving dumping activities there, however, because hauling garbage from the other boroughs was easiest to bring to the Queens area and he would have preferred to continue dumping on Rikers Island, which would later come to house the prison complex presently there. His other
preferred option remained Jamaica Bay. But Moses insisted on Staten Island, and what Moses wanted, Moses got. As Janice Kabel from *The Staten Island Advance* put it: “… Islanders were powerless to stop Moses’ plan for Fresh Kills. An attempt in the 1947 legislature to ban landfills in the city passed both houses, but was vetoed by Governor Dewey.”67 And so Carey took a look at Staten Island’s “sparsely inhabited back shore anyway” (Miller 2000:195) and the siting soon took place.

The Garbage Wars became so heated that one attention grabbing headline on October 20, 1938 reads, “Garbage War Begun: 10,000 to Organize; Vigilantes Prepare.” *The Staten Island Advance* reports:

> Angry Staten Islanders last night began mobilizing for a “fight to the finish” against Sanitation Commissioner Carey’s plan to establish a city garbage dump at Greenridge. … [B]usiness and civic leaders … threatened ‘physical violence,’ if necessary, to combat execution of the plan.

The article documents the beginning of the mobilization against the landfill, crediting typically petite bourgeois groups like the Kiwanis and Rotary Clubs, and three Lions Clubs68 for forming the Staten Island Citizens Committee of 10,000 who appealed to all “civic, social, business and patriotic groups to get behind the campaigns.” The Staten Island Vigilantes put forth a call to angry residents, believing there were enough “red-blooded men” on the Island willing to literally fight violently. Feeling their representatives were powerless before the political elite in Manhattan, people perceived

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68 These kinds of civic groups, while common throughout the 1950s and with a worldwide presence, have significantly diminished in membership and community prominence in the U.S. over the course of the latter part of the last century. For studies on the decline of civic engagement in the U.S. and dwindling membership in civic groups, see Robert Putnam (1995). For a historic look at civic groups and their influence on electoral politics, see Theda Skocpol and Morris Fiorina (1999). Despite smaller membership numbers presently, various lodges still dot Staten Island today.
them as managing the city with a top-down approach with the Borough of Richmond at
the bottom of the political hierarchy. The Vigilantes’ message was this:

We will use force to prevent the garbage barges from unloading here. We
will make it so hot for the barge owners that they will not dare to land
here. About 80 years ago an aroused Staten Island populace burned down
an objectionable quarantine building on the East Shore, which the
government had seen fit to erect here. Our slogan now is “Remember the
Quarantine” (October 20, 1938).

The strategy to campaign against the siting beyond this thinly veiled message of potential
violence set forth a plan of action that included mass meetings, enlisting the support of
neighbors, auto parades, and pamphlets explaining the danger of the garbage dump to the
people of Staten Island. Residents were already very much familiar with these dangers
given their experience with Great Kills.

Things quieted down from 1939 until 1945 as talk of siting a landfill facility
waned, taking a backseat to foreign affairs related to the war effort. But in 1945 rumors
of a new garbage proposal began to circulate anew. By 1946, unofficial reports had
become a reality and resistance to the site reached fever pitch. But marches to City Hall,
older strategies of active protests and letter campaigns were undermined by political
shifts like the one made by Richmond Borough President Cornelius A. Hall. After
opposing the proposed amount of $650,000 for a “marine unloading plant” included as a
line on the budget proposed to the Board of Estimate, Hall changed his position and
supported the item. This move stunned Islanders. In a statement released to the press,
Hall announced he would no longer oppose the plant. It later came to light that Hall’s
predecessor, Joseph A. Palma, had also presented a garbage dumping program to City
Hall in 1943, intensifying residents’ sense of betrayal and frustration. The papers even
ran a story where the project is attributed to Palma and downplaying Moses’ hand in it
altogether. The finger-pointing that ensued after Hall revealed Palma’s role in the siting even targeted the editor and staff at The Staten Island Advance, with Hall blaming the paper for not doing enough to educate people to prevent the siting of the landfill at Fresh Kills.69

With the site scheduled to open and no details on the site presented for public discussion, residents were left with a growing list of questions about the proposed plans that went unanswered. Their questions were printed in lists like this one:

“How does the City Planning Commission know how much that unloading plant will cost?
Have plans been prepared somehow under cover, in spite of the fact that the $200,000 item was ruled out?
The original Fresh Kills plan was a 10 year program. 10 years of dumping on the West Shore of the Island! Is this still the program?
Who is behind this revival of the proposal?
Is it merely the City Planning Commission’s desire to see a big airport built where Fresh Kills marshes now are?
Have city officials decided that incinerators are too costly, that their construction is too slow to carry the load?
If this is the case, why dump on Staten Island? Because this is the borough with the smallest population? Because we cannot talk loud enough in numbers?” (June 8, 1945 from The Staten Island Advance, “Landfill … Again!”)

Included in this set of questions were also some aimed directly at Borough President Hall, as Staten Islanders wondered why he had changed his mind and why he was suddenly speaking of a “limited landfill,” raising the question who would be “limiting”

69 On July 18, 1946 The SI Advance published an article, “Palma Denies Sponsorship of Garbage Dump.” The other headline reads, “Ex-Borough President Replies to Hall; Hits Project.” This article sums up the events involving Palma, who had while in office, claimed to oppose the project. The article blaming the paper for the borough’s landfill woes appears in an article printed on the July 23, 1946, “Hall Blames The Advance Fore Great Kills Dumping.” The lesser headline states, “Says Paper ‘Never Raised a Cry’ In Protest.” The claim quoted by the sub-headline regarding the paper is a gross misstatement as that publication printed articles on the subject just about daily and from multiple perspectives.
it? It would take a grand jury indictment in the summer of 1946 for residents to begin to get more information on the project.  

Residents looked for answers to these questions and others over the years but information about the size, exact duration of dumping activities, the materials being deposited and their toxicity, the risks to residents’ health, plans for its closing, and other matters, remained vague or ever changing. Intensifying anxiety over the siting of such a large site for a landfill was the noxious experience residents had been living with Great Kills on the eastern shore. Most of the narrative concerning Great Kills revolves around the stories people consistently told about its smells and associated vermin. Among the most gracious references to its malodorous character is captured by the phrase used by Mrs. Charles Josephs representing the Lynn-Howton Association in her testimony during a PTA protest against dumping on the Island. In a public statement about landfilling on behalf of her association, she calls the smells emanating from Great Kills simply, “odors terrific.” Others were less polite and described it more forcefully as “nauseating” (a word that comes up routinely in accounts of residents’ memories of Fresh Kills today).

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70 This is documented in “‘How Big a Dump?’ The answer is: ‘That’s a matter of guessing.’” Borough President Hall had spoken of 850 acres while the grand jury stated its belief that the site would encompass 2,100 acres. It turned out that the grand jury was not too far off. Those 2,200 acres were the ones that were turned over to the City. Another article in The SI Advance titled “Dumping Project—The Truth Emerges!” Thursday, July 18, 1946 also documents the need for the borough to sue for information on the landfill project before they could get answers.

71 Cited in an article published in The SI Advance announcing PTA Protests on June 14, 1946 in an article simply called “PTA Protests Landfill Plan.”
A number of studies were conducted to understand the risks involved with landfilling so close to residential areas. Most famous among these studies are those conducted by Dr. Natale Colosi, Professor of Bacteriology at Wagner College on Staten Island who went on to become Chairman of the Interstate Sanitation Commission.\textsuperscript{72} His research found that only 15-20% of the city’s waste stream could truly be characterized as garbage (\textit{The SI Advance} July 16, 1946). The rest could be recycled and reused. He also conducted epidemiological studies that pointed to a correlation between disease instances and proximity to waste sites (\textit{The SI Advance} August 5, 1946). He was a tireless voice speaking out against the multiple forms of pollution and other threats posed by the Fresh Kills dump throughout his life. His studies and others further served to mobilize the younger generations for opposing future environmental threats.

\textsuperscript{72} The Interstate Sanitation Commission is a tri-state agency for improving the communication between state governments in New Jersey, New York, and Connecticut. It is intended to improve the environmental and water quality in these states through enhanced communication and coordinated regulation.
The stink over landfills regularly revolved around the literal *stink* produced by dumps.\(^{73}\) Staten Island papers regularly covering landfill issues make abundant mentions of the smells that disgusted neighbors of dumps everywhere. Comparisons between Staten Island and other landfill host communities were regularly printed. This was done in order to build solidarity as well as to make a broader case against landfilling. The discomfort of Queens residents, in one example, is described this way by *The Staten Island Advance* journalists:

> In Queens, landscaping and landfill near the site of the World’s Fair are filling the air with odors that residents say can come only from the dumped garbage. They don't like it in Queens, either.\(^{74}\)

Citing an editorial from the Long Island Press, the issue of smells is commented on in these terms: “Warm weather has brought new complaints from householders near the landfill operation going on in the lowlands which eventually are to become a landscaped ‘corridor’ connecting Flushing Meadow and Kissena Parks.” These complaints are “of the same tenor as those which for years during the LaGuardia administration arose against the dumping methods employed by former Sanitation Commissioner William F. Carey” (ibid.). In those days, the complaints were that garbage was being dumped without sufficient earth covering, aggravating the foul odors that spread over nearby vicinities. Rodent problems and other wildlife attracted by the over-abundant supply of meals available for supporting their large populations (not to mention the extreme body

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\(^{73}\) Patricia Salmon, former archivist at the SI Museum, provided more specific examples of the smells emanating from the landfill, telling me in an email that the odors were said to “replicate cat urine, rotten eggs, sulphur [sic], and spoiled food.”

\(^{74}\) The following quotes are from an article appearing in Long Island’s press reprinted by *The SI Advance* on Thursday, June 20, 1946, entitled “Garbage in Queens.” This article quotes the editorial appearing in the Long Island paper in full.
proportions animals achieved thanks to the abundant food sources provided by landfills) only exacerbated quality of life problems.

An Assault on the Senses: “Building a roof on a rat’s house”\textsuperscript{75}

Long-time Island Staten Islanders today still vividly recall the smells originating from Great Kills and Fresh Kills as well as from the Brookfield dump. Simply mentioning my interest in Fresh Kills to borough residents over the course of fieldwork consistently triggered recollections of the pervasive stench made worse by rainfall, warm weather, or even what would otherwise be a source of comfort in the summer time, the gentle breezes coming off the surrounding waterways. This theme is so prevalent that it is discussed in a short documentary about the history and transformation of the Fresh Kills site called \textit{The Story of Fresh Kills}. In that film, one interviewee captures the power of the landfill’s stench by likening it to the \textit{Seinfeld} episode about the smelly car that could not be cleaned where the stench took on a life of its own that came to be called “the beast” by the sitcom’s characters. Almost uniformly, memories of the stink were followed by a list of the neighborhoods most affected by the offensive smells\textsuperscript{76} for so many years. And after these two initial mentions, the common memories shared by people in the field consisted of the everyday strategies residents used to curb the discomfort of having to smell the landfill all the time. Strategies included keeping kitchen windows closed during the afternoon, closing all windows after each rainfall,

\textsuperscript{75} Quoted from an article printed on August 15, 1946, citing experts’ descriptions of so-called “sanitary landfills,” titled “‘Amounts to Building a Roof on Rats’” written by Lester Trautmann. The article highlights a landfill in the Port of Oakland riddled with the same problems faced at Fresh Kills contradicting reassurances made by city officials to residents regarding the “sanitary” quality of this type of landfilling.

\textsuperscript{76} Some of the neighborhoods affected by Great Kills and Fresh Kills include Greenridge, New Dorp, Eltingville, Oakwood, New Springville, Bulls Head, and Travis. Informants say that the smell would also affect some areas on the South Shore on particularly smelly days.
rolling up car windows within proximity to the Staten Island Mall, and running across the parking lot and driveways to avoid the stench upon arrival at the mall. One informant recalled the use of electric deodorizing sprays set up at shop doors in the mall that sprayed automatically whenever doors opened.

Anthony, introduced earlier in this chapter, shared his memories of the landfill after recounting how a few days before the kayak tour he was riding a bus and two people sitting in front of him were “bashing” Staten Island, saying “There’s nothing but a dump there!” Annoyed by their comments he interrupted their conversation, saying to the man who had made the dump comment, “Really, bro?! ‘Cause I’m going kayaking there on Sunday!” He said he got no response but a general apology from the passenger who made the comment. He was emphatic about his frustration with people who bring up the dump as though that is the only thing on Staten Island. He said that things have changed since the days when Fresh Kills was open. The overall changes the borough has undergone represent important insights into urban development, infrastructural innovations, and environmental changes particularly important in light of climate change given rising water levels and eroding coastlines. In 2012, Fresh Kills served as a buffer during hurricane Sandy, further underlining the value of wetlands and parks in protecting inland areas and absorbing excess rainfall and runoff.

Anthony recalls one of the attempts to mask the smells emanating from the landfill, a failed beautification project for mitigating the stench along one of Fresh Kills’ borders across the boulevard from the Staten Island Mall. In the 1980s, the City tried addressing both the smells and the eyesore caused by the garbage mounds by building a
berm and planting a tree buffer along Victory Boulevard. Recalling the pine trees that had been planted under the misguided notion that the smell of the mounds could be masked by a cluster of “minty-fresh” pine trees as though hanging an air-freshner in a car, he laughs and offers to show me the buffer. I soon get to see the trees as we ride past them towards the ferry. Despite being fully mature after a couple of decades, there was no sweet smell of pine in the air. I ask him if they had made a difference back when they were planted and he laughs quietly as he shakes his head while he drives.

In addition to ventures like tree buffers, the City used to also allocate special budget lines for disinfectants and deodorants for the landfill as well as for use on the streets of nearby communities. And while some residents were thankful for the efforts and commended the City for attempting to lessen the torture of their noses, they continued to call for the closing of the site altogether, sometimes in rather polite terms, albeit perhaps with a hint of sarcasm. Kathleen Dodd, the President of the Village Greens Residents Association, addresses the issues related to dumping in a letter written to the Legislative Commission on Solid Waste Management regarding Fresh Kills (September 24, 1986) at the peak of operations, saying:

> Our community has been plagued by odors emanating from the landfill. The Department of Sanitation must address the odor problem at the landfill itself, instead of washing our streets daily with pine oil. The residents smell the pine oil instead of the garbage. This is only a band-aid solution. The number of odor complaints has dropped drastically, but the odors at the landfill itself should be controlled. We do appreciate having the cleanest streets on Staten Island.

77 This berm now blocks views of the mall from the mounds which one Parks tour leader says benefits Freshkills Park visitors today who do not have to see unflattering views of the mall and its parking lot.  
78 Quoted from Senator John J. Marchi’s (R-Ward Hill) collection of letters and papers found at the College of Staten Island Archives. Senator Marchi represented his borough for a record 50 years, from 1957-2006, and is known for championing conservative issues and long advocating for the secession of Staten Island from NYC.
From 1948 to 1986 (the time of this letter) the smell only expanded in relation to the growing volume of the mounds.

Listening to Staten Islanders today trying to describe the smells of their childhood and the ways in which these speak to their memories of place, I was consistently reminded of the role the senses play in memory and thinking. The senses are integral in shaping experiences and memories. Often left out of academic writing, they are central to people’s narratives (Classen 1999; Classen and Howes 1996), particularly the sense of smell. However, this sense is very much involved in this case of historical interpretation as a type of “record-keeper” of material experience, as C. Nadia Seremetakis has put it in her collection on the senses and memory (1994). Memory and perception are entangled, existing together across time. She says: “There is no such thing as one moment of perception and then another of memory, representation or objectification” (Seremetakis 1994:9). Perception and “re-perception” is the outcome of interplay between witnessing something that implicates the senses and becomes embedded in memory. In Seremetakis’ exploratory collection, Jonas Frykman further theorizes how bodily reactions and sensory experience can result in making one feel part of nature, as the “surroundings [channel] energy into the body” (Frykman 1994:73). He includes reflections of how he feels his whole body changing as he merges with the wilderness he retreats to from the city, his skin hardening and tightening as the sun darkens his urban paleness. The alien-ness of the plants and other features of the landscape around him melt away becoming less external as he is better able to integrate himself into a woodland wilderness.
In another study of bodies immersing into their surroundings, Diana Young describes another version of the merging of the senses and lived experience facilitating the forming of oneness with the landscape. In her studies among Australian Aborigines who associate greenness with particular odors she has found that “the correspondence of greenness and odour is a socially created and transmitted synaesthesia that Anangu consider effects a transformation in the whole body” (Young 2005:61). During fieldwork among the Pitjantjatjara people in the Western Desert, she quickly learned that they sensed the bush becoming alive with the falling of rain that brings forth new life experienced through the smells produced before and during rainfalls. People themselves can become green by rubbing ukiri (green growth) on themselves or by consuming very green plants. Odorous substances bring about changes in the body and its receptivity to the land (Young 2005:72). In this way individuals seek to find synchrony between themselves and the landscape.

But odor is not always directly connected to an object and its geographic span can be nebulous. Such is the case with the miasma generated by rotting waste. In another exploration of scent and perception, the powerful scent of an orange is explored experientially. “Odours cannot be reduced to objects [sic] and can defy, experientially, this limitation to meaning. In looking at an orange, it can be named as orange and be understood as one; its smell can also be described as being like an orange; but does this capture the quality of its scent, or is there more to it than ‘orange’?” (Borthwick 2000:130). In the case of less pleasant smells than those associated with oranges, malodorous materials defy typical categorizations. When things devolve into putrescence and either deteriorate into the land or defy the biodegrading process they become
unrecognizable. And while smells can complicate perceptions of things, they also help in identifying emotions and provide them with added depth. Emotions and memories are linked by the senses and share a “core of commonality across cultures (a commonality that is transcultural but still cultural), embodied for example in notions of reciprocity (and its sentimental concomitant, amity) and its opposite, negative reciprocity, that is revenge (with its sentimental concomitant, enmity)” (Goody 2002:23). Following this thinking, smells in the case of memories of landfilling on the island bring people together as well as set them apart—mainly from residents in other boroughs—bringing in an element of the “negative reciprocity” in the previous quote given the animosity engendered by landfilling.

In the Letters to the Editor section of The SI Advance, residents wrote in to testify to the smell, trying to get at its essence.

“The fragrant odor of the Great Kills garbage dump is gently descending upon me. Just think, they want to dump on the other side of my present abode, too. Ah! Such a thrilling thought. I can hardly wait. …The wonderful stench will then drift toward me from two directions, east and west and, oh, its stink will meet. As I take into my lungs the fresh, healthy air slightly diluted by fragrant odors of landfill, I will remember for whom not to vote the next time we choose a borough president.”

—George C. Kosh (July 23, 1946 featured in The SI Advance’s Letter to the Editor series titled “Eltingville Man Raps Hall’s Garbage Stand”)

The offensive odors were more than just offensive. Odors were also harmful to plants and people alike, as evidenced by Dr. Colosi’s studies. Despite this, a lack of acknowledgement of the dangers of pollutants in the air and water by city officials persisted. In a rare example of city officials’ acknowledgement of the hazards found in the air, an abundance of dead plants by the South Shore Golf Course are discussed openly by Robert Moses and his top aides. This is a site the city was interested in purchasing in
1951 where entire swaths of greenery had been killed by fumes the city attributed to New Jersey. Indeed, they were aware of the problem of noxious gases even as they dismissed it. In a set of memos between Robert Moses and his aides, the issue of the “deplorable” conditions along the Arthur Kill is discussed plainly. Francis Cormier tells Stuart Constable (both key members of Moses’ staff known as “Moses’ Men”):

… [T]he closeness of the area to the source of sulphurous [sic] acid and other gases from the industrial plants in Port Reading will retard the development until some way is found to harness the fumes. Much of the foliage on plants throughout the area has been burned by the gases and some plants have been killed—rather positive evidence that the gases are toxic as well as malodorous.

Despite this comment, which goes unchallenged throughout the exchange, the city ignored concerns about pollution when those were expressed by residents at meetings and in correspondence with city offices.

While smells feature prominently in people’s memories of place, the problems with landfills were not confined to offensive odors. The mounds were visually offensive as well. Photos in the local press record the mounds rising behind neighborhoods.79 In the words of one Chairman and District Manager of a Community Board, residents said they felt as though they were “being buried alive” by garbage. The landfill is described as “a behemoth of rotting, putrefying dirt-covered garbage looming over us, casting shadows upon our homes and upon the children playing in their backyards.”80

79 Staten Islanders were calling one growing mound “Mount Koch,” in honor of Mayor Edward Koch (in office 1978-1989). The peak of landfilling operations was reached under his tenure and Staten Islanders came to resent him for this.

80 Quoted from a letter drafted by Maxine Spierer, Chairman and Dorothy Fitzpatrick, District Manager of Borough of Staten Island Community Board 3 dated September 24, 1986, to the Honorable Members NY Assembly regarding Fresh Kills. This letter is a part of the Marchi Collection based at the College of Staten Island.
Common to all landfills are a suite of related problems like the spread of vermin; the ever-present vector of disease; flocks of seagulls that sometimes meant traffic hazards for cars; fattened rats living happily from the fat of the land(fill); and spontaneous combustion and the threats this poses to nearby communities. All of these factors contributed to the blight. Combustion also meant additional clouds of noxious smoke in addition to the bad smell. Fires are an inevitable reality for landfills. Thomas DeLisa, former inspector of the Rikers Island landfill, is quoted in *The SI Advance* on June 12, 1946, saying about fires: “Numerous unpreventable fires, caused by spontaneous combustion, which sent clouds of nauseous-smelling smoke drifting across the East River daily, forced the Sanitation Department to abandon its dumping program on Rikers Island and transfer operations to Staten Island.” He also paints a vivid picture of the rats inhabiting the landfill and the somewhat gruesome use of people’s best friend the dog as pest management solution:

“The rats became so numerous and so large,” he asserted, “that the department imported dogs in an effort to eliminate the rats. When I left, there were more than 100 dogs on the Island, dogs which were never fed by authorities, but lived solely on these rats. Despite this the rats, some of them as big as cats, continued to multiply. It was nothing to see 100 rats in a walk across the landfill at night.”

Residents did not just take exception to the problems bound up with managing the waste dumped on land but also the fact that while Staten Island produced the least amount of waste city-wide it was forced to bear the brunt of the city’s trash burden. Adding insult to injury, residents feel, they came to be known as not much more than the home of the most notorious of landfills. Daniela, lifelong resident of Staten Island, says

81 “Moses Backs Dump Project,” by S. S. McSheehy, from Wednesday, June 12, 1946. Other headlines reporting on this story include “Rikers Island Fires Blamed On Dumping of Garbage,” “‘Clean Fill’ To Be Used, He Declares,” and “Great Kills Methods OK for Fresh Kills, Says Park Commissioner.” One informant told me she had seen as many rats running around at the SI Mall.
that the only things people associate with Staten Island are “the dump, the Jersey Shore Guidos, Mob Wives, and Willowbrook.”\textsuperscript{82} None of these associations reflect the complexity of the borough and instead support the stereotypical way in which Richmond tends to be portrayed and understood. The history of Paleoindian settlement, Dutch farms, luxury resorts, and extensive park land is overshadowed by the enduring “scar on the face of Staten Island,” as Dan, another Staten Island native in his early 30s, calls the Fresh Kills landfill (Dan’s insights on Fresh Kills are further explored in Chapter 7).

\textit{The Waste Crisis (1961-1991)}

After meticulously documenting the battles over the siting, the archival record at the Staten Island Museum breaks at the end of 1946 and picks up again in 1961 with similar consistency. The only item in between those years is a report prepared by Commissioner Moses dated 1951. That report, written three years after Fresh Kills began operations, explains its mission with more clarity than that articulated before:

\begin{quote}
The Fresh Kills project is not merely a means of disposing of the city’s refuse in an efficient, sanitary and unobjectionable manner pending the building of incinerators. We believe that it represents the greatest single opportunity for community planning in this City. The cooperation of the Borough President of Richmond, the Department of Sanitation and Parks, the City Planning Commission and Board of Estimate will create enough valuable new property in this presently fallow and useless area to pay the cost of the project many times over and to produce a well rounded and diversified community, practically planned, to meet the future needs of Staten Island (Pp. 14).\textsuperscript{83}
\end{quote}

\textsuperscript{82} Willowbrook State School was an institution for the mentally disabled. It was badly overcrowded by the 1960s and gained national notoriety for some of the experiments conducted by its medical staff on patients. There are letters in the CSI archive from Senator Robert Kennedy and borough officials and residents documenting concerns over conditions there throughout that decade. The activities going on in that institution that caused alarm persisted for another 20 years. Geraldo Rivera earned a Peabody Award for his expose on Willowbrook garnering him national attention for his reporting on what went on in this institution. Willowbrook was finally closed in 1987. CUNY’s CSI campus is currently situated at this site. 

\textsuperscript{83} From Moses’ report, “Fresh Kills Landfill: 100 ACRES OF PARKS ARTERIALS PUBLIC WORKS, 100 ACRES FOR PRIVATE DEVELOPMENT.” Prepared for the City of New York Borough President
This period is also characterized by several documented fires in the landfill caused by spontaneous combustion from the high heat of decomposition, and other environmental nuisances beyond the smells that persist throughout the 1970s and 80s especially. Complaints about floating garbage escaping the site and floating between Staten Island and New Jersey are also common. The State of New Jersey had to sue NYC to ensure that the City would improve its methods for getting refuse to Fresh Kills and off the scows without polluting the shared waterways. Persistent litter on streets that flew off the mounds and into communities was another constant problem. The quality of life issues technical problems generated were just one side of the equation. The landfill was reclassified as “open dump” at the end of the 1970s as it did not meet the requirements of a “sanitary landfill.” These constant problems led Staten Island Assemblywoman Elizabeth Connelly (D-West Brighton) to sue the city to bring Fresh Kills in line with new Federal legislations that had tightened standards for sanitary landfills nationwide. Winning the lawsuit meant that better leachate control and ensuring regular earth covering of refuse to curtail pollution were central measures that had to be implemented.

The growth generated by an influx of immigrants to NYC impacted Staten Island differently from the other boroughs. Italians living in Brooklyn moved to Staten Island following the building of the Verrazano-Narrows Bridge in the 1960s-1970s, despite the growing mounds adjacent to the new and quickly proliferating suburbs. People moved to

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these neighborhoods in pursuit of home ownership. Real estate was more affordable there than in Brooklyn because land was more readily available and to some degree also because of the new neighborhoods’ proximity to the landfill that lowered the value of properties.\textsuperscript{85}

Another notable development in the late 1970s to early 1980s is the construction of a methane collection system. The construction of the world’s largest methane processing plant on the world’s largest landfill was a highlight in the life of Fresh Kills. It presented one instance of redeeming waste into something useful and productive. By the end of 1982, extracting gas from about 100 wells sunk 60-75 feet into a 400-acre section of the 2,200-acre garbage dump allowed the plant to send “about 4 million cubic feet of gas per day into Brooklyn Union’s nearby pipeline system—enough to heat more than 10,000 Staten Island homes, according to Getty Synthetic Fuels president Robert H. Collins.”\textsuperscript{86}

Throughout the 1980s, Island residents would once again feel unjustly dumped on when they would come to absorb the whole of the city’s waste flow as the last of the landfills within the city closed in Brooklyn and Queens (the Fountain Avenue and Pennsylvania Avenue landfills in Brooklyn, and Edgemere in Queens). News about toxic dumpings in Brookfield-Staten Island, Fountain Avenue- and Pennsylvania Avenue landfills-Brooklyn, fueled ongoing anxieties over what was being disposed at Fresh Kills. Stories about deposits of materials like asbestos peppered the papers throughout the

\textsuperscript{85} Patricia Salmon tells me in personal communications that new homebuyers in the 1960s and 1970s were sometimes mislead by realtors and were sold homes without being told about the landfill which was not always visible from certain neighborhoods in the earlier years. Once people bought their homes, they could not resell them upon learning about the landfilling operations going on close by.

\textsuperscript{86} “Methane plant opens at landfill: Island dump to yield $1M yearly for city” in \textit{The SI Advance} of October 14, 1982 by John E. Hurley. Another article also reporting on the value of the new methane plant appearing in \textit{The Staten Island Advance} was printed on the 5\textsuperscript{th} of August, 1983, entitled “Methane plant pays off” by Leslie Palma.
1980s. Materials like cyanide and other toxic substances “were among the hundreds of thousands of gallons of unauthorized liquid waste dumped by caravans of tanker trucks” in Brookfield. The threat of the spread of asbestos particles blown by the wind raised additional concerns. The general mistrust present from the start of operations only grew over the five decades of the landfill’s existence worsening with stories about toxic dumping and pollution.

The 1980s was also a time when garbage as a political issue was fully thrust into the limelight when the Mobro 4000 made headlines. This was the infamous barge that made a 6,000-mile/5-month odyssey from Long Island down the eastern seaboard as far as Belize, looking for a place to dump its rotting waste. The 1987 journey of this garbage barge was a watershed moment for discussions on waste and disposal, which while having consumed host communities over time, had not made the broader national debate.

As the Mobro scandal unfolded, local officials from Staten Island were doing their part to prevent disposal of the barge’s contents at Fresh Kills. Senator John Marchi registered his disapproval of the use of Staten Island in a letter to Mayor Edward I. Koch dated June 2, 1987. Fearing that once again Staten Island would be forced to accept rubbish refused at all levels of governance, locally, nationally and internationally, he wrote to remind Mayor Koch that the people of Staten Island had strongly supported him as a candidate:

It is bad enough that we now have the only operating landfill in New York City. It would add insult to injury if we were forced to accept garbage which is not the City’s responsibility and which originates form a

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87 “Witness tells court of midnight dumping of toxins at landfill” from The SI Advance printed on November 5, 1982, written by Raymond A. Wittek. Special thanks to Cara Dellate for locating additional material on this matter.

88 Accounts from the news at the time report the trip took five months while Benjamin Miller who compiled the full account behind the Mobro incident puts the trip at two months.
jurisdiction outside New York City. ... I am sure that you appreciate the sensitivities of Staten Islanders on this issue.

But despite the barge’s long journey, its contents would end up back in Long Island, following incineration in Brooklyn. The ashes were unceremoniously entombed in an Islip landfill (where the journey had originated) after sitting in the sun for several more weeks while politicians debated what to do with the waste.

This incident briefly highlighted not just shrinking landfills as an issue but the problems of massive waste production and related disposal problems. Discussions about the economics of recycling and incineration ensued and the need for better ways of addressing what came to be labeled a “waste crisis.” But while waste reduction was sometimes touched on, it did not become a focal point of waste management strategies (despite “Reduction” being one of “The Three R’s” in the DSNY’s campaign slogan for curtailing waste—or “Reduce, Reuse, Recycle”). Industry waste was also largely sidestepped as a sphere of regulation. In contrast, recycling boomed in popularity. Waste reduction efforts, including the composting of organics, continue to be paid less attention (MacBride 2012).

Despite the increased interest in recycling, only about 10% of the city’s waste was actually recycled in the 1980s. The markets for recycling as well as for the products manufactured from recovered resources were still small which meant multiple limits to recycling as a central strategy for curbing waste streams. And even by late 1980s predictions, 50% recycling rates (which have never been reached and the city currently only recycles about 25% of waste by some estimates) still meant that tonnage of garbage
remained in the millions. *The SI Advance* reported that recycling efforts were in danger of collapsing for lack of markets willing or able to use the material.\(^89\)

As the decade of the 1980s came to a close and the national conversation shifted away from waste once again, the interest in landfills took another turn. In 1989, Dr. William Rathje, an archaeologist based in Arizona who popularized the science of “garbalogy,” famously excavated the contents of Fresh Kills. His studies of landfilling have yielded information on taphonomy, decomposition rates (especially under anaerobic conditions), and insights into society’s desires about landfilling. Regarding the last point, Rathje has shown that the aims of experts differ from those of the public. While regular people want waste to decompose and shrink, landfill engineers want waste to remain intact to avoid leaching and contamination. Rathje’s conclusion was that making a landfill into what he called a “sealed sore on Mother Nature … seems un-American.”\(^90\)

In this same article, Rathje contrasts engineering ideals with those of the public who think detritus should biodegrade. His garbalogy projects demonstrate that one of the biggest myths about garbage is that it is biodegradable, which in the context of landfilling is not always possible under anaerobic conditions, despite claims by makers of “biodegradable” products. The notion that products break down in this sense amounts to a form of “greenwashing,” allowing consumers to lessen their feelings of guilt over throwing out disposable products (Leonard 2010; Owen 2011).

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*The Last Barge (1992-2001)*

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\(^89\) Recycling as a solution is challenged in the article “Plans for ashfill moving ahead” written by Don Gross from the December, 9 1990.

\(^90\) Quoted in an article by Marty Lip at *The SI Advance* in his article “A scientist looks inside our landfill” printed October 16, 1989.
Waste management and practices at Fresh Kills in particular had set off an ongoing struggle between Albany and New York City. The State of NY had cited the City for a number of violations. Among them:

- The daily release of two million gallons of “untreated and unpermitted leachate” into surface and ground waters.
- Litter blowing into waterways.
- Waste materials that were not properly covered.
- On 68 days, access to and use of the landfill that was not adequately controlled; on nine days, there was no guard at the dump’s gate.
- The absence of systems for monitoring or controlling the movement of landfill gas off the site.
- On 23 days, odors that were not controlled and became a “nuisance.”
- On 30 days, adequate equipment that was not available.
- Several failures to submit plans and obtain permits required by earlier consent orders.\(^92\)

Albany sought high fines from the city as a result of the litany of violations observed on numerous visits throughout the late 1980s. These fines totaled $76 million. Pressures kept mounting in the sphere of waste as the pace of landfill closings quickened nationally. NYC feared losing its only landfill as no alternative had materialized, especially considering the rise in successful environmental resistance movements and growing skepticism over incineration.

Incineration, once considered the “civilized” way of handling garbage in the 1940s through the 1970s, faced stiff opposition in the 1980s and onwards. Incineration proposals were at a further standstill as city government transitioned from Mayor Koch’s leadership to David Dinkins’ administration. While the Koch Administration had planned to build at least five burning incinerators throughout the city, Dinkins

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\(^{91}\) Leachate is one of the two by-products of landfilling, methane gas being the other. Leachate is the soupy, smelly liquid residue sometimes found at the bottom of garbage cans which in the case of landfills is produced in massive amounts requiring special filtration systems for preventing the contamination of local water tables.

\(^{92}\) This list was published in *The SI Advance* the article “State says Fresh Kills has to go: city facing fines, forced closing of dump” by Marty Lipp on November 9, 1989.
campaigned on delaying this program for a minimum of three years in order to conduct further studies on their safety and benefits. Dinkins also advocated further studies on recycling. Incineration had grown unpopular both because of communities’ fears of “toxic ash” and because there were concerns about their sitings which were expected to be placed “in places where the path of least political resistance leads.”

For his part, long-time Republican Senator John Marchi continued to apply pressure on the city and to explore secession procedures. Further motivated by the series of landfilling safety violations and the looming costs of clean-up, he was quoted in the local paper as saying: “Staten Island has borne this burden imposed by the city for many years and ought not to bear the added insult of having to finance the expense of making it safe when it is finally closed.” Marchi’s exploration of what the secession of the Borough of Richmond from NYC might entail is elaborated on in a letter from Marchi to one of his constituents, Mike Ciringeoni, where Marchi says, “I have studied and found it to be economically and legally possible.” He goes on further:

The reality is that there is no quick fix to many of the problems associated with the presence of Fresh Kills. I introduced legislation to speed planning for construction of a high-temperature trash incinerator on Staten Island, and I continue to push for faster city action on establishment of trash-burning facilities throughout the city.

Ciringeoni had written his Senator to put his problems with Fresh Kills succinctly: “it stinks.” In his letter he uses the metaphor of the smell hitting him like the bombs that had hit Pearl Harbor. This plainly written letter incited a surprisingly extended dialogue

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94 Quoted by Carl Campanile in his article from December 5, 1990, “Marchi resubmits measure to make city pay for Fresh Kills.”
95 From a set of letters dated from December, 1989, included in Marchi’s collection found at the CSI Archives.
between Marchi and Ciringeoni evidenced by references to telephone conversations in the preserved letters where Marchi details his secession efforts to his constituent.

The waste stream expanded by 80% in the 30 years between the 1950s and 1980s. Ideas about taxing manufacturers for excessive packaging though not often mentioned was one of the means of addressing the waste problem in the few multi-pronged approaches floated by the press. Offering incentives to manufacturers and consumers for wasting less was another related suggestion. And despite the rise of what turned out to be a strong anti-incineration lobby, this method was still considered a viable solution as part of an expanded recycling program in a multi-pronged approach for reducing waste. On the other hand, Edgar Berkey, president of the Center for Hazardous Materials Research at the University of Pittsburgh, points to the larger social problem:

> Those of us who have spent our lives developing solutions to the waste-management problems realize that in large part it is a cultural crisis. The pervasive throw-away psychology in our affluent, fast-paced society helped create this mess; a real solution will require attitude and lifestyle changes beginning at home. Cultural change is usually slow, but it can be speeded up by recognizing that we face a crisis.⁹⁶

Pursuing a suite of strategies together is the best way of addressing the waste problem.

But complex issues requiring varied approaches are not the stuff of policy which is easier to implement in simpler terms for ensuring efficiency. And so the waste stream continued to expand unabated, even as the closing of Fresh Kills became a reality.

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⁹⁶ Quoted in the SI Advance on February 17, 1990 from an article entitled “Landfill crisis can only be solved by a combination of strategies” penned by Edgar Berkey.
Figure 20: Celebrating 10 years post-closure at Freshkills Park, Staten Island. This anniversary barge symbolically brings trees for reforestation commemorating the last garbage shipment in 2001. Parks and Sanitation jointly share oversight responsibilities with DEC at Freshkills Park for a total of 30 years (photo by author).

Fresh Kills’ final closing was made possible by what project personnel today describe as the “aligning of political stars.” It took Republican Mayor Rudolph Giuliani, working with Republican Governor George Pataki, and Republican Staten Island elected officials, especially Guy V. Molinari, the borough president at the time, to get it done. Despite the magnitude of garbage produced—11,000 tons when the announcement of the landfill’s closing was made in 1997—and the cost of closing the site, $1 billion according to *The NY Times*, what had been nothing more than empty promises finally became reality. The city began paying for shipping and landfilling waste out of state, in addition to hauling it across the city in preparation for its long-distance journey. The closing would have a financial and human toll. Workers of the sort needed for absorbing garbage on the scale produced in NYC became redundant. Some were reassigned or retired, and

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97 Published on December 21, 1997 and written by Vivian S. Toy, the article “Sealing Mount Garbage; Closing Staten Island’s Fresh Kills Dump Is an Operation of Staggering Complexity” traces the details of the expected closure.
others were laid off and had to find other types of work. In February, 2000, as the city prepared for the actual closure in a little over a year, *The NY Times* reported on the mounting costs:

Just a year and a half ago, the Giuliani administration estimated that the city would spend $522 million over five years to close the landfill, including $180 million to export trash, according to the City Council's finance division. But now, that estimate has climbed to $622 million for the closing.

Despite the expenses and loss of jobs the closure meant, Fresh Kills received its last barge in March of 2001. Fresh Kills reopened in September of that same year to accept debris from Ground Zero following the terrorist attacks on the World Trade Center. Because of its role in the salvage operations after the attacks, when Fresh Kills came to serve as the site where human remains were collected for forensic identification, the future park and reserve will include a memorial paying tribute to those lost on that day. Opened as a temporary landfill for the duration of two to three years, Fresh Kills finally officially closed after more than a half century in use.

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98 One Fresh Kills tour guide told me that there were about 300-400 workers working at Fresh Kills at the peak point of operations. In contrast, there are currently about 30 people working on site today. Finding exact numbers of retirees, layoffs and workers who were reassigned in the archival record has not yielded those statistics.

99 Eric Lipton reported these varying figures on February 21, 2000 in his article “Efforts to Close Fresh Kills Are Taking Unforeseen Tolls” printed in *The NY Times*.

100 Because the events of 9/11 are still very emotionally charged and Staten Island suffered so many losses in the attack of that day in 2001, the subject of this memorial is one that would require its own separate discussion. I did not pursue this topic exclusively with most informants, so it is a subject awaiting further future research.
A New Start for an Old Dump

Viewed from the present day, landscape history is invariably tied to contemporary politics of compliance, often contrasting scientific and institutional goals with traditional societies’ practices and public awareness and participation.


How are conflicts over future land uses—especially those entailing cleaning up polluted sites—negotiated and by whom? Some Staten Islanders are unconvinced of the safety of the site and are skeptical that it can be developed into a reservoir of urban biodiversity as the designers and project staff plan. This chapter juxtaposes two interviews for exploring how constructing parkland on a repurposed industrial site of this scale reveals how different perspectives on land use decisions are complicated by various desires and expectations. And desires and expectations vary greatly, particularly in the case of blighted spaces where there is lingering mistrust. The first interview is with Carrie Grassi, formerly the Land Use and Outreach Manager of the project, who details the process of the conversion underway. The second interview is with “Dan,” a Staten Island naturalist engaged with conservation and reforestation around the borough.

In order to also provide a general background on the ecological work essential for constructing ecosystems, material collected from public outreach programs with the
consulting biologist on the project’s board, Dr. Stephen Handel, is also included here. Additionally, an introduction to the site provides a general snapshot of the plans for habitat construction. The first annual opening to the public in 2010, an event called “Fresh Kills Sneak Peak”—a play on words highlighting the peaks of the mounds—served to introduce visitors to the site and the conversion program. From these vantage points emerge contrasting visions for the site that ultimately reflect a shared aim: establishing a healthier and functioning ecosystem that will improve the life of city residents and urban wildlife alike while healing the social rifts between residents and city government as well as the ecological disturbances created by tons of trash.

The Opening

Freshkills Park is a 2,200-acre site and will serve as a living laboratory for many of the sustainability initiatives that the city is undertaking, including research on land restoration and renewable energy projects. The park will have five main areas: the Confluence, North Park, South Park, East Park and West Park. Each area will have a distinct character and programming approach, developed in response to site opportunities and constraints, public meeting and stakeholder input, agency input, operation and maintenance concerns, and feasibility of implementation. … Though the park’s development will continue in phases through 2036, development over the next 10 years will focus on creating early interventions and public access in the North and South Parks as the East and West Parks are still undergoing landfill capping procedures. Development will complement safe and effective landfill closure operations with state-of-the-art land reclamation techniques, alternative energy resources and ecological demonstration projects. The plan seeks to ensure that Freshkills Park will support richly diverse habitats for wildlife, birds and plant communities, as well as provide extraordinary natural settings for recreation—sports and programs that are unusual in the city, including horseback riding,

101 After a number of attempts to meet up with Dr. Handel for a formal interview over the course of almost a year, we were unable to schedule one. We met briefly on a couple of occasions at outreach programs and kept in touch via email but unfortunately could not meet in person for a longer conversation. Dr. Handel’s work in restoration projects on both U.S. coasts requires regular travel in addition to his teaching duties and speaking engagements.
mountain biking, nature trails and large-scale public art and cultural programming.

From the NYC Parks Department Newsletter, The Daily Plant Vol. XXVII No. 5721 (October) 2012

On a beautiful warm, sunny day in early October of 2010, visitors were able to explore Fresh Kills independently by foot for the first time for what would become an annual event called “Fresh Kills Sneak Peak.” At these events, park goers can walk around North Mound and access the waterways. North Mound is one of the four mounds at the site where various habitats will be constructed and paths and trails for walking and cycling form a key part of the design. Prior to the start of this annual event, access to the site was limited to specified stops for bird watching and then later for kayaking. Fresh Kills is otherwise fenced off from adjacent neighborhoods and access to it is restricted jointly to DEC and the Sanitation and Parks Departments. The tall fences are in places obscured by dense stands of the common reed (Phragmites australis). Walled off by plants and metal fences alike, “phrag” grows densely on the edges of roads and throughout the tall mounds sometimes obscuring this industrial wilderness with their incredible height and dense foliage, as the place awaits transformation. The presence of the wildly invasive Phragmites is pronounced at disturbed sites around the city generally and around Staten Island in particular. This weed is a usual inhabitant of sites commonly plagued by soil compaction. The phrag problem around Staten Island is significant and threatens the borders of otherwise healthy ecosystems. Like litter, phrag takes on a haunting presence in the borough, noticed by natives and outsiders alike.
Figure 21: Phragmites obstructing from view one of the landfill structures at Freshkills-Staten Island. In this photo, the plant grows through the concrete surface of a parking area (photo by author).

John Byron Kuhner, a teacher of Latin at the Staten Island Academy, has written a perceptive book entitled Staten Island—Or, Life in the Borough (2010). This book is a reflection on life in Staten Island from the vantage point of a resident from another borough but by someone with a special appreciation for the island and its rich landscapes. His careful look at the borough’s “personality” captures its spirit, which he characterizes as “bashful” (Kuhner 2010:2) in comparison to the other boroughs. This close look at Staten Island’s landscape and its people leads him to the subject of garbage and dumping at the heart of the island’s history as well as to the abounding Phragmites stands, a constant presence signaling disturbances in the landscape.

Garbage ends as it began in the store, overlaid with a veneer of prettiness. The phragmites, which are particularly fond of manmade wastelands, have made it their particular home. They sway beautifully in the wind, and I can recall that as a child I often thought of polluted places like Fresh Kills and the Meadowlands as pastoral and lovely, for their “amber waves of grain” (Kuhner 2010:50).

Indeed, the phrag and grasses sway in the gentle breezes and glitter in the sun, along the base of the mounds throughout the park in dense monocultures, removing visitors from
the more familiar surroundings of NYC. The views from the mounds offer a completely
different vantage point on the city and its ecosystems. It is not uncommon around Staten
Island for waste to be covered over by what on the surface projects a green veneer of
prettiness that nevertheless appears out of the ordinary.\(^{102}\)

On the day of the first annual Sneak Peak, Terry Doss, a restoration ecologist with
Biohabitats, Inc.,\(^{103}\) rounds up a group of visitors for a hike and introduces them to the
general plan for Freshkills Park on the hike uphill. Emphasizing the value of grasslands
no longer common in the NYC area, Doss explains how small brush will be cut down
from more wooded habitats to preserve and expand their range. While woodlands are
valued and encouraged, they will be managed so as not to compromise the geomembrane
that caps the garbage or overwhelm the grassland spaces essential for attracting certain
bird species and the insects they feed on. At the time of this writing, the rolling hills
made of trash beneath are abuzz with the musical sounds of crickets and other insects that
harmonize their melodies with the rustling of plants and grass in the ever-windier
hilltops.

Landscape architects and biologists are building different ecosystems including
tidal wetlands, fresh water wetlands, woodlands, as well as grasslands. Some of these
habitats are already found at Fresh Kills—such as the wetland marshes that escaped

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\(^{102}\) Mount Moses is a case in point. Generated by dredging activities and highway construction under
Robert Moses, this mound has become a permanent feature of the landscape on Staten Island, appearing as
a natural formation and offering attractive views of the Greenbelt. It is now one of the borough’s well
loved hiking trails offering splendid views of the Greenbelt.

\(^{103}\) Biohabitats, Inc., is an environmental company that offers consulting for planning, ecological
restorations, and design services. Their home page describes their work this way: “To thrive in a changing
world requires an artful blend of sound science, place-based design and ecological democracy. That’s why
we offer integrated services that regenerate whole, living systems, while providing solutions based on
diversity, resiliency, and hope for a prosperous future.” Their advertised mission is expressed as
“restor[ing] the earth and inspir[ing] ecological stewardship.” They are involved in various restoration
projects around the country.
filling operations. In these cases, what is required is not constructing habitats but encouraging what is already there. Stimulating the natural processes that have begun to develop since the landfill’s closing is a central aim of restoration. For example, while birds and other pollinators have already begun the process of spreading regional plants through natural seed dispersal methods, ecologists have been finding ways of enhancing these processes by planting more of the same native species and related plant communities rather than implementing a palette wholly invented by landscape designers. In this way, they are ensuring that the plants and animals that have already begun repopulating the site continue to do so. Some of the animals that have been returning include the great egret (*Ardea alba*), red-tailed hawks (*Buteo jamaicensis*), killdeers (*Charadrius vociferus*), muskrats (*Ondatra zibethicus*), ring-necked pheasants (*Phasianus colchicus*), white-tailed deer (*Odocoileus virginianus*), northern snapping turtles (*Chelydra serpentina*), American goldfinches (*Carduelis tristis*), and ospreys (*Pandion haliaetus*).

Doss explains some of the technical aspects of the work currently underway, like the capping process on the last of the four mounds adjacent to where the crowd stands.
Capping refers to the sealing of the last garbage mound with a tough plastic cover then topped with about three feet of soil and a minimum of six inches of topsoil (*Fresh Kills: Landfill to Landscape Design Competition 2001*). She also tells visitors about the problems with invasives like *Phragmites* growing resiliently in disturbed soils, posing a threat to restoration. Dealing with this invasive weed is no small task given the multiple adaptive features that make the common reed so pervasive. Its root systems form a tight weave that prevents other plants from growing and its stems and leaves contain a protective chemical composition making this plant unpalatable to many animals. Another advantage includes the reeds’ height which obscures sunlight for shorter plants. One method of addressing the phrag problem has been spraying herbicides but any use of chemicals presents environmental and health hazards. As an alternative, the city is experimenting using goats to graze on the phrag growing on the hills for controlling its spread. Cutting the plants down will eventually weaken their root systems and open up space for native plants otherwise disadvantaged by this hardy weed.

Besides problems with invasives, the site faces other setbacks as well. Obtaining the massive amounts of soil needed for capping and landscaping a 2,200 acre site presents an ongoing problem. One special challenge has been obtaining the type of earth typical of marshes needed by some of the plants that will be included in the marshy areas of the park. Dr. Handel, the consulting biologist on the Fresh Kills board, says quality soil is not necessarily required for ensuring the success of reforestation since some plants do quite well in sandy soils. John McLaughlin with the Environmental Protection Agency (EPA) in charge of two Brooklyn landfill cleanups, echoes Dr. Handel’s

104 The soil used in the capping process includes at least two different types. The topsoil must meet federal criteria for safety, and ideally will have enough nutrients to support plant life. The soil beneath that thin top layer is of lesser quality and does not need to meet health criteria.
assessment. Never the less, the more delicate plant species typical of marshes have more specific growing requirements. Sandy mixtures can help manage the phrag problem because poorer soils diminish the plant’s spread since sand is not as rich in nutrients as other soil types. Finding the kind of pH and clay types typical in marshy areas is difficult but necessary for ensuring the survival and proliferation of certain native plants unaccustomed to especially depleted soils and pollution. Some species of plants growing on the mounds are unaccustomed to harsh conditions like the added heat produced by the mounds generating methane, a side effect of anaerobic biodegradation.

While the site cannot be “restored” in the sense that it will be taken “back” to its “original state,” the project team thinks it has potential to recapture some of the diversity it had years ago. Working the land to maximize its use for recreational and cultural purposes as well as ecological ones is the primary goal. Therefore, enhancing ecological processes has meant constructing water catchments for purifying rain runoff and serving wildlife to mediate pollution problems. With budgets fluctuating from year to year, however, obtaining and spreading the right type of soils is made all the more difficult. The budgets guaranteed so far are earmarked for two playgrounds in different neighborhoods abutting the old landfill, Schmul Park and Owl Hollow, the first two areas to open on Freshkills’ periphery. After that, the future of the reclamation program for this site as a whole is less certain.

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105 Schmul Park, in the Travis neighborhood of Staten Island, opened in the autumn of 2012 and features an attractive colorful playground for young children, with restrooms designed with sustainable features like translucent walls that allow natural light in and are energy efficient. The site also includes porous ground covers, wetland plants and native grasses, handball courts, and a softball/baseball diamond. Owl Hollow was in the news in 2012 because of incidents of sinking grounds that had to be further filled, increasing the amount of money for construction and pushing back the opening date. It opened in the summer of 2013.
Sneak Peak 2010 was expected to draw anywhere from 500 to 700 people but actually attracted about 1,800 visitors; approximately two-thirds to three-quarters of the attendees were locals. Given the borough’s history of conflict with the rest of the City, it is no surprise that Staten Islanders are suspicious of large-scale municipal construction projects carried out by city government. After all, the landfill itself is considered an imposition and blight on a borough that has housed a number of undesirable industries. Landfilling has, however, represented the most severe environmental disruptions. This has set residents against city government and against residents from the other four boroughs. Including Staten Island residents in the process has been critical for the project team. But will construction of this park heal the social rift borough residents feel? This question is addressed by the findings analyzed in this chapter. The following section features my hour and a half long interview with Carrie Grassi.

Building a Park: Planning and the Work of Outreach

To learn more about the progress made on the park’s construction, I meet with the Land Use and Outreach Manager in October, 2010, for an overview of the plans beyond the winning design created by James Corner Field Operations. The staff works at making the design iconic through their use of images from the design plan when promoting the project. I walk into an empty office in one of the city buildings downtown near the Tweed Courthouse about lunchtime. Carrie Grassi stays around to wait for me.

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106 Attendance numbers were furnished by the project’s Land Use and Outreach Manager.
107 The information contained in this section is all data provided by Carrie Grassi, albeit without direct quotes.
108 James Corner Field Operations’ High Line Park has become a world attraction and an unofficial symbol of urban restoration projects using old industrial infrastructure supporting lively habitats for plants and animals (see Chapter 4 for further details on High Line Park and its design team).
She is sitting at a desk facing the open door to her office overlooking the radiantly white room I had just entered, in an old fashioned and solidly built set of offices with high ceilings and tall windows that let in natural sunshine even from what appears to be the back of the building. We greet each other, and she is as warm and cheerful as the previous times I have met her. We had met on several occasions after our first chance meeting on the Staten Island Ferry following an event at the Greenbelt Nature Center, part of a long period of outreach to borough residents explaining the plans for Fresh Kills. I am here to interview her about her work. Given the small six-person staff managing a project on the scale of Freshkills Park, the work yet to be completed seems overwhelming, but not so for Carrie.

As the Outreach and Land Use Manager, Carrie manages the technical side of the project and serves as liaison with the public. The technical work involves the many procedural tasks specific to building at Fresh Kills. This expansive site is still unmapped parkland, Carrie explains. All processes must follow the Uniformed Land Use Review Procedure (ULURP)\textsuperscript{109} when constructing new spaces. Mapping parkland and changing zones, for instance, require completing applications that must follow a rigorous public process. This includes Community Board Meetings, meetings with Borough Presidents, with the City Planning Commission, and any other public meetings required for the dissemination of information and for the building of consensus about project objectives.

All applications for land use must follow these procedures as well. Both City and private applicants must go through this public process instituted following Robert Moses’ tenure. Because development was conducted without public consent under Moses, this

\textsuperscript{109} ULURP refers to a standardized process for publicly reviewing applications for land uses that affect residents and their communities. It is the city’s public process for reviewing the environmental impacts of proposed projects.
procedure was introduced in order to prevent Moses’ way of thwarting public input. At the point of developing a new part of any project, especially those with a given use or geologic particularities, targeted outreach is undertaken with specific interest groups like bikers and running and track organizations, in other words, groups with a special stake in the planning process. Civic Associations are also contacted for special presentations if they are interested in participating in the project’s development.

Carrie Grassi’s job activities for involving the public entail regular outreach efforts for keeping city residents abreast of all new developments. It also includes working with researchers interested in conducting studies related to the site. Supporting research helps maintain the public’s enthusiasm for the project. It also allows researchers to amass data on different topics and best practices given the great potential for learning and experimentation presented by a place undergoing such a radical transformation. She highlights a diverse group of researchers and students involved in the conversion already, from forestry management to social scientists and biologists. The group of forest management researchers is exploring phytoremediation techniques to identify what plants are best equipped to clean up soils by absorbing toxins naturally. Biological studies focus on bird migration patterns, another on turtle populations on site. A number of these investigations are being conducted by researchers affiliated with the City University of New York (CUNY), but other institutions are also interested in working at the site. The Staten Island Zoo has proposed a study on the deer population given the rising numbers swimming across to Staten Island from New Jersey.

110 For more on the type of development typical under Moses see Ballon and Jackson 2008. Their edited collection is an attempt to redeem Moses’ legacy. For an account of the struggle against Moses that made Jane Jacobs famous and prevented the construction of the Lower Manhattan Expressway (LOMEX, also known as the Canal Street Expressway), see Flint 2011.
The project team welcomes research that engages the site as a new place apart from its past as a landfill. Helping advance knowledge about it will hopefully mean inspiring urban conservation. Carrie points out that one of the problems with parks in Staten Island is that they tend to be vandalized and sometimes used as recreational facilities of the illegal sort. She tells me that this problem has prompted Dr. Richard Flanagan, Professor of Political Science and Economics at the College of Staten Island, to launch a *Bowling Alone*-style study of Richmond County that looks at civic engagement vis-à-vis political networks, neighborhood associations, and related to this case, considers park uses. Dr. Flanagan’s work tackles the problem of Staten Islanders’ detachment from the political process. This problem is partly due to the factors outlined by Robert Putnam’s study (1995), or how disengagement from political processes may be understood at least in part by cross-generational shifts in attitudes towards civic engagement among citizens/residents and their political landscape.

In addition to the challenges of facilitating public involvement, Carrie explains that the Fresh Kills reclamation process faces significant budgetary barriers and problems. In terms of funding, the yearly pots of money allocated fluctuate. This can jeopardize steady progress from year to year. Annual budgets come from the Mayor’s Office.\footnote{With Mayor Bloomberg’s last term ending December, 2013, the future of the site faces added uncertainties. Depending on how much commitment to environmental issues and ecological innovations Mayor Bill de Blasio will have could mean slowed progress at Fresh Kills.} Freshkills Park has been organizing a tax exempt 501(c)(3) status to work around city agencies’ budget limitations. Many parks including Prospect Park, the Bronx River Alliance, and the Central Park Conservancy use this status for funding work that is
not possible on city allocations alone. This arrangement opens up other funding streams and the research community and advisory committees will be set in place under this structure.

Capital funding for operations also pays for the project’s public presence. Carrie says there are many people who want to volunteer to do something, but the site must be closely monitored and regulated so volunteers are not allowed inside yet. This reclamation’s online presence is crucial for what her boss, Eloise Hirsh, calls a “virtual park”—a park in the making. Current public outreach includes a lecture series, the Freshkills blog, and a Facebook page that keep people engaged with a place still mostly off limits to visitors. Because the site is closed, it is harder to harness the public’s enthusiasm for and engagement with the park’s construction, making its online presence critical to keeping the public engaged with the unfolding conversion.

Environmentally, a site of this size and type requires a great deal of engineering to create, maintain, and now transform. The Fresh Kills landfill was upgraded around 1991, significantly improving water quality in and around the site. This upgrade was conducted for improving the management of leachate capturing mechanisms, forming a part of the retrofitting the landfill underwent to comply with newer legislation intended to improve the management of landfills nationally. Leachate capture has meant that New Jersey is

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112 Conservancies have become the way for parks to survive the withdrawal of city funds. The “need” for these organizations is always hailed as a means of guaranteeing adequate upkeep of places that through added funding streams are privatized to varying degrees.

113 The idea of a “virtual park” points to the liminal stage of a place that is still undergoing transformation and is in flux, mostly inaccessible to the public but made more familiar through the circulation of its images online.

114 But while polluted conditions are improved by upgrades, sanitary landfills are not exactly what their name suggests. Stricter legislation enforcing compliance for making landfills more sanitary resulted in numerous closings nationwide, shrinking their numbers from almost 8,000 in 1988 to around 1,754 by 2006 (Thomson 2009:64). The Resource Conservation and Recovery Act (RCRA) was passed in October of 1976. However, it did not prevent illegal dumping or imply strict compliance with overall safety measures.
now the main source of pollution at the site. A cleaner waterway does not mean edible marine life, however, although none of the fish around the city is edible either, Carrie adds.

Our interview ends with her showing me where some of the water cleansing occurs on site on an enlarged image on an easel in the conference room where we are talking. The mounds feature prominently in the image. They are a feat of structural engineering. Constructing them in patterns that prevent runoff damage or water capture that compromises the contents below is only the beginning. Moreover, molding them and constructing additional features like stone borders and water catchments that channel rainfall away from them form part of the ongoing management strategies required to keep the site functional. Finally, landscaping elevated terrains set to shrink as they settle over the course of a decade after capping and maintaining plant life on hot and shifting mounds further complicates the process. Transforming a complex place like this one, and of this scale, requires multiple contributions from people in various arenas, as this chapter shows.

Preserving Urban Wilderness: A Staten Island Naturalist’s Work at Home

In order to get a sense of how a lay environmentalist understands this transformative project, I sought out one of the borough’s avid birders and naturalists. Raised on Staten Island, engaged with the forests and waterways thanks to his naturalist father, Dan grew up observing insects, amphibians, birds, and other wildlife. He

RCRA was amended and strengthened in November, 1984, to include the Federal Hazardous and Solid Waste Amendments making controls more stringent and having the concomitant effect of forcing the closing of many local landfills.

115 The settling effects and heat are byproducts of decomposition which in the case of landfills is only a partial one. Full biodegradation is not possible or desirable as it complicates long-term management.
continues to keep his finger on its pulse. He has been participating in the conversion project by attending meetings, tours, and other related events in order to stay abreast of the changes underway at Fresh Kills. He feels passionately about the site, albeit with a guarded optimism and hope that this unfortunate place designated for dumping can be transformed into a more productive ecosystem.

I meet with Dan early on a muggy September weekday morning in 2011, to interview him about his perceptions of the Fresh Kills project. I had reached out to him over email to arrange our meeting. As a lifelong naturalist inspired by the borough’s renowned amateur entomologist and naturalist William T. Davis, Dan spends much of his time meandering around the island checking on the health and environmental conditions for various animals, from insects to birds and amphibians. His friend Daniela, another native Staten Islander introduced earlier in this study, also joins us.

When I describe my project to Dan as a study of the restoration of Fresh Kills, he winces. He states that there is no “restoration” happening at Fresh Kills because there is nothing there to restore. The site used to be marshland and now has tall mounds. No marshes can be “recreated” there, he emphasized. The habitat constructed in the place of wetlands will never resemble the original marshes. Embarrassed at having phrased my work in those terms typically used by the program staff and fearing looking biased in favor of the City’s program, I try correcting myself. But Dan kindly replies to me that my perception is quite common, due in part to how project planners and city officials present Fresh Kills’ transformation to the public. Dan shares his concerns that these official representations are misleading, as they do not accurately describe the transformation currently underway.
His passion for ecology and his overwhelming interest in the conversion makes the interview flow from the start as he speaks with ease about nature on the island and Freshkills Park. Not yet familiar with the extent of the greenbelt system, the geological features and neighborhoods around the island, Dan and Daniela treat me to a crash course on geography of place. They suggest I consult three different maps, two from the 1960s and another from the 1930s. These older maps are not only instructive in understanding where the neighborhoods most affected by the landfill are situated but are especially helpful for getting a better sense of the value of the ongoing conservation efforts that have successfully preserved open spaces in the face of quickening development, particularly after the construction of the Verrazano-Narrows Bridge in 1964. The bridge’s construction marks a pivotal moment in the borough’s history as it quickly urbanized what had prior to the 1960s been mostly a rural hinterland to Manhattan and the rest of NYC.

Foremost on Dan’s mind is his concern for the way in which access to the site for researchers is closely guarded by the Department of Sanitation (DSNY), the Department of Environmental Conservation (DEC), and the Environmental Protection Agency (EPA), a perspective starkly contrasting with the one Carrie presents. Requiring mandatory signed waivers before granting access to the site to researchers suggests to Dan that these agencies are worried about lingering hazards for which they do not want to be held accountable. He thinks these offices are more concerned about what research findings could mean in terms of shifting attitudes among the public towards questioning the safety of the site before it opens.
Disturbed by what he calls “the hang-ups of research,” requiring that proposals be vetted by both DSNY and Parks delaying research by slowing access, Dan thinks that rather than having these agencies worry about having missed something environmentally hazardous that could be potentially dangerous, they should welcome any discoveries in order to protect the public. He points out that the bulk of the research done on site has been conducted by Stephen Handel who consults on the reclamation, which restricts the range of findings given the specific experiments being conducted by a single team. However, he mentions that Dr. Mark Hauber from Hunter College, who studies tree swallows, recently obtained approval to set up boxes for trapping/catching these birds to study this species’ population numbers. And though he did not know the specifics of this bird study he was glad to see that access to the site for biological research had begun.

Dan is uneasy with the DSNY’s justifications of “liability” that limit volunteers’ access to the site. According to Dan, the DSNY worries that volunteers will “break things,” as though there are things there to break.116 Another concern he highlights is that of the water quality on site. He recalls that during the 2002 design competition stage, a botanist on one of the competing teams was specifically told not to include any amenities focusing on the waterways because pollution levels prevent many water activities. I had just kayaked in Fresh Kills some months before and given what Carrie said about the quality of the water being cleaner than that coming in from New Jersey, I ask Dan about the risks associated with water pollution. He shares his memories of growing up seeing

116 The methane capturing units found throughout the site are potential examples of infrastructure the Sanitation Department worries about getting damaged. These units will disappear once the park opens and will be covered with manholes. For the time being, however, the units stand above ground while being regularly monitored for the remaining two decades the site is under conversion. Anthropologist-in-Residence, Robin Nagle has highlighted an additional concern, telling me in personal communication that “The DSNY is also worried that volunteers who visit the site will feel harmed (by a miasma, perhaps?), and sue the department and/or the city.”
people crabbing and fishing all over the island, especially in the southern shore. Residents continue doing that and he worries about the consumption of the animals caught given pollution levels in the surrounding waterways.

We talk about the types of toxins in the form of heavy metals that could be present at the site. Considering what John McLaughlin with the EPA has said about the differences between Superfund sites like the ones he manages, or the Pennsylvania Avenue and Fountain Avenue landfills in Brooklyn, versus a common landfill like Fresh Kills, the concerns are different. Superfund sites have special contamination problems that differ from those found at other cleanups. There are higher levels of hazardous pollutants in need of containment at National Priority sites, including radioactive metals. Lesser hazards are presented by places like Fresh Kills. Dan brings up the dump on Brookfield Avenue and Richmond Avenue just off Arthur Kill as a point for comparison. This is a site where illegal dumping took place throughout the 1970s and 1980s. Brookfield is currently in the process of getting cleaned and recapped with Superfund dollars. Dan adds that he was disappointed over the recent work performed there that interrupted a study on the scissortail flycatcher (*Tyrannus forficatus*).

The wildlife at Fresh Kills is not the only area of concern for Dan. He argues that a study of real estate values around the island is long overdue. Such a study can provide an insightful way of tracing the effects of harmful sitings impacting more than just real estate values, but pointing to other indicators pertaining to health and wellness. An analysis of housing values in neighborhoods like New Springville, Tottenville,

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117 Many Staten Islanders point to the higher rates of different cancer types around the island and suggest they cluster around sources of pollution. But incidents of cancer and other illnesses like asthma are difficult to tie directly to any single source in terms of certain causality. An epidemiological study in the style suggested by Dan could deepen current understandings of the impacts of development in Staten Island.
Greenridge, and Bulls Head in particular, enclosed within what he calls “the stink bubble,” can provide an alternative way of understanding the borough. Comparing market prices circa 1985 and onwards can illustrate if there are significant changes in development patterns from when the landfill was at peak smell, to once it closed and the noxious airs subsided. But this “stink bubble” is also the result of a proximity to “Chemical Alley,” a string of facilities that produce the smells wafting in from New Jersey. One of the chemical smells produced across the waterway is the scent used to flavor McDonald’s French fries manufactured on the Chemical coast. I mention to him that I have heard the Park Rangers leading guided tours attribute the smells perceptible on the mounds to New Jersey and he says this is no exaggeration.

When talking about restoration ecology and its potential for improving natural spaces, Dan is somewhat skeptical of the strategy behind efforts to build or rebuild ecosystems that have been damaged or destroyed. One of the faults of the restoration ecology approach, he says, is the assumption that we can create habitats: “Do we even know what soil compositions looked like before the area was built on?” he asks. He points out there are brownfields that appear to be nothing but muddy pits but soil
composition includes all kinds of fungal spores and microscopic bacteria that are at work transforming the soil. Rather than exploring the habitat at the micro-level, landscape designers go in and plant species that are not always adequate for the site and do not test the soil or seek to understand it. When plans turn out to be ineffective, developers give up and build on top of these older projects despite these sites being otherwise productive ecosystems with their own unique type of biodiversity.

Dan follows these contentions with another question: “Are seed sources going to work in each particular locale especially when they cannot be grown on site or nearby?” This question is especially relevant when thinking about the work of the nursery specializing in native plantings growing plants for Freshkills but where space constraints mean that seed germination and plant-growing must be outsourced elsewhere. Moreover, this can mean that plants are not necessarily adapted to the extra-local conditions of NYC, per se, and by extension to the peculiar conditions relevant to the landfill.

Another reason he offers for his healthy skepticism is a lack of attention to actual issues of biodiversity in citywide projects aimed at sustainability. He focuses his critique on the MillionTreesNYC program which he thinks will be looked back upon as the

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118 Acknowledgement of the complexity of soil biota as an invaluable area of biodiversity has more recently become a special area of research. The Global Soil Biodiversity Initiative is one group that has been highlighting the importance of soil ecology since its inception on September, 2011. McPhearson et al. also briefly discuss the complexity of urban soils in restoration contexts (2010).

119 While the native plants nursery must outsource some of its propagation operations, seeds are sent to a site in Princeton-NJ for planting and growing. Princeton is still within the natural range for the native plants grown. A geographic span of about a 75 mile radius is generally considered the natural range for plants. However, the conditions under which certain species are grown drastically differ from those found at a complicated site like Fresh Kills. Alternatively, this is not the same for other restoration projects where conditions are not so dissimilar and still fall within the natural range of the species planted.

120 The MillionTreesNYC program will be tied more directly to Freshkills via a specialized tree nursery housed on site. Because Freshkills is conceived as a lesson in restoration and conservation, it will showcase productive areas of various sorts, including a nursery for uncommon tree species not grown regularly by other production greenhouses in the region. “Production” in this case refers to the type of
biggest waste of money. “‘Biodiversity’: What does it mean?” he asks and goes on to answer. Dan explains that “biodiversity” can refer to genetic diversity, the presence of extremely diverse edge habitats depending on size, and so on. But when he sees MillionTreesNYC staff trudging through habitats, in some cases thinking these areas dead, and planting trees where they have difficulty growing, he wonders about the city’s practices. In order to illustrate his point, he says trees are being planted on the edges of parks where other trees already exist just so the target number can be met but where additional plantings are not needed. Dan’s thoughts on the MillionTreesNYC program echo the concerns over long-term maintenance sometimes voiced by NRG personnel who say they would like to spend more time following up on reforested sites. The focus on target numbers versus the stability of the projects could have a negative impact on the advances made so far.

He adds that the MillionTreesNYC project illustrates an expensive but unfeasible attempt at “green” that is more about Mayor Michael Bloomberg wanting to put his name on something more so than aiming this effort at really improving the city’s ecology. Dan is not alone in his views that the MillionTreesNYC wastes resources, and neglects the “habitat” principle used to determine where nature can thrive. He recalls a conversation with an ecologist who thought a better project would be the “Million Acorns Project.” Dan thinks that instead of spending $8 million on pit construction to plant young trees

121 Saplings planted in tree pits must contend with a number of complications. These include irregular irrigation, being planted in especially poor soils, enduring dehydrating conditions like rock salt spread in winter and dog urine and other waste, soil compaction from people and dogs walking in tree pits, and in some cases, even competing with other shrubby plants planted by well-intentioned people seeking to beautify tree pits. These conditions—on top of being planted in isolation from other plants—make survival especially difficult for saplings and young trees (younger than five years old).
with high mortality rates, the city should have more randomly dispersed acorns and observed what survived. After all, that is how nature works in terms of randomness and survival of species. He suspects Mayor Bloomberg thought it would be a good idea to populate our streets with trees and then realized that building pits where none existed before, purchasing trees, and caring for them to insure that they become established, is far too costly. This is why now the city is encouraging individuals to plant trees on their properties and street trees are cared for by volunteers. Dan thinks this is all not just too costly but also not very politically savvy or feasible. Funding such expensive programs at a time when cutbacks are the norm is politically risky.

Besides the inefficient tree planting program, he points out that getting rid of invasive species—like mugwort (*Artemisia vulgaris*), honeysuckle (*Caprifoliaceae* family), and bittersweet (*Solanum dulcamara*), invasives discussed in prior chapters—is not the most effective approach to landscape management either. There should be much more of a debate-and-question approach. After all, what is to say some invasives will not make for healthy ecosystems in the future? This drive to rebuild ecosystems to prior states seems misguided to him. And considering the mixed feelings biologists have about restoration ecology and invasives management, his point echoes the type of “reconciliation” question highlighted at the start of this study.

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122 Tree mortality rates for the city as a whole average 10% with the Bronx and Manhattan having the highest rates at over 15%. Many trees have died off in parks as well as in street pits. Figures are cited from *Building a Stewardship Corps* a grassroots progress report presented at the Brooklyn Borough Hall in February, 2011. Dr. Timon McPhearson, consulting biologist working with the city on improving the ecological outcomes of the proposed programs outlined in PlaNYC, says in his interview with me that trees competing with one another can mean a 50% loss of individuals. Street trees by definition are in places that are not conducive to retaining water which further stacks the odds against them. McPhearson posits that it might be more economical to simply replace dead trees than having trucks drive around watering new saplings and this might be why the contracted nurseries simply replace them. He suggests that more people need to think about providing tree care in their neighborhoods to improve the overall lives of trees.
One of the sites of special interest to him is Wolfe’s Pond, a place Dan often talks about. He is still studying the complexities of an ecosystem like the one found at this tidal wetland, as well as that found at Acme Pond where a storm surge caused the dyke in place there to break. He mentions this also happening back in 1926 when a Nor’easter blew out Wolfe’s pond, situated along the eastern coast of Staten Island on the south end. This happened again in 1992. Jetties are consistently proposed for preventing erosion, but they do not actually function that way. Jetties only hold sand in place and certain kinds of environments require that periodic flooding occur, as is the case with coastal areas like Wolfe’s Pond and the Great Kills area. He says he wishes that people who do not know enough about ecology or engineering would stop shouting out suggestions and making demands that make no sense at public meetings. Channeling the political satirist Stephen Colbert, he says this is where “Truthiness comes into play”: these types of public works are where simulated expertise presents a more appealing solution than more complicated realities.

Following up on his comments about restoration ecology, I ask him to share his thoughts on the value of the mosaic habitats planned for the site. He is very adamant about what he perceives as a futility of the design to implement a scheme that simply amounts to habitat fragmentation. This patchwork will not necessarily enhance “biodiversity,” “sustainability,” or any other buzzword used by city agencies and project planners. Fragmented habitats are not functioning ecosystems, he says. The site should be all grassland or something else. He is skeptical, even while optimistic. He thinks that the benefit of building a grassland habitat at the site is that this environment would be advantageous for migratory birds that are already found around the island. Such birds
include the American kestrel (*Falco sparverius*), the bobolink (*Dolichonyx oryzivorus*), and the eastern bluebird (*Sialia sialis*), all grassland birds.

Pointing to the disconnect between design plans and residents’ expectations, he brings up the wildflower fields proposed for an area in the park scheduled to include an amphitheatre for public performances. He says, “Once visitors go there to sit on the lawn for cultural events, there goes the wildflower meadow!” Moreover, wildflowers bloom at a particular time in the summer and while that will make for a beautiful sight at the peak of the blooming season, once that is over, all some people will see will be a field of weeds. Pretty soon Staten Islanders will want the place treated for bugs and weeds because they will think that this is a breeding ground for mosquitoes and other vectors, he says.

While City agencies reach out to the public to enhance the success of public works projects, the island has a wealth of experienced people like conservationists and naturalists who are not always consulted, in Dan’s experience. Unfortunately, this group of active and knowledgeable nature lovers has been shrinking. When I first meet up with Dan, he is reading about the rates of membership in nature groups. He tells me that in the 1920s there were 227 members in the Staten Island Birding Club out of a population of 30,000-50,000. While there are half a million people living there today, the membership of groups like Friends of Blue Heron Park and other naturalist organizations has not grown proportionally to the overall population growth on the island since the 1960s. He has witnessed this from his own involvement with different groups and casual observation: membership of Staten Island naturalist organizations is disproportionately low compared to its current population.
Dan explains what he sees are the reasons for the dwindling interest in the natural world, not just on Staten Island but everywhere. “Today’s society, with its instant gratification … it just prevents people from going out on nature walks,” he said. He agrees with Richard Louv (2005, 2011) who has coined the phrase “Nature-Deficit Disorder.” Dan understands the significant decrease in naturalists and conservationists in this context. Louv explores the connection between health problems like obesity (among others), a type of dissolution of social ties, and the lack of time spent outdoors, leading people to know very little about their world and its inhabitants of all sorts which contributes to the building over of spaces that have been preserved by earlier generations. There is a loss of a connection to nature, “a fundamental divorce from nature” that is troubling, Dan says. It is this type of disconnect that would lead people to see a wildflower meadow as a weedy stretch in need of spraying. In addition to failing to see the value of a wildflower meadow post-bloom, he thinks people’s fears of mosquitoes and in particular the spread of the Asian tiger mosquito are reasons people support spraying pesticides and herbicides.123

Another concern for Dan is the lessening of the special attachment to natural spaces that previous generations of Staten Islanders once had, a matter that frustrates him. Daniela, too, worries about this. She brings up her concern over a proposed Moses project successfully blocked by Staten Island conservationists. A proposed expressway set to run through the heart of the Greenbelt could soon become a reality now that

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123 The Asian tiger mosquito has proven difficult to eradicate after arriving in the northeast in 1985. These mosquitoes can breed in as little as a spoonful of water. Even while they cannot fly more than 50 meters their entire lives, they have nevertheless been difficult to exterminate and abound throughout Staten Island, especially in and near the Fresh Kills meadows. For additional details on the ecology and threat posed by these mosquitoes, see the government site: http://www.pendercountync.gov/Government/Departments/PublicWorks/MosquitoControl/AsianTigerMosquitoFacts.aspx.
residents clamor for congestion relief and are less attached to the undeveloped spaces around the island. This frustration with a diminished love for nature is an underlying theme during my interview with Dan.

“Sustainability” in the case of Freshkills Park is not something that comes together easily given the nature of the site. Beyond the green roofs, solar panels and compost toilets planned for the state of the art comfort stations at the foot of the mounds, it is not always clear how else it will be an example of sustainability. Wind farms and water catchments are two additional sustainable innovations. But despite these, Dan continues to tentatively see this project as a “sustainable” one. He is not sure what other “green” elements could be implemented at a park of this sort, a converted landfill. He gives the Fresh Kills team credit for all of the outreach efforts aimed at including residents’ input in park construction even while acknowledging that the hearings include a number of residents who are tired of having to attend so many meetings, also noting alternatively, that people are rarely satisfied.

He says that projects like the Fresh Kills park conversion are difficult because they must incorporate so many different perspectives. These varied vantage points include those of the ecologists involved in the habitat design and can indicate visions that are sometimes opposed to those held by ordinary people and visitors who will be the park users. The perspectives of urban planners, too, can conflict with the hopes and visions of the other groups. These different views require careful balancing which is difficult but will make for interesting outcomes. Steven Handel, the biologist consulting on the Fresh Kills conversion, echoes the importance of how multiple perspectives present a challenge

124 Because installing sewer pipes inside the mounds is unfeasible there will be no restrooms on the mounds themselves but only at their base.
as well as produce interesting outcomes. The competing desires and visions for newly
created places are challenging to reconcile in the context of conservation at large as well
as in the case of reclamations.

Dan and Daniela’s concerns with the limitations of discourses of sustainability
also extend to questions regarding the management of a landfill-turned-park. Dan shares
a conversation he had with a friend who works for the EPA who told him that this office
would have to be larger than it currently is in order to regulate such an immense site. The
Department of Environmental Conservation (DEC) is also involved in monitoring the site
but only for the first 30 years. Engineering oversight is not the only management they
are both worried about. At public meetings Dan has repeatedly heard people ask about
the policing aspect of monitoring Freshkills. Such a large site will be difficult to manage
on many levels as it all becomes accessible to the public. He says that people often voice
security concerns in terms of potential risks in addition to environmental threats. “The
bogeyman lives in parks,” is how he puts it, slightly in jest. Fears of risks, like a potential
increase in crime in open park space, tend to take a variety of forms despite crime rates
dropping in recent years. These fears form part of the basis of Dr. Flanagan’s research,
the political-scientist at CSI mentioned by Carrie Grassi, who is investigating vandalism
and illegal activities in parks common throughout Richmond. Managing healthy parks—
whether referring to their ecology otherwise—is a more complicated matter than typically
assumed.

*Building Habitats: A Biologist’s Work on “an Engineering Success, an Ecological
Disaster”*

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125 Data for this section was collected at three outreach events attended throughout 2011-2012.
Dr. Steven Handel is a restoration ecologist and professor of ecology and evolution at Rutgers University-New Jersey. He is the consulting biologist working on the Fresh Kills conversion project and leads other large-scale restoration projects including the Orange County Great Park in California, where an old military airport located between two preserves is being transformed into a connecting natural corridor set to enhance the health of the preserves as well as provide additional park space. He has also been working on the Meadowlands remediation in New Jersey, another converted landfill site.

Dr. Handel’s preliminary research on brownfield cleanups and his work on Fresh Kills illustrate the difficulties of restoration efforts complicated by a warming climate. Predictions of hotter, dryer climates guide his work. Without making estimates about potential changes, he sees the only pragmatic solution being to approach restoration as a mosaic environment built as “an accordion.” This analogy refers to the type of placement of habitats he pieces together in the landscapes he fashions with the expectation that they will have the best chance to thrive. He points out that “complexity at the micro-scale” is a very different—and radical—approach to landscaping. Operating at the micro-scale includes considering soil types utilized at restorations and ensuring that the ecology of the soil itself contains diversity of mycorrhizae, the various fungi in symbiotic relationships with the root systems of vascular plants. Dr. Handel says environments should be textured. “Make it rough,” is his advice because smooth landscapes are unrealistic. He calls smooth landscapes like rolling green spaces “fictitious restoration ecology.” Smooth landscape design is inconsistent with successful environments.
Landscapes have to be rough to be sustainable—as in *textured* like nature tends to be, full of plants of various sizes, with crevices and numerous micro-environments.

Dr. Handel warns of the problems he foresees with the restoration of Fresh Kills, noting several ecological constraints including problems like seed dispersal complications, degraded plant and animal communities and compromised soil quality and biota. These constraints make it difficult to build on natural processes in order to heal wounded landscapes. Other obstacles include the natural disturbances of successional processes, lurking invasive species, complications with the genotypes of planting material, and the levels of fragmentation found in cities especially. In addition to the problems that pertain to the landscape’s natural processes, the restoration effort also faces numerous regulatory limitations. These include factors like engineering goals that are incongruent with ecological goals, a poor rooting zone, a series of disturbance regimes, and the phasing of construction. These challenges point to the difficulties in reclamations that range from building and maintaining habitats as well as navigating city government in support of this type of public works projects.

Layered atop these environmental constraints are also social ones ranging from aesthetic questions and individual preferences amounting to “beauty being in the eye of the beholder,” by which Dr. Handel means that there does not seem to be general consensus on what kinds of amenities will work best for each site. He acknowledges that there are “different strokes for different folks” and that while there has been widespread support for the site’s closing, providing a coherent program for it has been a challenge given the community’s different needs and wants. But many residents have disengaged from this public works program and simply wish to be left alone following a long and
frustrating struggle to close the landfill. Yet despite the multiple constraints facing the project team, Dr. Handel is confident about Fresh Kills’ restoration and its potential to develop into a place of renewal and beauty.

In his outreach presentations to local and international audiences interested in urban restoration, he points out that the plants Henry Hudson encountered upon his arrival will not readily return. Among the reasons for this, Stephen Handel explains, are the difficulties brought on by long-established and cash-strapped bureaucracies that cannot be made to work towards ecologists’ goals. The fact that the landscape encountered by Henry Hudson cannot be restored has not completely deterred such efforts, as the Lenape Garden project in the Lower East Side demonstrates. Despite this, Dr. Handel is relieved that city officials are no longer ignoring global warming and are more actively planning for it. The growing funding for restoration projects with special attention paid to wetland and coastal buffers in response to harsher storms demonstrates a growing interest in addressing climate change.

Fresh Kills presents ecological opportunities. Dr. Handel maintains that “green fields” of all sorts add value to cities, making Staten Island an especially valuable resource for its diverse green spaces. But because green fields can also refer to soccer fields and not as much to wildlife habitat types, it is important to pay special attention to

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126 The Lenape Garden is a small public space in front of a local library in the Lower East Side that Amy Gevaris with the NY Restoration Project (NYRP) has created with Eric Sanderson, author of *Manahatta: A Natural History of New York City* (2009). Sanderson is also the leader of the project under a similar name, or themannahattaproject.org. He is a landscape ecologist for the Wildlife Conservation Society at the Bronx Zoo. There has been significant interest in the landscape found by Henry Hudson along the Hudson Valley Region upon his initial arrival on the *Half Moon*. Sanderson’s virtual recreation of that landscape is only one of the more popular manifestations of the attention researchers have been paying to the city’s ecology, present and past. The Lenape Garden was established on June 13, 2009 on a 55 X 60 foot plot. Consisting of Zone 7 plants including woodland plants like common persimmon and Solomon’s seal, to flowering meadow plants like butterfly milkweed and big blue stem, a berry patch with elderberries, different types of blueberries, wild strawberries and raspberries, and lastly, the three sisters (or corn, beans and squash plants). This garden serves to remind city residents of the diverse plant life common in the area prior to its extensive development.
restoration. The new field of ecological engineering thus offers green solutions. Fresh Kills represents an opportunity to restore what Dr. Handel describes as “the natural heritage of land” by reinstating ecological functions and reducing, though not necessarily eliminating, management needs and costs. This site signifies enhancements to the region’s biodiversity by bringing back extirpated ecosystems and diversifying the landscape. Moreover, it promotes opportunities for citizen scientists and stewards to participate in ecosystem management. Dr. Handel has conducted numerous research studies which find that without public support and citizen commitment and involvement in restoration, such projects tend to be short-lived with diminished success rates (Galbraith and Handel 2007; Parsons et al. 1998; Robinson et al. 1992). These opportunities can serve to inspire reengagement and build enthusiasm among an otherwise tentative Staten Island public.

Though Staten Island is technically the greenest borough in terms of total acreage of open land, wider public perception of it continues to be a challenge particularly given Richmond’s associations with landfilling. Fresh Kills is considered an amenity not just for Richmond residents but for all New Yorkers. Negative perceptions of the borough persist despite its last landfill closing 10 years ago and even with the plethora of parks found there. However, this association is undergoing transformation as the restoration project progresses. In fact, Dr. Handel believes Fresh Kills will benefit not just Richmond residents but all New Yorkers. Not all Islanders are as optimistic about the conversion as is the project team, however.

*Expert Opinion and the Public*
One of the more striking initial observations I made at the start of fieldwork was the low attendance numbers at informational meetings on the proposed conversion program for the Fresh Kills site. The project team began holding public outreach beyond Staten Island around 2010 and the better-attended events have been those held in Manhattan and Brooklyn. Some island residents would later tell me that outreach events were not always very well advertised around the borough so unless residents are looking for upcoming events, they often do not know when they are happening. Others attributed poor attendance to outreach “fatigue,” or exhaustion with the long public hearings process following the landfill’s closure. This exhaustion and impatience with repeated meetings was evident at the time when I began attending them, seven years after the closing of the old landfill and four years after the announcement of James Corner Field Operations’ winning design bid back in 2002.

At one of these meetings in the summer of 2009 at Wagner College on Staten Island, speakers responding to the latest Environmental Impact Statement expressed their fatigue and frustration with the plan, framed by an impatience for all the “studying” conducted on the many aspects about the site and the constant presentation of new draft proposals to the public. What Staten Islanders at a number of meetings consistently rallied for was something not emphasized in the plan for the site: the construction of additional roads to relieve the choking congestion drivers regularly rail about at public meetings. Getting around the borough using mass transportation is a constant challenge, as is accessing other parts of the city from Staten Island.127

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127 The problems of public transport and related class and race dimensions in Staten Island contrast with the rest of NYC’s access to mass transit. The irregular bus and rail system on the island is a great subject for a separate study. The poor and working classes living on the island must endure the longest commutes in the city just to get around Richmond County, not taking into account the lengthy commutes to Manhattan and
One speaker at the Wagner hearing argued that no one cared about the environment for 50 years while the “open dump” grew into the largest landfill in the world but now a “wetlands argument” is continuously used to halt progress on roads. This contrast between valuing natural landscapes over roads suggests a classed set of values that prioritize one type of space use over others. Stereotypes of Staten Islanders as “ungreen” or “anti-green” further complicate the interaction between residents and city officials, and even among residents themselves, as environmentally-minded individuals seek to direct discussions over those who are less committed to the environment. This generates antagonisms at meetings and results in making people who are calling for additional wilderness spaces appear as though they know better what other “natives” fail to understand. This is a familiar context reminiscent on the surface of colonialist arguments about ignorant natives not knowing how to manage the land, requiring settlers to make it productive, or more enlightened nature lovers and/or experts knowing better than others how to conduct more efficient urban planning.

The conflicting desires and visions for the future of the site and contradictory proposals have once again revealed an uneven power structure. This unequal power structure has traditionally meant that Manhattan is placed above the rest of the “outer” boroughs and in particular over Richmond dubbed by residents “the forgotten borough” precisely because of the uneven policies “dictated” from Manhattan, according to

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128 This notorious title is no longer held by Fresh Kills as it has been displaced by ever larger urban landfills in California and Nevada.

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borough President James Molinaro and his administration. President Molinaro regularly uses this type of rhetoric when speaking at public events, especially those associated with the future of Fresh Kills. This opinion is also shared by borough residents as well.

The ensuing cleanup effort has not been free of tensions given this history of conflicting plans for developing the most rural of all the boroughs of the City of New York. This chapter contrasts these two particular interviews in order to highlight a central theme that reemerges over the course of this ethnographic case study: establishing a more reconciliatory type of urban ecology must include multiple perspectives and be reinforced by active civic participation at varying stages of the process. Members of the project team and the public want to build a site that serves to improve the borough.

Given the borough’s long tradition of conservation, many residents value the additional open public green space. This is true of the project team as well. But what kinds of amenities are best for the site? This is still an open question and one contested by residents as different groups and individuals want different things.

In an interview with one of the individuals involved in judging the 2002 design contest, Ben, Director of the Native Species Nursery, discussed the issue of the disparate desires projected onto this site, saying of these different visions:

You have all these regulatory branches with a say in all of this. It’s not a simple step from point A to point B, I think, … from an insider’s perspective, whatever gets accomplished there is all the more amazing to me because it [Fresh Kills] is so complex with so many cross-purposes and so many concerns. Well, as much as anybody complains about those bureaucracies at any given time, including myself, at the root of it all are legitimate concerns about public health, public spending, public safety, and all of those things, so it’s an extremely [complicated process]—all those forces coming together, people will want, everybody it seems to me—and I’ve been to all of the public meetings over the last five years about the Master Plan and things like that and everybody wants a piece of Fresh Kill[s]. They want it to do that one thing they haven’t been able to
do on Staten Island like bus terminals, relieve traffic, Veterans’ Administration, Wars of the Veterans Cemetery. At almost every public event I’ve been to there’s been a contingent of Veterans there asking, because they’ve been lobbying for Veterans Cemetery on Staten Island I guess forever, which is perfectly fine, perfectly legitimate. My point is only that as I said, everybody you ask, their heartfelt intent is for something to happen on Staten Island is looking to Fresh Kills as a solution for everything and so for everyone of those interest groups, if you will, would have gotten their way, we’d have this hodge-podge of a hundred different things where everybody kinda got what they wanted but there would be no integrity to it [the plan for the site] and it would just be dividing up the pie, so just in the face of that trying to create a park, I think is really challenging and if given the chance to address those needs as they come up (October, 2010).

The vastness of the site adds to the complications of building and is also a factor that holds a great deal of promise, including for the purposes of training additional lay scientists and future generations of urban residents engaged with the outdoors. The potential for fostering citizen science and stewardship among the lay public is a topic discussed in further detail in the following section.

Cleanups are complicated by compound factors like varying perceptions of the viability of the multiple programs proposed, by the public’s concern over risks, and by the invisibility of maintenance work which can obscure the complexity of places, whether built or open ones. Furthermore, existing tensions between citizens, their elected representatives, bureaucratic offices and experts, further complicate the work of environmentalism, management, and governance. While risk can be defined statistically as “Risk = the probability of an event multiplied by some measure of its consequence” (Yohe and Leichenko 2010:31), the way the public understands it is not measurable in mathematic terms and tends to vary.

In Citizens, Experts and the Environment ([2000]2005), Frank Fischer outlines the stakes in debates over environmental protection, demonstrating why policy is riddled
with conflicts between scientific experts, politicians and citizens. Using philosophy and science studies, Fischer theorizes new techniques for bringing about real democracy in the realm of environmental policy. He looks to traditional approaches that have shown promise for engaging citizens in the democratic process. By turning to methods like participatory research, Fischer aims to demonstrate that citizen participation does not have to be at odds with expert knowledge. Citizen involvement with government officials need not be antagonistic. While government officials are ultimately in charge of tracking and measuring risks and developing appropriate responses to them in the way of policies, this does not mean there is no place for citizen involvement. But in the case of space use where park land is concerned, Peter Harnik, the conservation optimist introduced in Chapter 4, says:

If the prioritization is done incorrectly, a community can lose faith in the process. Done right, this is where the training of excellent planners, the listening and analytical skills of capable facilitators, and the leadership skills of effective politicians all come together in a harmonious whole. It won’t be perfect for anyone but good for everyone (Harnik 2010:54).

Getting all stakeholders to work harmoniously together is difficult, especially in the context of preexisting conflict and a lingering lack of trust as is the case in Staten Island. The way in which the different parties involved relate to one another can mean localized tensions that manifest themselves in varied ways. These tensions are diffused in different ways, including the passage of time which is assumed to minimize risks.

But when it comes to long-term risks, protecting citizens requires special oversight. Monitoring aging objects or hazardous facilities presenting potential threats is central to the work of protecting the citizenry. In a rare study on the management of long-term risks in the form of toxic hazards and aging infrastructure, Joseph Masco’s
ethnographic work on nuclear weapons testing sites in New Mexico (2006, 2008) maps the multifaceted experiences of risk in the case of the atomic bomb and its afterlife. In the instance of aging nuclear arms weapons and nuclear sites in the Post-Cold War era, his study explores conceptual categories intended to incorporate the lived experiences not just of scientists working at the Los Alamos lab where nuclear power was tested, but also those of the public. The public’s experiences are never the less central despite being kept out of the process of research and defense. The reason for this is that while not involved in guarded nuclear research, the public is nonetheless deeply enmeshed in what Masco calls a national project of the “unthinkable” (Masco 2006:4) within a security-obsessed nation.

How the bomb is experienced, even half a century after the height of the Manhattan Project, is contingent upon an altered sensory understanding, or what Masco calls a “technoaesthetic” (Masco 2006:76). This altered sensory experience of the bomb and the power of nuclear fission is in part the result of a psychic dissonance producing an occurrence of the “sublime,” in the Kantian sense. But some of the experiential phenomena that triggered experiences of the sublime—a mix of awe and terror produced, in this case, by an awesome explosion—later became concealed from scientists themselves as testing came to be performed underground. He says of this shift:

Experienced through prosthetic senses, the bomb produced by underground testing became a philosophical project increasingly linked not to mass destruction or war but to complexity, safety, and deterrence within the laboratory, allowing new generations of scientists increasingly to invest in nuclear weapons as a patriotic intellectual enterprise to produce machines that could only prevent conflict (Masco 2006:77).

The act of moving something underground not just produces invisibility through concealment, but also generates a sensory disconnect between the actions taken in the
name of experimentation and their repercussions. In Masco’s nuclear example, this masking of explosions through underground detonation in some ways operates against determent, as scientists become removed from the process of the harms produced by the bomb, shielded by computer simulations and statistical models. In the case of the entombment of waste, a similar rift is produced between the public, the polluted environment, and eventually also between waste experts and the detritus concealed from sight.

While landfilling is an altogether different activity from nuclear weapons testing, this aspect of matter being hidden underground and causing contamination indefinitely is true of both instances. In the case of landfilling, it is also true that there is a “strange duality” at work in the nuclear age where “contamination, and the possibility of mutation, can travel hand in hand with visible signs” (Masco 2006:33). Finally, as in the case of the technoaesthetics surrounding the bomb, the combination of this discourse produces a “community of experts” that evacuates to a certain degree the ever-present risk of contamination the public fears.

There is a duality to how the Fresh Kills site is experienced. In contrast to the high visibility of Fresh Kills as a massive human construction, it is maintained by an invisibility of landfilling technologies based on expertise. The necessary expert knowledge required for creating and maintaining landfills, combined with the closing off to the public of land and waste, the role of citizens in reclamation projects is marginalized. Fostering participatory mechanisms for responding to environmental disasters is difficult for these reasons.
As products of nature and culture, technoscientific objects have the capacity to escape control, despite the best of efforts to contain risk and suppress hazards. Research in Science and Technology Studies demonstrates that knowledge is always partial (Harding 1998, 1990; Haraway 2001). This, too, means that even the best-laid plans tend to mutate and defy contention and control, and they “traffic” or “leak” between presumed bounded subjects. The threat of dangerous mutations in the case of processes characterized by pollution pose a threat not just to the environment but to the systems of government regulating risk and working to prevent hazards. Mistrust and skepticism, though understandable, are consistent challenges.

Masco’s study of nuclear borderlands also shines some light on the case of new types of “wildlife preserves” constructed on compromised sites where nature has “returned” after a long period of closure to human habitation. His work reminds us that discourses of “preservation” cover up “longstanding practices of environmental ruin,” (Masco 2006:313) that tend to inform the past and present. The process of imagining and rebuilding this site are ongoing. Some of the work of encouraging and expanding greater biodiversity within city limits is hopeful. But the nature of the site contains risks. Acknowledging that and trying to understand the site as a complicated mixture of threat and potential is still unfolding and different ways of understanding new hybrid places like Fresh Kills entails a gamut of elements still under construction.
One of the findings of this study underscores the importance of public participation in public works projects in general, and more specific to this case, in urban ecological management. But how can ordinary residents help foster biodiversity in cities? Some of the experts I spoke with recommend some basic maintenance tips summarized in the section below. According to non-profit personnel like one of the arborists at TreesNY and scientists like the one consulting with the city on ecological details pertaining to PlaNYC featured in the upcoming chapter, basic tree care is one of the invaluable services residents can provide. My interviews with these two individuals provide directions for citizens to reconnect and establish more symbiotic relationships with the city’s trees. Trees provide a valuable range of ecosystem services people benefit from. Humans can in turn offer trees special care. In this way, humans can improve the survivability rate and the general quality of life of trees. This section ends with a discussion on the ways in which gardening enhances ecosystem services as well in all of its different styles.

Addressing complex problems like those produced by pollution require diverse approaches. And while scientific expertise is indispensable, other fields of knowledge can never the less contribute to solutions in important ways. Because encouraging public participation in ecosystem maintenance is vital, public outreach can take multiple forms. Enhancing public participation involves understanding the challenges and envisioning alternatives from multiple perspectives. Interdisciplinary approaches can span the spectrum of art and science and provide the basis for a fruitful discussion of urban sustainability.
8

Urban Canopy Care and the Trouble with Tree Pits

The pivotal role played by trees ensures that loss of canopy diversity and function is a loss both to forests and to the landscapes beyond.


*Maintaining a Healthy Urban Forest*

The maintenance work performed in the depths of parks is not the only type of regular care work required by the city’s flora. As I learned throughout field work, the trees New Yorkers walk past every day live especially stressful lives. The environmental conditions that make the city so hospitable to invasive species—factors like pollution, poor soils, cramped spaces, and lack of diversity of habitats—are also challenging to individual trees. In order to better understand the work of caring for New York City’s natural infrastructure, I sought out one of the head arborists with TreesNYC, a non-profit organization working closely with the city’s agencies involved in growing the urban canopy in conjunction with the MillionTreesNYC program.

I wander around a well-lit hallway in one of the historic Downtown buildings where city agencies are located. I am following conflicting directions from Sam Bishop II, Director of Education and the arborist I am here to meet, and those given to me by the guard downstairs where I cleared security. I knock on two doors, unsure I am knocking on the right office door. One door is labeled “Street Trees” and the other bears only a number. When Sam opens the door, I see that both doors open into the same large open
room connecting a series of offices and his desk is right in the middle of the large area where both doors open to and I am glad to find him. He has stacks of papers and books all around his desk and a plastic bag with beautiful flowers of a striking azure blue. I cannot help but praise his recent purchase and he tells me they are New York aster (*Symphyotrichum novi-belgii*). They remind me of gentleman’s buttons (*Centaurea cyanus*), both in the *Asteracea* family. We sit down to talk after he pulls me a chair from a nearby cluster of old-fashioned leather chairs by his desk.

We begin by talking about the Citizenship Pruner program, a program critical for helping maintain the city’s street trees by training city residents to conduct basic maintenance on their neighborhood tree stocks. Sam explains that PruneNYC enrollees must undergo a five-week course and take a citywide exam that certifies them for five years. Licenses must get renewed after five years at no extra cost and most participants stay on top of it so that they can continue tending to the street trees they adopt and care for. He emphasizes the value of this program, important not just for ensuring that basic care is provided but also for “spreading a love for trees,” in Sam’s words, and for promoting knowledge about them. Newly planted trees are especially in need of the most care so individual street tree maintenance is critical for addressing the needs of saplings that take a few years to become established.

The needs of young trees differ from those of mature ones. Young trees are especially prone to drought because their development is dependent upon sufficient irrigation. Stunted growth can result from drought, and a lack of water access causes stress that can make trees vulnerable to disease. Some species are more tolerant of drought than others but all trees require regular access to water to survive, especially
early on in their lives. Droughts can be the result of climate trends but also the outcome of people’s impact on the trees’ environment. Dogs urinating in tree pits are actually detrimental, contrary to New Yorkers’ sense that this practice is harmless or helpful. The salt in dog urine impacts the soil in a similar way as salt does for preventing ice formation in the winter. Soil composition is significantly altered by factors like these lessening water absorption. When there is no rain, trees cannot access the water table below the topsoil because of the changes induced by human elements. Timon McPhearson, the ecologist introduced below, also discusses these challenges at length at our meeting, when he characterizes the struggle to get residents to care more about their trees as an “… uphill battle educationally to get people to see the value of trees to themselves.” Indifference to trees is part of the challenge the city tries to overcome through education. Unresponsiveness to street plants is assumed to be exacerbated at least in part by the transient nature of city living which inhibits sustained connections between residents and their places of residence along with the organisms that inhabit them.

Sam tells me that maintenance of the type that citizen pruners learn in one field session and four classroom sessions regarding pruning and disease management are different from trimming low-lying branches and watering. Regular watering can be conducted by anyone. Trimming is useful for all trees but especially for young ones as a corrective measure influencing their growth. One city employee likens pruning young trees to the field of orthodontics. Braces set children’s teeth straight while they are still young, much as pruning can guide trees’ upright growth. And while the more complicated problems for all trees (old or young) are handled and managed by the City,
citizen pruners provide an invaluable service by watering. In terms of pruning, however, citizen pruners are discouraged from doing much more than basic maintenance with an emphasis on watering and improving tree pit conditions. Improving conditions includes incorporating decorative plantings in tree pits for preventing compaction by discouraging people and dogs from walking in them. Aerating the soil and adding compost and mulch when possible are other things volunteers are also encouraged to do.¹²⁹ One of the program’s rules is that pruners must remain on the ground at all times when trimming trees. The higher portions of the tree canopy are maintained by professional pruners paid by the city. While the more intricate work is contracted to vendors, Sam’s office expects stronger storms to increase care needs. Declining budgets will mean that more people are required to provide the necessary basic care for all trees.

![Figure 24: A typical unmanaged tree pit (left) and a well-maintained one with fenced flower bed and decorations (right).](image)

City agencies and private sector partners have complicated budget streams. Funding often consists of private and public sources that can further cause difficulties between city agencies and their private partners. Sam tells me that TreesNY works very

¹²⁹ The Parks Department tries to provide free wood chips for residents caring for trees but they cannot do so on a regular basis. The mulch they provide is the end product of the chipped Christmas trees collected during the annual event called Mulch Fest or from regular tree pruning in parks. For Mulch Fest, residents bring their Christmas trees for chipping in local parks one weekend in early January. Mulch and compost are provided as supplies last and with the end of the Department of Sanitation’s composting program for grass clippings and autumn leaves suspended, there is no longer a source for free compost for giveaways. As an alternative, citizen pruners can provide these materials at their own cost.
much like a standard non-profit style organization, relying on case-by-case funding from
the city for special projects with no overhead funding. This requires that this office rely
on donations and fundraising efforts from private foundations and donors for special
projects.

What factors guide species selection for TreesNY? Is there an ecological target in
mind? Or are the criteria based on a more practical logic? Sam explains how the city
stocks new trees. When it comes to tree selection for “full stocking,” the city’s approach
is “block planting.” These phrases refer to the strategy of surveying neighborhoods by
literally going up and down city blocks and designating locations for new tree pits and
deciding what tree species best fit each proposed space. Neighborhoods with few or
fewer trees are a priority, as emphasized in PlaNYC. These neighborhoods are usually in
the poorer areas of the city where asthma rates are especially high. Tree pits are installed
wherever more trees are needed, like along especially barren streets. Residents can also
call to request trees near their homes, or when trees die or are cut down because of storm
damage or disease. Foresters must also consider the physical site itself. Sam explains:

That decision [of where and what to plant] is made by the forester who’s
actually looking at the planting site itself. So things that they might be
looking at are “how wide is the sidewalk?” which creates the issue of
“how much space do I have between the tree and the building?” “Are
there overhead wires?” so I need to plant something small. Generally, the
preference is to push for larger trees where we can fit them in because the
larger the tree, the greater the environmental benefits. So obviously a
bigger tree is gonna cast a lot more shade, which is one of the major
environmental benefits. It’s got more leaf surface to trap pollutants, and it
has more, it has more just plain wood, and of course all the CO2 it just
pulls out of the air becomes the wood of the tree, basically (September,
2011).

I ask Sam whether TreesNY prefers native species of trees given the rising
emphasis native plantings are being given by city agencies. He is careful to identify his
office as separate from the Parks Department and other offices before responding. He stresses that though various agencies collaborate on projects, they are distinct and have separate functions. TreesNY, in this instance, works to meet PlaNYC goals in conjunction with the MillionTreesNYC project and the Parks Department, but they are still separate offices. Many city offices including the Parks Department are focusing more on natives, as are gardeners at community gardens and the NYC Restoration Project (NYRP) as well. The city at large is producing legislation that will protect and promote native plants.

But choosing among native species is not central for tree selection. The principle factor is instead what he sums up as “where and why.” Selected tree species must survive NYC street conditions.

And then one of the technical things that goes into it also is that the Parks Department plants trees at two and a half to three inch caliper … the trunk is two and a half to three inches across measured six inches above the soil. So they have to be able to find the trees that they want at that size, which can be hard to do because a nursery is gonna have to hang on to a tree for a long time to grow it to that size and they just don’t want to do that. They just want to get it out the door, get their money and move on. So it can be hard to find the rarer or the more exotic stuff in larger sizes simply because it’s a lot more time and investment for the nursery (September, 2011).

Moreover, there is also the matter of the trees that have been removed from the species list because of insect infestation, trees like the maple that have suffered from the Asian Longhorn Beetle (ALB) problem. 130

130 Arborists have been battling ALB (*Anoplophora glabripennis*) in NYC since the 1980s. This invasive pest arrived in packing material from China and has utterly decimated ash trees, poplars, elms, birches, willows, and horse-chestnuts in addition to maples. When signs of ALB are discovered, trees must be cut down and destroyed by chipping or burning in order to prevent the spread of this destructive insect. As of 2013, Manhattan and Staten Island have been removed from the list of quarantine zones, reducing the overall acreage of quarantined trees within NYC. The Bronx has not had any signs of this pest.
Moreover, there are also aesthetic reasons for the selection of given species. Some people do not like ginkgo trees (*Ginkgo biloba*) because they are skinny and have narrow canopies, contradicting common expectations of what trees should look like, or robust specimens with a broad canopy. Another problem with this species is that female ginkgo trees drop fruit that smells a bit like sharp cheddar cheese, a scent displeasing to some people. He says of the general consensus on Ginkgos: “[Residents] hate the female ginkgos!” (*emphasis in original*). Pine trees offer another example of an unlikely choice for street trees. While a number of pine species are native and are green all year round and can add color to the landscape during seasons when there is little of it available, they are not ideal street trees for practical reasons as they are broadest at their base and thinnest at the top causing them to interfere with sidewalk traffic and space. Though they are pretty, pines do not offer the desirable benefits other trees do, like shade and breeze.

Given his use of the example of the ginkgo, I ask Sam to tell me more about the misconceptions people have about trees as “liabilities,” a topic I have heard him address on numerous occasions when concerned residents raise the issue of the harms caused by trees during his lectures and workshops. He offers a lengthy explanation of infrastructural problems, like trees undermining the bases of homes, and the new products available for managing them. Better infrastructural management has improved conditions for trees and people’s attitudes towards them. Repairing old clay pipes using new technologies that cover holes without digging up entire piping systems is one of the examples Sam discusses at length. An improved technique like this means of plugging older pipes helps prevent the tree-as-liability attitude in the public and shifts the focus away from trees-as-menaces to trees-as-benefits. While he is sympathetic to people’s
fears of root systems growing towards structural foundations, he points out that what
draws trees in particular directions is water. If trees are growing towards homes, that
usually means leaky pipes. He says:

Yeah, no, the tree does not secretly have a deal with the Roto-Rooter man
to come make him redo your pipes every couple of years. It’s typically
more that there’s an infrastructure problem, and you know people when
they’re doing their piping, they may think about the stuff in the house but
they don’t think about, well, “where does the pipe from the house go to?”
especially in an older city like New York where you’ve got a lot of
construction that was done in the 1900s (September, 2011).

He has to convince people that trees are not a threat and that if anything the problems
they end up with are indications of larger problems with their homes. In this way he
disassociates trees from the negative perceptions he encounters among the public.

Thankfully, tree care has come a long way from a time when roots were cut when
they posed a problem. Trees are also better selected and maintained today. The
philosophy behind tree care and management has changed from cutting the roots as a
response to a variety of problems including heaved sidewalks. New products exist for
this purpose as well. Some, for instance, guide roots and encourage them to grow lower
and deeper in the soil to avoid sidewalk damage. Wider tree pits are also better
accommodating root systems today. Furthermore, using rubber mixes that act like
“pavement” allowing the surface of sidewalks to expand as the roots grow have made
significant differences to tree pit construction.

More often than not, Sam says trees are like lampposts to residents, rather than
living beings that need TLC, especially when young. What he means is that many people
do not often notice trees and tend to miss them when new ones are planted.

A lot of people don’t even really notice the trees or think of them as alive, they’re just kind of like, “It’s a tree. It’s there,” you know? You can’t
play fetch with it, so it’s there, it’s like the lamppost over there, that’s about it [said in a falsely indifferent and dismissive voice].

Worse, some people chain their bikes to trees wounding their bark and compromising the trees’ vascular system. Combating indifference is one of the reasons why tree care and the Citizen Pruner Program are so crucial.

Trees are also an important component in the city’s resiliency plan because they help relieve sewers during intense storms producing flooding effects. The more powerful storms expected to become the norm given fluctuations induced by global warming make trees valuable infrastructural amenities for the city. Damage following Hurricane Irene in 2011 which preceded Sandy, included noticeable injury to tree populations, highlighting the threats predicted in association with increasingly regular and more severe storms. Levels of damage differed across the five boroughs after Irene and the city relied on individuals’ reports. Trees in most immediate need of attention, like those on cars and homes, were the city’s priority. And though young trees have the most needs when it comes to overall “treeage” (tree triage), it is mature trees that tend to suffer the most harm when storms strike. Age directly correlates with size and size has everything to do with their tendency to collapse under their weight following a storm.

As we near the end of our meeting, his enthusiasm for plants becomes ever more evident as Sam tells me about his involvement with trees dating to his youth. Learning from his dad who started out as a Citizen Pruner in the early years of the program (it began in 1980), Sam moved back from Massachusetts to work for TreesNY instead of pursuing a career in law for what he earned his degree. He tells me he is very happy with this decision to work with TreesNY instead of pursuing a law career. Like numerous city employees and those in the non-profit sector I spoke with, his passion for plants and the
work done for the city’s benefit is palpable. Workers employed by the city or working in partnership with government often understand their labor as a service and as more than a job. For him as well as for others I spoke with, the plants they work with enrich their work.

Managing conditions for trees and maintaining them as living beings is only one piece of the complicated multilayered management work this study explores. The next section provides a more in depth account of what goes into fostering what biologists refer to as “ecosystem services” around the city.

*Ecosystems Services: Fixing Nature’s Value in Cities*

Wanting to understand the more scientific goals of PlaNYC, I contact one of the consulting biologist charged with directing the plan’s aims in more ecological ways. Dr. Timon McPhearson is Assistant Professor of Ecology at The New School’s Environmental Studies program. His research on urban ecology stems from his focus on damaged ecosystems and their interrupted functions, a topic he pursued as a graduate student. Referred to as community ecology, he studies the human relationship with landscapes. Because he recognizes the intimate role human beings play in the functions of all ecosystems, his activist and policy work center on urban socio-ecologies and how people can restore ecosystem functions and services. His work therefore assesses ecosystems at multiple levels, including the international scale.

On an unseasonably warm winter morning, I meet him at his office at one of the new buildings of the New School campus on Fifth Avenue in Manhattan. His office is small, warmly lit, and intimately set up displaying charming photographs of his new
family. He is soft-spoken and reserved. I wait a moment to let him finish an email he is
drafting as I arrive. He invites me in and I ask him to share more about his work with me
than what I am already familiar with from his public talks and published works. Dr.
McPhearson tells me he began focusing on ecosystems services 13 years ago. He began
his career studying rural landscapes as urban areas are not primarily associated with
ecological processes. Urban ecology is a much newer field and the potential for
economizing environmental benefits is only just beginning to be explored. He explains:

There’s been a push [since Millennium Ecosystem Assessment in 2000]
for trying to understand the value of ecosystems to people called
ecosystems services, the services the ecosystems provide, whether that’s
health benefits, storm water regulation, planet regulation, heat mitigation,
etc., all of these are things that ecosystems do essentially for free that
humans get the benefit of and the last 10 years has focused heavily on
rural landscapes and on economic valuation of those services—
monetizing, essentially—the value of, say, storm water regulation in New
York City. What hasn’t been done very much is a focus on urban areas.
That’s relatively newer and also non-economic value of ecosystems, so I
am working with a number of different people. I am trying to improve the
metrics and the valuation methods for how to do that, and New York City
is one of our case studies along with a bunch of other cities in Europe
(February, 2012).

Researchers have been recognizing the value of green infrastructure since around
the late 1990s when they began setting dollar amounts to different elements of the city’s
ecology to encourage conservation (Bolund and Hunhammar 1999). Following some
preliminary surveys about two years after the release of PlaNYC, the city has made
available the amount of $2 billion for enhancing green infrastructure. Water absorption
of the sort enhanced by street trees is an important priority because storm water is one of
the most significant challenges facing the city. The value of absorbing water
theoretically offsets maintenance costs for an aging sewer system, determining the dollar
value of trees in the standardized metric set for valorizing an ecosystem’s services.
Value and ecosystem services are gauged this way because this formulaic approach for arriving at a dollar value is relatively easy to figure out and apply. Measuring effects in numbers and attributing dollar values makes investments in infrastructure more concrete for policy-makers.

Measuring improvements in rural landscapes, already considered ecologically functioning have set the standards for urban ecology. In the urban case, the aim is to measure various elements. Trees are an especially useful example for explaining the process. They produce positive effects on urban real estate, like increasing property value. Moreover, they mitigate the heat island effect, purify the air, and absorb water. These functions can be made mathematically knowable since they are calculable. The metrics for this have already been worked out. Timon McPhearson lays this out in the following way:

So we can invest a small amount of money and get a very large reward, or the investment versus pay off is somewhere in the 1:3-1:4 kind of ratio in terms of dollars, so every dollar you put in you get four dollars back, and you’re helping mitigation, water absorption, and the health benefits [for people] haven’t even been calculated yet. That work is still ongoing but we expect the health benefits to far surpass every other measure (February, 2012).

Though urban ecology and its related ecosystems services have not been as well-studied, there is an abundance of data on urban forestry. Selecting tree species for enhancing the urban canopy is more straightforward as the eligible species come from a short list mainly including about one hundred trees. There is a longer list of varieties of trees that can go in parks, however. Deciding what particular type of tree is planted can involve community input. People tell the city what trees they would like to have planted based on tastes and the city tends to listen.
When trees are planted on park lands, they are selected differently and the decision does not incorporate community input but is made by the Parks Department. Rather than focusing on street trees as MillionTreesNYC originally envisioned, parks have become a target for reforestation. Offering general numbers from memory, Dr. McPhearson tells me that 400,000 trees have already been planted in parks; 200,000 in streets; others in places like private garden spaces and elsewhere (in 2012 numbers). 400,000 of these trees have been donated by the NY Restoration Project (NYRP), the city’s main partner in this effort. Other trees have been planted on Department of Environmental Conservation (DEC) land as well. DEC is very cooperative with city government and is very receptive to the MillionTreesNYC campaign.

Dr. McPhearson also underscores the importance of reforesting the city given the changes global climate fluctuations are making increasingly apparent like destructive storms and more regular flooding. He says that 40-80 years from now some species will not be able to handle a hotter, wetter NYC, so growing the number of native species is important. While allowing for non-native species that can thrive here is acceptable to some degree, his bias is on the side of natives and he explains why, saying:

Personally I’m a major proponent of native species as much as possible. There’s one general caveat which is that because the climate is changing, depending on the species you’re interested in … there are a lot of native species to choose from within that [the city’s range] and other locally adapted species whether they’re insects or birds, or invertebrates, any number of other kinds of animal and plant species, interactions between trees and shrubs and herbaceous plant species, that have coevolved in this area for a long period of time. From that perspective, it makes a lot of sense to use native species so that other species will recognize them, they have associations with them, so in terms of local biodiversity, nativeness matters. But, from say a street tree perspective, you might—given that that’s a very harsh environment to live in—one could argue, I think quite well, that there are some non-native species that might do really well in New York City and be able to live in places where almost nothing else can
live and that might be good for urban greening in general (February, 2012).

Encouraging diversity in plant species and emphasizing natives is premised on the idea that the stresses of climate change will impact ecosystems differently. Encouraging diversity as a response to predicted effects in conjunction with species that have established connections with other local organisms is a better alternative to landscapes dominated by exotic species that proliferate because they do not have predators to keep them in check and are thus advantaged over indigenous varieties. Invasive varieties having advantages over native species means further problems for natives, requiring additional work from residents to manage the spread of invasives.

But New Yorkers are not always sure what the best ways are for fostering biodiversity in the city. Dr. McPhearson praises Farmers Markets that are selling native plants, including garden varieties, because they are starting to make these beautiful species available to the wider public. Native plantings are better gardening options than ornamentals that tend to escape into parks when pollinators and the wind spread their seeds in city parks as the photographs below show.

![Figure 25: Monocultures of garden varieties of English ivy (left) and myrtle (right) in the Clove Lakes Park forest floor, Staten Island (photo by author).](image)

This has been happening over the past century. He suggests two ways for expanding the markets for native plantings: educating gardeners, and demanding that plants be labeled,
much like food should be labeled as either the product of genetically modified organisms or traditional seeds. By demanding things like labeling, he suggests another way that regular people can help preserve biodiversity at home. The main drawback for the proliferation of natives as he sees it, centers on the diminished availability of native plants and education about them. But he thinks that re-educating residents on their landscaping practices and making native varieties available will change the public’s mind about the plants they cultivate in their gardens. With a wider availability of native plantings, the transition to planting natives should not be too slow or difficult as people discover and come to appreciate the beauty of wild plant varieties.

But these are just basic alternatives for transforming the ways in which we shape the city’s landscape. To these more general courses for action he adds more proactive alternatives, underscoring the importance of “greening.” By this he means “guerrilla gardening,” taking over vacant lots and gravel pits and planting a few flowers and whatever other plants will fit in confined spaces which over time can turn into functioning ecosystems. No matter how small the plot or how simple the ecosystem, the benefits collectively amount to significant improvements. Ecosystem services can be improved in any area, including spaces made up primarily of gravel. Creating even small patches of plantings can increase the amount of green infrastructure around the city which to him is the first priority. The second priority is using native plantings.

Though battling invasives can seem like a “losing battle,” the efforts are gauged differently by people working on their management. “It can be done,” he responds, invasive species can be brought under control. He expands on this further, saying:

So, when you talk to people who really spend all their time studying invasive species, I think you find both sides of the argument, some that
say it’s a losing battle, why waste your time, just get used to them, and the other side, it says it’s not a losing battle, it’s that we’re not fighting hard enough, we can learn to manage with invasives and keep them—you’re not gonna get rid of them, but you can minimize their impacts, you can limit their spread, you can start creating better management means to control them so that in the places where they’re not dominant, you can decrease their dominance so that you can start allowing native species and a more diverse system to proliferate. I kind of go back and forth with that, to be totally honest. I mean, there’s places I’ve seen in the city where I just don’t see how you’re ever gonna win. But there’s also places where the invasives haven’t taken over yet and without management it looks like they definitely will, in five to 10 years. So, you can imagine putting up some kind of barrier or finding some way to plant ahead of them to create dense vegetation where it makes it harder for them to take over. That’s what Parks Department’s doing. I think they’re working really hard at it and I think they’re doing the best they can and it’s a very expensive operation. What seems to be likely is that without those efforts the invasive species are likely to take over all these green spaces, and then depending on your value system, they’re not all bad. They’re really good at storing carbon. We’re not really going to solve climate change by storing carbon in cities, it’s just a little bit, and it matters, but it is relatively minor. On the other hand, they’re really good at storing and absorbing water, but most plants are, so that’s kind of just a trade off. Invasive species are really dense and not very good for recreation so in terms of people being able to interact and walk through gritty trails and interact with diverse kinds of green nature, I think, it’s more limited with this densely packed non-native species (February, 2012).

Though controlling invasives is an expensive endeavor, he asserts that the city has the money for it. The budget is not necessarily a real constraint because there is about $1.6 billion available for this sort of work. He is sure more support will follow as data also starts to demonstrate the benefits of encouraging these systems. He expects this money to trickle down to ordinary homeowners as well as those who can make significant changes to the spaces they manage.

He goes on to note that the feel of spaces also matters. Landscapes in parks with dense vegetation are as important as recreational amenities. Preventing something like porcelain berry vines (*Ampelopsis brevipedunculata*) from killing trees and completely
transforming the landscape as has happened in areas he has seen around the city, is worth pursuing. Parasitic vines kill trees all the more easily when they absorb a great deal of water following rain storms, smothering and weighing tree canopies. When trees die, the landscape is changed as the canopy opens up flooding the forest floor with added light that provides advantages to sun-loving species over shade-loving ones. These instances of radical transformation caused by vines wiping off tree populations present glimpses of what the landscape could look like if invasives are not curtailed. Considering the millions of people living in NYC, if everyone could be put to work, residents could pull up all the invasives around the city, Dr. McPhearson posits. Everyone just needs to do her/his small part.

Figure 26: Trees choked by opportunistic vines near Wolfe’s Pond Park, Staten Island (photo by author).

**Discussion**

Michael M. J. Fischer's philosophical analyses of science studies (2005, 2009) and the philosophy of science and their relevance to anthropological thought provide a reminder of the importance of considering the social dimensions of science. Scientific knowledge and technological advances require ongoing negotiations between scientists,
experts of different stripes, and the lay public. Fischer explores how emerging theories and technological innovations in environmental studies, computer science, and bioengineering, are transforming human experience, particularly when it comes to concepts of nature, culture, personhood, and the body. Echoing Bruno Latour’s and Donna Haraway’s arguments that biology is still very much part of a civic exercise, Fischer adds the concept of “deep play” to expand upon this work. The concept of deep play refers to how scientific knowledge is disseminated through vast networks from media, personal connections, and in the case of restoration ecology for the purpose of urban cleanups, through public hearings and other forms of outreach. Fischer says of this process joining the sciences to civic processes:

Just as we have moved from Mertonian sociologies of science to analyses of what scientists actually do, so too we need to pay attention to civic epistemologies and cultures of politics as they are mediated by the paradox that the more networked, the more transparency, the more access, perhaps the less polis-like ability for localities to control local destiny (unless careful attention is paid to the infrastructural firewalls, speed bumps, accountability mechanisms, alternative valuations, sanctions, rewards, jouissance, intensities, sensibilities, and openness) and as they are transduced across the cultural switches of the heterogeneous communities within which the sciences are cultured and technologies are peopled with the face of the other (Fischer 2009:113).

“Nature,” in Fischer’s work serves as a category for moral testing involving persons situated in varying positions, including conflicting ones. In the sense that disturbed or polluted landscapes are instances of “biologies repaired,” in Fischer’s language, the positionality of diverse stakeholders complicates all aspects of the work of restoration and healing.

The potential for fostering “citizen scientists” in a new site undergoing vast change is one of the benefits of restoration ecology, a point underscored in Stephen
Handel’s work outlined in Chapter 7. Citizen science engages the public in collecting large data sets over long time spans (Bonney et al. 2009). Projects are designed by research scientists and are structured to also teach participants about the processes or organisms they are observing and amassing data on. Such is the case for projects like The Birdhouse Network, research set up and overseen by the Cornell Laboratory of Ornithology (Brossard et al. 2005). This study demonstrates the value of citizen contributions. Citizen science projects can be educationally valuable for participants, even while the hierarchical nature of these collaborations lend themselves to critique (Sharpe and Conrad 2006).

Citizen science has been an important part of Staten Island’s native conservation movement and is at the basis of the borough’s intellectual and preservation institutions, ranging from the local zoo to the botanical garden, to institutions like the consortium of cultural centers that form a central part of the borough’s identity. Public participation in scientific research has more generally also become more prominent for amassing data on the changes brought about by climate change. The U.S. Phenology Network, for example, is one organization compiling data on plants and animals across the country using willing participants who make observations and input them to a national database. And while organizations like the Bronx Botanic Garden are participating in this effort, individuals can contribute independently as well. These kinds of efforts are further immersing the lay public in scientific programs and are to some degree blurring the line between “expert” arguments and popular understandings of them. The importance of being an “incidental steward,” whether as citizen scientists or naturalists, is illustrated by Akiko Busch (2013) in her book of that title. A journalist and nature-lover, her forays
into the natural habitats of the upper Hudson Valley to locate invasive species, count herring, or listen to bat colonies in their nesting spots, demonstrate the importance of observation and documentation by citizen scientists. Building a data bank on the dramatic and less dramatic changes our neighboring landscapes are undergoing assists scientists in their assessments of changing patterns and (re)connects ordinary individuals with their local biospheres. This knowledge base can help local governments enhance their resiliency plans in response to climate change.

As this chapter points out, public involvement is a valuable asset in ecosystem maintenance. The emphasis on involving the public in a range of activities spanning the whole of public projects—whether as input into decision-making, data collection, and everyday maintenance work—is echoed by experts from biologists to city administrators. Public involvement enhances the likelihood of success for various projects and instills an environmental ethic that can be muted among urban populations who can become disconnected from natural areas given the patchiness of spaces for biodiversity. But fostering a new land ethic, in Aldo Leopold’s terms (1991), is indeed possible and desirable. The next chapter is dedicated to finding ways for fostering an environmental ethic of this sort in NYC.
Fostering Conservation in Cities

I’d always thought of the trees and grasses as antagonists—another zero-sum deal in which the gain of the one entails the loss of the other. To a point, this is true: more grass means less forest; more forest less grass. But either-or is a construction more deeply woven into our culture than into nature. Where even antagonists depend on one another and the liveliest places are the edges, the in-between or both-ands. So it is with the blade of grass and the adjacent forest as, indeed, with all the species sharing this most complicated farm. Relations are what matter most, and the health of the cultivated turns on the health of the wild.


*Anthropological Perspectives for Preserving Biodiversity*

Literature in the anthropology of conservation is diverse. Anthropologists working with rural and/or indigenous populations in the developing world are guided by the Convention on Biological Diversity that includes a range of environments as key protected areas. Marine and forested ecosystems, pastoral and range management as well as preserving the genetic diversity of resources, are all targets for conservation. Whether protecting single species, entire ecosystems, or habitats, research in conservation however diverse has not tended to focus on urban ecosystems. The unique habitats and genetic diversity of wild species of plants and animals inhabiting cities has yet to become a focus of research.

The general dearth of conservation work conducted in industrial cities is understandable given the ways in which urban landscapes are typically dominated by concrete and are densely populated with little room for plants and animals besides
humans. This type of landscape promotes the assumption that natural processes are either absent or too insignificant to represent a rich sphere of research, or an area vast and central enough to warrant focused conservation efforts. But considering the ongoing pace of extinctions especially common in cities, as Munshi-South points out in Chapter 3 of this study, particularly in the case of the disappearance of plants and their genetic diversity, conservation research in cities is essential. It can open up new avenues for thinking about the environment, preservation, and the value of biodiversity in other contexts beyond the rural. Urban conservation involves rethinking design plans and attention to biodiversity. Plant types, in one case, can inform understandings of ecosystem functions. Plant ecologists Pickett and Cadenasso, whose interdisciplinary work includes research and collaborations with landscape designers, remark on the value of enhancing plant ecology in urban landscapes by saying:

> Linking plant ecology with so many different perspectives, kinds of expertise, and motivations in the cycle of design is challenging. However, it is also an opportunity to use plant ecology to learn new things about urban ecosystem function, and about conservation and vegetation management in urban areas. If an ecological urban design cycle can contribute to improving the quality of life in cities, it may help prevent suburban sprawl, with its pressure on the natural habitats ecologists prize so dearly. Both urban and wild systems share concepts and theories and stand to benefit by engaging the urban design professions in an adaptive cycle (Pickett and Cadenasso 2007:11).

Broadening conservation efforts as cities are doing in response to the extinctions expected to increase given the effects of warming, is a reasonable response to climate fluctuations. But what form does conservation take in cities? Conservation efforts in the developing world offer instructive insights.

As already noted, growing conservation projects in industrializing countries have hinged on preserving habitat and genetic diversity among both domesticated and
undomesticated plants and animals. Whether preserving rare species in places like the Amazon, or working with subsistence farmers on domesticated plant and animal varieties, anthropologists work at various levels with local populations to promote environmental practices that conserve valuable natural resources. In their review of the anthropology of conservation, environmental anthropologists Benjamin Orlove and Stephen Brush sum up conservation practices operating on multiple levels. They outline those layers this way:

Conservation policy includes efforts on three levels. The first targets individual species, often by limiting or preventing hunting and harvesting. The second focuses on the protection of the habitat in which the populations of endangered species live. The third manages entire assemblies of ecosystems. For example, the first would protect spotted owls, the second would protect the forests in which spotted owls live (thus also protecting other species that inhabit these forests), and the third would manage the complex of forests, meadows, agricultural lands, and other zones. The first is oriented directly to the species; the second establishes protected areas as reserves; and the third enacts systems of reserves—managing or reducing gaps in sets of fragmented protected areas (132) or treating protected areas as cores surrounded by buffers and linked through corridors (68). In ecological terms, the first is associated with population ecology, the second with ecosystem ecology, and the third with landscape ecology (Orlove and Brush 1996:331).

Targeting specific species and reserves for conservation and preventing fragmentation are all goals that can be pursued in postindustrial settings in similar ways as they have been in tropical contexts. Besides target populations and their respective habitats, another element emphasized by studies of conservation projects is the value of involving local residents at all levels of conservation and fostering public participation over the long term. Doing so is essential to the success and stability of any ecological mission. Full length ethnographies of conservation projects in various parts of the world have also documented just how vital local participation is.
Christine Walley’s *Rough Waters: Nature and Development in an East African Marine Park* (2004) takes an ethnographic look at new conservation practices in a Tanzanian Marine Park. Her study is especially important because it presents a shift in ideological approach. Prior to this project, conservation programs did not typically include residents in the planning process. Aimed to address the interests of the local residents, the Marine Park built on Mafia Island was premised on a “participatory” model. But this concept and model meant different things to island residents and organization planners. Residents hoped that the park would change damaging practices like underwater dynamiting for increasing fish harvests, a tactic regularly used by industry fishermen. This strategy was decimating fish populations and causing environmental damage. Residents thought that construction of the park, given its ecological promise, would prevent this but the fishing industry proved too powerful an interest group. Moreover, residents also hoped the park would result in improving people’s standard of living by enabling local residents to enhance their incomes by benefiting from the influx of tourist dollars the project was expected to bring. But their hopes were dashed when the park did not yield the results they hoped for and their experience was instead one of disappointment, anger, fear and skepticism of proposed projects like it.

The park never attracted the type of tourism that was promised by planners and the economy as a whole did not benefit from the luxury hotels and newly built homes on the island. In the end, the marine park was another typical failed or failing development project that meant more limitations on island residents and increased poverty, restrictions, and difficulties instead. Walley’s study shows that while bureaucracies can
institutionalize rights, they can also exclude and dominate populations. Exclusion of residents meant that they had to rely on outside groups in order to engage in their struggle with bureaucracies responsible for the institutionalization of their rights in the first place (Walley 2004:216). Hers is an example of the problematic connection between technocratic practices that rely on or privilege specialized knowledge and the limits these place on participatory models. She says of this subject: “In general, the language of development found among international and national institutions tends to be abstracted from the social realities of particular locales and is often couched in technocentric terms that reduce complex socioeconomic and political issues to rationalized policy directives and generic solutions” (227). Relationships between experts and various publics can be strained and complicated. The program underway at Fresh Kills in the case of this study further illustrates this point.

Another ethnographic account of conservation stressing the value of the public’s participation is Paige West’s Conservation is Our Government Now: The Politics of Ecology in Papua New Guinea (2006). West’s historical account of the effects of conservation and development in Papua New Guinea demonstrates how the creation of place is the outcome of interactions between people’s memories and ideas of it. With the help of people’s imagination and the value they attribute to the significance of a place, a site can be transformed. Her study makes evident how nature is produced alongside space especially in the case of natural places built under capitalist principles for the purposes of encouraging consumption. West shows us how the experience of conservation in Papua New Guinea represents an example in support of Neil Smith’s
claim that the construction of wilderness is historically situated and constituted, always
guided by a clear social and political function (West 2006:30).

West’s analysis of the Crater Mountain Wildlife Management Area reveals the
effects of conservation of the type shaped by global impacts on local circumstances. This
global impact is based on the management practices of mostly industrialized nations’
involve[ment] in relation to non-governmental organizations (NGOs). The ways in which
the Gimi-speaking people interact with NGOs illustrates the disparate goals held by both
groups. Furthermore, by juxtaposing the work of Henri Lefebvre, David Harvey and Neil
Smith on space and geography alongside theories on the role of the imagination by
Vincent Crapanzano, Arjun Appadurai, and others, West theorizes the making of Crater
Mountain as a place framed by conservation projects. And while these projects are
guided by the Australian state and other players from the “global north,” they are never
the less shaped by the imagination and desires of the people who live there. She lays out
three primary examples for illustrating how conservation impacts cultural traditions. Her
two examples include birds of paradise, the harpy eagle, and bilum (bags traditionally woven
from plant materials). While the Gimi exhibit hospitality and generosity in their
interactions with global NGOs and state agencies, they receive mainly empty promises in
return. The conservation projects conducted in their home region have not translated into
improved living conditions, instead resulting in frustration. In this sense, this instance
presents a good parallel to Walley’s case study. The disappointment and skepticism over
the intentions of planners and state representatives is also a persistent problem for cases
involving landfill reclamations in less exotic settings like NYC.
And while urban conservation in postindustrial cities differs from developing contexts, these different cases share some commonalities, mainly the need to involve the public for ensuring success as well as engaging residents’ imagination for creating a “new” place out of an old blighted area. But engaging the public in urban cleanups is further limited by the risks associated with pollution, the inaccessibility of highly managed sites undergoing transformation, and the extent of disturbances that make the work of conservation laborious and complicated as well as risky in some cases. Complications result from the specific needs of a place requiring scientific knowledge for its management. The interface between experts and related publics can also be a source of tension in the case of reserves abroad, as Walley’s study shows, paralleling this study’s findings and demonstrating the same problem in the postindustrial urban context. As this study also illustrates, the inaccessibility of sites also requires new means of understanding and engaging with conservation projects. This last factor is one of the added layers of complications relevant to cleanup projects.

So how can engaging the public’s imagination assist in facilitating a transformation like converting a capped landfill into a park and nature reserve? Because envisioning a healthy future for blighted places require alternative ways of thinking about polluted places, this chapter highlights the perspectives of an artist whose work explores hybrid outdoor spaces. Competing ideas about urban reforestation produce conflicting understandings of landscapes. This is complicated further in the case of places haunted by pollution and long-term risk. How do people manage and shape their own landscapes? Through a growing network of community waste reduction activists I met Evie McKenna, a photographer and long-time resident of NYC, who explores this
question in her work. Her commitments to waste reduction intersect with and influence her professional and artistic interests. Natural urban landscapes, recycling, and compost’s potential for improving poor urban soils combine in her life and art.

The gardens featured in McKenna’s photographic studies range from neglected sites to places following alternative landscape designs. These hybrid places include recycled objects and mass produced adornments introduced into the landscape for enhancing the experience of urban nature. Unconventional visions of urban spaces can inform understandings of the expectations of nature city dwellers have. This is a theme of special relevance to projects like landfill reclamations and park reforestations that necessarily must incorporate multiple efforts simultaneously. Generating a language for articulating varying understandings of natural landscapes can provide a framework for discussing multiple expectations and desires. Her photographic studies of urban gardens can help provide a language and a conceptual apparatus for understanding the work of restoration and the visions still unresolved for the future of Freshkills Park. Her work is presented here as a start to such discussions about New Yorkers’ experiences of nature in their city.

Envisioning Interstitial Spaces: The Role of Art in Stimulating the Imagination for Conservation

“A piece of art is never a finished work. It answers a question which has been asked, and asks a new question.”

The work of maintenance often gets lost behind more conspicuous innovation projects and the lure of the new (in the case of infrastructural projects as well as in preferences for consuming new commodities). Anthropologist-in-Residence with the Department of Sanitation of New York (DSNY), Robin Nagle, has been calling attention to the stigmatized and mostly invisible work of *Picking Up* (2013), as her new book is titled. This ethnographic study of the sanitation department recounts her experience as a trash hauler. In that work, Dr. Nagle calls attention to the hazards and strains of the work of “SanMen,” or Sanitation workers, who are among the least respected and most undervalued of the uniformed city services. The invisibility of maintenance work on infrastructure of both kinds outlined at the start of this study, or that of urban systems like sanitation and natural organisms like plants, has not gone unnoticed by all residents.

Beyond Dr. Nagle’s attention to sanitation and the importance of urban maintenance, feminist theorists have shed light on how reproductive activities at the household level in support of families and homes have been obscured and downplayed because of power differentials between men and women and the devaluation of care work (Folbre 2001; Folbre and England 1999; England 2005; Benería 2008). I extend this argument regarding the invisibility of maintenance work to include the work of urban infrastructural maintenance as a sphere of upkeep often outshined by new real estate developments incorporating technological innovations. Infrastructural maintenance does not always spark the enthusiasm that new construction does, often taking the form of invisible labor that nevertheless ensures the city’s smooth functioning. Like much of the work in support of reproducing the family, the household, and the labor force, this form of urban maintenance labor can also mean unpaid work, as in the case of the city’s
reliance on volunteers. Volunteer work is at once essential in terms of fostering public participation but also problematic given the current trend of state retrenchment and emphasis on charity, philanthropy, and unpaid care work.

Besides feminist theorists engaged with this topic, artists are another group that has focused special attention on maintenance work. Artistic projects in the maintenance genre have sought to facilitate alternative visions for relating objects to the work of cleaning up as well as to reconnect people with rejected things and places. This section highlights two instances of the use of artistic projects. This is done in order to make sense of both maintenance work and alternative uses of constructed urban natural landscapes in a way that supports the type of visionary pursuits the Fresh Kills project team seeks to inspire through the use of the park’s design plan. The project team also bolsters this connection between design, artistic vision and landscaping through regular design competitions for features that may or may not be built on Freshkills Park. These designs include those of structures for harvesting renewable energy emphasizing urban sustainability and enhancing the aesthetics of place.

Maintenance is a theme explored artistically by the Artist-in-Residence with DSNY, Mierle Laderman Ukeles, a leading artist in service-oriented installations and performance art. She began to explore this theme in the 1970s, inspired by the constant work of cleaning up after her new family when she became a wife and mother. In focusing on service, Ukeles highlighted feminist themes regarding the invisibility of maintenance, sanitation and the hard work of keeping an entire city clean. Her commentary on these subjects also led her to showcase the stigma around waste and related maintenance work in the case of sanitation jobs. It was in this way that she
became involved with DSNY and became their Artist-in-Residence. Her participation with Sanitation inspired numerous other artists throughout the 1970s and onwards to consider maintenance and repurposing as special themes worth exploring. Art, in this case, exposes more than repairs work but engages the public in exploring the meaning of work in a new way. For Ukeles, the city and the type of maintenance labor she focuses on intimately binds the public and service providers together, raising moral obligations worth investigating further.

Ukeles suggests that artists have a privilege and an obligation to work in restrictive environments, within the environmental infrastructure of the urban. The shared “restrictiveness” of the urban, according to Ukeles, brings us all together: “Out of these most humble circumstances, we can begin to erect a democratic symbol of commonality” [quoting from Ukeles’ Sanitation Manifesto! 1969:625] (Feldman 2009:54).

Her examinations of sanitation and maintenance put everyone in contact with a taboo sphere of city life and work associated with dirt not normally explored through art. Her later projects led her to shine a spotlight on pollution more specifically, a topic explored in her work on Fresh Kills itself. Her maintenance pieces showcase a side of social life—and in the case of Fresh Kills, a place—most people would rather ignore. She is currently designing a permanent structure called the “Landing” that will be built in Freshkills Park.

The transformation of Fresh Kills from a wasteland to a living space echoes Ukeles’ approach to landscapes. Her work begins with the premise that though urban space is not typically explored ecologically, it should be conceived as such as well as socially. The project team follows this idea as well. Given the separation often assumed between “nature” and cities, conceptualizing urban landscapes ecologically entails some

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131 The intimacy of cleaning up after somebody or the general public is an under-theorized theme awaiting further exploration.
132 After researching her work at the Feldman Gallery archives in SoHo for several sessions, I was unable to schedule a meeting with Mierle Ukeles who ceased to respond to my requests for an interview.
rethinking. Understanding what has been a literal and figurative “wasteland” for the past 53 years has required more than the artistic representations of the James Corner Field Operations. Supported by visions like that of artists like Ukeles, and scholars like Robin Nagle whose academic work aims to reconnect residents with a site they have disassociated themselves from for generations, the project team labors to help local residents in particular reconnect with the site.

Throughout my years in the field, I met a few individuals who engage their environmental commitments in their work. Evie McKenna is one such example. A photographer who has long thought about the use of urban space, how nature features in city landscapes, and the type of maintenance work that goes into even the smallest patch of open space amidst extensively built environments, Evie recalls how as one of six children, her family wasted little. At a young age, she reused material for crafts. Her current work considers how green spaces around NYC (where her work is primarily based) reflect cultural and personal attitudes towards natural landscapes often involving the use of everyday banal objects that become transient features in the landscape. She explains the meaning of what she calls “vernacular gardening” this way:

I [have been] using the term “vernacular gardening” and I guess my definition of “vernacular” is when people have more time than money. It feels like a lot of the gardening that people do here [in the mixed income neighborhood where she lives and produces her work] has to do with using the constraints of the mostly small urban areas that have a lot of existing structures and they [gardeners/space users] have to kind of puzzle-solve in terms of the gardening that they do (January, 2013).

Her photographic projects of urban gardens grew out of her explorations of vernacular architecture more generally. Her studies now include a focus on urban spaces themselves and the ways in which they take on layered meanings through the use of
living organisms mixed with manufactured objects. Noteworthy for her are the ways in which spaces evolve whether due to natural processes (i.e., the spread of volunteer plant species that populate bare earth) or neglect. The people who tend small home gardens alternate between fostering natural processes and supplementing them with mass produced things like fabric and plastic flowers, plastic or metal insects, and other decorations intended to beautify sometimes otherwise barren places.

I like thinking “what was that person thinking that decided to do this?” [laughs a little as she ponders individual motivations then pointing to one of her photographs featuring a bright red bloom on a rose bush barely beginning to sprout leaves in the spring after dormancy] … or in this other one here, where they put the artificial rose in bloom that they attached to a real rose bush that was not yet in bloom and it’s just, … [shaking her head with a smile] when I saw that, I thought it was hilarious because it talked about a kind of impatience maybe, that people have because as we know as gardeners, things don’t always turn out perfectly or right, and sometimes I feel that people just augment their small gardens, let’s say, with things that are more consistent, and I think it makes them feel a little bit happier because they know that “I’m gonna see one bloom there all the time ‘cause I put it there” (emphasis in original transcript).

Her quote points to a sense of impatience in urban gardening. After all, small spaces regularly mean one or two plants that bloom at different times throughout the seasons, or at once, leaving gardens rather bereft of color the rest of the year. She posits that this could be what prompts people to add their own splashes of color to break up the less dynamic shades more commonly found in city-scapes, the grey of cement and gravel, or dulled colors of compacted soils. Whether color is natural or artificially added does not take away from the satisfaction of its presence in small outdoor spaces. Either in the case of lush gardens or neglected ones made up primarily of concrete and brick, what interests Evie are the ways in which individual efforts support aesthetic ideals about nature. She thinks of gardeners’ enhancements as reflections of people’s love for the
beauty of flowers, birds, insects, and other life forms and their desirability even in places of neglect.

“Vernacular gardening” then to some degree refers to gardens where the natural and artificial hybridize, where recycled materials are sometimes incorporated, and where the gardeners who tend to their open spaces sometimes have more money than time. But money only compensates for the time that gardeners lack for spending on landscaping or waiting for plants to emerge. Evie McKenna’s mention of money taking the place of time does not signify that people have enough money for landscaping their gardens professionally in order to reflect more conventional styles. She sees gardens as mirroring class: gardens reflect classed conceptualizations of nature and an idealized natural world. This classed way of fashioning and reshaping spaces contrasts with conventional gardening practices as well as with newer approaches involving the use of native plantings in home gardens. Evie recognizes the difficulties for incorporating native plantings in gardens considering the lack of availability of nurseries growing native
Contributing to the sometimes surrealistic effects evident in the gardens she photographs is a lack of familiarity with local gardening practices resulting in some of the spectacularly overly decorated garden spaces that catch her attention. Immigrant neighborhoods offer instances of this reworking of space as newer residents unfamiliar with local plant life introduce completely new elements to their yards, including domesticated edible plants like corn or exotic decorative species.

Figure 28: A conventional garden (left) and “vernacular” spaces (center and right) with close up of recycled material like mop handle and old pipes (far right).

Evie and I are meeting in her studio where her work covers the walls. She points to a picture she had mentioned at her Studio Open House the previous weekend and tells me more about it. This photograph, taken in Forest Hills, Queens, features tall and overgrown bushes made colorful by the plastic flowers weaved into their branches. She often wonders if this approach of mixing artificial forms with living ones is motivated by a sense of disappointment in what natural organisms actually yield, leading people to substitute the natural with the artificial. At other times she thinks there is perhaps a

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133 The lack of nurseries growing native plants is an issue for landscape designers, homeowners with private gardens and community gardeners. The general unavailability of native species further complicates promoting native plants around the city. Increasing accessibility to wild plants could reduce the ubiquity of invasives and the instances of escaped garden varieties ending up in forests. In a number of cases, incidents of exotics and invasives in wilderness areas are the result of gardeners introducing exotic plants that proliferate into the city’s parks. Besides one nursery specializing in native plants within NYC, there are only a few nurseries throughout Long Island offering some local varieties. But these are too far away for most city gardeners to visit and purchase from. People working with native plants sometimes take individual actions to promote indigenous plants by asking vendors at local farmers markets to grow plants from seed and sell maturing plants at those same markets. There has been no concentrated effort so far, especially in the form of policy, for addressing this gap in availability of native plantings.
general “inability to discern between the natural and the artificial” among gardeners who create these mixed spaces. She thinks they likely consider of the hybrid spaces they create as though they are “taking gardens to a higher level” and attempting to add “a wow factor” not found in nature. In this way, natural and unnatural come together in original ways.

Figure 29: Adding a “wow factor” to outdoor spaces (courtesy of Evie McKenna).

She notes that the choices of plants, too, can sometimes be complicated and people make “incongruous choices” that are at times aesthetically driven and other times the result of a lack of a gardening background nevertheless aimed at making spaces livable on a small budget. Evie tries “to understand the psychology of some of these situations” and the way in which they can represent “zero concern for scale.” Sometimes she finds gardens that express what she calls “truly a love for excess … to the point of irrelevance.” By this she means places where there are too many elements packed into one small space making gazing upon the landscape difficult to take in all in at once. Recognizing the beautiful things included in the space for themselves becomes a chore. It is then that the deliberate additions included in a place can lose their beauty.
How plants themselves are shaped also takes on unique forms, sometimes in response to space availability, other times to a given aesthetic. Evie brings up the forsythia bushes she observes around her neighborhood every spring. They are among the first plants to add a splash of color to the city’s more or less barren landscape as plants first emerge from dormancy. Their bright egg yolk-colored blooms announce the arrival of warmer, sunnier weather. These plants are meant to grow in all kinds of wild directions but people like to take hedge clippers and lop them into boxes, like so many “loaves of bread,” she says, cutting them into shapes they are not meant to grow in. And while this can signal that people are gardening in ways that they are not meant to, she sees this practice and others like it as following the old adage, “necessity is the mother of invention.” People want something to look at so they make their spaces work for them and she finds this kind of exuberance to vernacular gardening optimistic and hopeful. Though her audience sometimes finds her pictures depressing, she does not see her subjects that way and thinks of the places she photographs as beautiful and interesting. “You have to have a certain optimism about life,” she says of the people who transform their places in such a way, whether they integrate banal or repurposed items or not.

The ways in which some local gardeners blend nature with recyclable materials in beautiful and livable ways represents a hope for landscapes characterized by deteriorated conditions in the heart of the city. This will to transform depleted natural spaces reflects a general desire to enhance and incorporate natural patches into the quilt work of tall buildings and square patches of living organisms into a city with growing biodiversity. These activities support city government’s effort to reclaim brownfields by enhancing types of ecosystem services. More large-scale efforts to decontaminate the waterfront
and conserve or enhance natural habitats significantly diversify this effort. A concerted attempt to break up concrete surfaces to improve filtration for addressing storm overflow in the city’s old combined sewer system has also grown alongside the MillionTreesNYC program. This part of PlaNYC called Greenstreets has been the most expansive program of city beautification since the last century when NYC began to plant trees as a coordinated effort throughout the five boroughs. And while some homeowners still opt to fill their small gardens with concrete or cover them with gravel, some mixed-income neighborhoods demonstrate a rich blend of landscaping. These include vegetable gardens, more conventional gardens, and the type of outdoor spaces regularly photographed by Evie featuring hybrid landscapes incorporating discarded materials.

Her photographs reflect the ways in which decisions about a landscape’s look and feel are complicated by multiple desires, visions, and hopes, conflicting ends and budgetary constraints. The decisions still left to make at Fresh Kills have not made everyone happy and skepticism and hope are mixed among island residents. The aesthetically driven choices implemented (sometimes based less in habitat science and more on aesthetic conventions and familiarity) present additional questions about landscape management plans for a large-scale project like this one. But the type of landscape under construction in Fresh Kills presents a marked departure from conventional park planning in the Olmsted style, in the case of park construction typifying “classical” park spaces (read, “pastoral” ones) in NYC and elsewhere.

As Evie reflects on the changes underway in Staten Island while we talk about my research, she says, “I think you have to go anti-Olmsted … You have to find a new way of looking at things, some of them having to do with scale.” She then thinks for a
moment, wondering out loud what might work in a place like Fresh Kills and suggests that plans there could include a variety of amenities that can “give an experience without necessarily finding it in nature.” Native grasses, long and unkempt, while a good choice for the site would likely make people uncomfortable because people tend to be “more comforted by familiar stuff.” She notes that a feature like sprawling lawns, for example, is not hygienic or sustainable. Explaining what she means by “not hygienic,” she adds that lawns attract dog urine and are just too hard to maintain. She expects there will be resistance to atypical landscapes beyond rolling grassy hills. She thinks people will find wild native grasses to look “unkempt.” This observation echoes that made by Dan in Chapter 7 who fears potential calls for spraying wildflower meadows by people who might not see native plants as something other than weeds. Different aesthetics can make for conflict. “It takes a while to get used to it [native plantings more often perceived as weeds]. Even for someone who can think of different landscapes, it’s hard to give up on the idea of familiar grass. There’s something comforting about grass,” Evie says. There is always going to be much controversy and disagreement around how common space is used and how it can be shaped to reflect cultural preferences, or even political ideologies.

Chandra Mukerji’s (1997) pivotal study of the importance of gardens in relation to politics and socio-political rituals demonstrates how esthetics, politics, cultural trends, and power ultimately shape the land. Hers is a rare study in the history of landscape design. This study of garden construction under King Louis XIV demonstrates the profound connection between people and the built environment. In the historic period her study explores, the landscape came to reflect a blend of militaristic goals, scientific explorations, engineering techniques, nation-building, and even food production. All of
these aims operated in support of aesthetic values applied to the rationalization of the landscape. Thus an emerging nation came to mark its boundaries by directly etching them into the land through landscaping techniques and elaborate designs.

Gardens are sites where people reflect upon and experiment with relations between the built and unbuilt environment. They are places where managing the natural world is a matter of everyday concern, and where social relations to nature can be both forged and contemplated. Gardens use engineering and cultivation practices to make “nature” unnatural; and then they reconstitute a “second nature” honed to human purposes through their artifice. Gardens are complex laboratories, where new cultivation techniques are explored, new approaches to engineering entertained, new aesthetics mobilized, and new demonstrations/representations of power tendered; they are places where human will and the natural order are co-constructed. Gardens address, in other words, some fundamental ties between human action and the material, “natural” world, so they have surprisingly important tales to tell about human societies (Mukerji 1997:33-35).

The gardening practices shaping NYC’s landscape represent a range of concepts and practices, some more directly echoing the themes Mukerji’s study analyzes, such as the blending of artifice and “nature” as Evie’s work also demonstrates.

Artistic works regularly exhibited at Parks headquarters based at The Arsenal in Central Park further reflect the importance of how art can foster residents’ connection to parks and the city. This building includes a gallery space on the top floor where works dealing with the city’s open spaces, nature, and other related outdoor-themed works are on display in rotating exhibitions. Some of the projects showcased at this Parks gallery demonstrate the invaluable contributions art can make to conservation efforts. In one example, the opening of a show celebrating the work of a botanical illustrator was featured alongside a talk by Carol Woodin, a botanical illustrator herself and the editor of a collection of botanical illustrations (2009) documenting endangered plant species. Woodin’s collection of illustrations highlights endangered plant species and has traveled
to galleries in other countries for the purpose of raising awareness about endangered plants often unfamiliar to a broader public. While endangered animals receive most of the public’s attention, many plants face the same very real threat of extinction but the wider public remains relatively unaware of their plight.

Art at the Arsenal, along with the Parks and Fresh Kills lecture series, form a central component of the public outreach conducted in support of the conversion project. These means circulate aesthetically-oriented knowledge about the environment, the city’s parks system, and urban biodiversity. A concern for the environment and an investment in environmentalism can be bolstered by inspiring individuals to become more involved in bringing about positive changes through conservation. Artistic works engage the imagination and can successfully inspire further action. A divide between the “hard” and “soft” sciences is paralleled by that between the sciences and humanities. Despite a long tradition of conservation spurred by aesthetic works highlighting the complexities and beauty of the natural world, these spheres have grown increasingly apart when they could be employed together to cultivate a conservation ethic. Yosemite’s popularity, for example, was enhanced by the photographs of Ansel Adams. John James Audubon’s collection of paintings contributed to the preservation of native birds that were being killed to extinction when feathers for the millinery trade for women’s hats was fashionable. These examples and others like them reinforce the value of art and literature for conservation in combination with actions guided by scientific knowledge.

Conceiving a new land ethic, following Aldo Leopold’s vision, requires us all to employ a range of experiential knowledge. As one contributor says in a collection of
essays bringing together urbanists and environmentalists entitled *Still the Same Hawk: Reflections on Nature and New York*:… to really sponsor an increased land ethic in the city’s constituents, the paradigm shift must be multidimensional, on all fronts—not just facilitated by the written word, but also by visual, even aural forms (every movement must have its beat, as was often said about the effective progressive actions taken in the 1960s) (Zuber 2013:115-6).

Other contributors to another collection emphasizing the importance of bringing ecology and the environment in line with artistic programs called *Ecology and the Environment: Perspectives from the Humanities* (2009) also echoes this message. In this collection, researchers in the different sciences and scholars in the humanities argue for the important contributions the sciences and humanities can both make for promoting environmentalism among wider publics. One contributor reminds readers that:

... environmental policy isn’t just Gifford Pinchot telling people to do things; it’s listening to John Muir’s poetic musings about Yosemite, as well. … the humanities might rescue the policy and scientific communities from the ideology of “techno-scientific-salvationism,” the belief that science will solve the environmental crisis (Swearer 2009:9-10).

Highlighting the beauty and value of natural systems within urban centers requires both aesthetic and ecological knowledges. It requires the imagination as well which also tends to spur a more intimate connection with nature, of the sort typically relied upon when inciting political action for the purposes of conservation.

*Bipophilia*

The well-known biologist and myrmecologist (ant expert), Edward O. Wilson, underscores the value of the convergence of science and art for what these fields may disclose about humans and the world. His theoretical work in science and history seeks
to narrow the gap between studies of cultural objects and organisms from a biological perspective. Wilson’s term “biophilia” draws from his blending of different disciplines aimed at understanding what he sees as an instinctive bond between human beings and the rest of the world. Moreover, humans’ special attachment to plants and animals stems from a curiosity and a deep love of living organisms born out of our own evolutionary trajectory. He explains the term “biophilia” this way:

Although the rules of sexual choice, diet selection, and social behavior are to some extent shared with a few other species, the overall pattern is particular to *Homo sapiens*. Not only symbolization and language, but also most of the basic cognitive specializations are unique. Among them appears to be biophilia, which is richly structured and quite irrational, in conformity with a private genetic history played out in the warm climates of the Old World (Wilson 1984:114).

The importance of plants and animals for humans is unique and irreplaceable. The will to understand them and know them, is also an exceptional element of the human experience. Wilson emphasizes that conservation is rooted in a human affinity for living beings ingrained in human evolutionary history. He posits that inanimate objects will never replace our love for living things: “on Earth no less than in space, lawn grass, potted plants, caged parakeets, puppies, and rubber snakes are not enough” (Wilson 1984:118).

And while our love for things is a rather unique trait peculiar to humans, the conservation ethic can serve us well in this arena as well. Marxist sociologist and deep ecologist John Bellamy Foster (2001, 2009) is one theorist engaged with the problem of capitalist crises and environmental destruction. As a deep ecologist, Foster advocates the radical proposition that landscapes and organisms should be respected and preserved regardless of their utility to human beings. Based on this philosophy, his work further calls for a complete social transformation based on an alternative to the current economic
system in place which exploits the environment and loosens human ties to other individuals and to the world at large. He warns that no technological fix will resolve the economic and ecological crises we are in. His book *The Ecological Revolution: Making Peace with the Planet* (2009) takes up Raymond Williams’ (1973) idea of “resources for a journey of hope” for analyzing the trouble with the narrow treadmill of acquisition and exploitation developed nations are on and for finding alternatives. The treadmill of production and acquisition has aggravated conditions for the planet. Foster emphasizes that the current consumption levels typical in the developed world are unsustainable. He is worried that environmentalists are turning to accumulation as though this is a solution when in fact it is the cause of our current problems. Solutions to pollution, dumping, and extreme consumption will need to take an opposite form to the processes that have produced today’s environmental problems.

Today, making war on the planet is fought primarily by technological means, pointing toward exterminism. In contrast, the task of making peace with the planet is a question not mainly of technology, but of changing social relations, pointing towards sustainability and coevolution. … What distinguishes a genuine ecological revolution from a green industrial revolution is primarily social agency. Green industrial revolution is conceived, as we have seen, as a top-down attempt at technological shift, led by ecologically modernizing elites, but without a popular uprising that would challenge the economic, social, cultural, and environmental norms of capitalist society (Foster 2009:28).

Expanding the land ethic beyond all living beings, environmentalists from John Bellamy Foster to Bill McKibben ([1989]2006, 2008) and others, are promoting the conservation of resources as well. Applying a type of land ethic to inanimate objects the way Jane Bennett (2010) does in her political ecology of things can help make visible that inanimate objects are resources, too. Objects—whether made of synthetic materials

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134 This term refers to Allan Schnaiberg’s framework, popularized in the 1970s, for understanding production and the impacts of over-accumulation on the environment.
or not—are extensions of the living resources we regularly conserve and preserve. Reminding people of these deeper connections between humans, other living organisms, and also things, might make it easier to instill a deeper affinity with the animate and inanimate world. The type of conservation of objects advocated by Bennett can prevent the formation of landscapes like Fresh Kills and others spoiled by waste. This way of thinking expands narrower conceptions of conservation to include natural spaces, resources, and things alike. Wasting less is an integral part of an ecological worldview. Looking back on the effects consumption has on the environment and the problems inflicted on particular sites through wasting and dumping, a new commitment to an environmental ethic will take stock of place, consumption and the non-human natural world together.


**Salvaging**

**Conclusion**

True growth … is the ability of a society to transfer increasing amounts of energy and attention from the material side of life to the nonmaterial side and thereby to advance its culture, capacity for compassion, sense of community, and strength of democracy.


With national growth and progress currently measured by consumption, the expansion of landfills has continued unabated. But many concerned individuals are increasingly working to shift cultural focus from the material to the nonmaterial side of life, as the quote above suggests. The people working on waste reduction and ecological improvements featured in this study are evidence of this and represent a hope for a more ecologically vibrant city. They are working to both promote the conservation of objects and the preservation of open spaces so that the proliferation of landfills, like the one at Fresh Kills, can be limited in the future.

This conclusion first highlights landfilling as an ongoing, historical process in which I situate my ethnographic findings on how the instance of landmaking at Fresh Kills is the latest step in the ecological transformation of NYC. Next, I draw from chapters 1 through 4 and 9 in particular to suggest ways that anthropology can make a unique contribution to ecological studies on landmaking and how city residents perceive the types of highly engineered ecosystems providing the city with spaces of biodiversity. Finally, I highlight the implications of my ethnographic findings given the current challenges faced by municipal workers and volunteers in particular who work tirelessly to
preserve biodiversity in the city. The successes of their work, evident in the healthier ecosystems characterized by increasing complexity of flora and fauna over the years, are invaluable gains to the city as a whole. These environmental improvements have infrastructural benefits from the vantage point of ecosystem services, as Chapter 8 shows in the research so far conducted by Timon McPhearson. But despite the economic and ecological advantages provided by this conservation work, fiscal commitments have not grown accordingly and the Parks Department as a whole continues to seek private funding to continue their important work.

Limitations

The unplanned nature of the city’s development has created an array of situations that have required complicated cleanup measures that continue to present challenges to city government, as the introductory chapter outlines. Places like Pelham Bay in the Bronx and Great Kills Gateway Park on Staten Island are currently undergoing extensive cleanups requiring Superfund dollars. The Gowanus Canal and Newtown Creek, in Brooklyn and Queens respectively, are other well-known cases of extensive pollution and toxicity requiring comprehensive cleanup interventions. But besides dangerously polluted places, the city also contains a variety of sites ranging in rates of pollution and ecological disturbances.

Despite how commonplace cleanup projects have become in postindustrial cities, there is a scarcity of anthropological studies on the multifaceted landfill cleanups becoming more common in postindustrial cities. Environmental studies have instead focused on other health-related issues, including air pollution. Studies of green house
gases mostly involve analyses of the impact of automobile traffic on the greenhouse effect and public health. Studies of this type of air pollution outnumber those on other contributing sources and tend to neglect the fact that landfilling is one of the greater contributors of greenhouse gases to the atmosphere. Anthropological analyses of urban conservation are lagging behind those written by practitioners in other fields. The legacies of pollution confronting postindustrial cities today can further inform the future of conservation. Understanding the main challenges to urban conservation, including enhancing coastal resiliency, protecting urban watersheds, and managing invasives, will yield invaluable insights for American cities and others elsewhere. My study has explored some of the ways that NYC is currently engaged in conservation on all of these fronts.

PlaNYC has developed what had been isolated efforts into a more coherent environmental program that now includes invasives management as Chapters 1 and 2 show, as well as broadened waste reduction strategies. The wealth of biodiversity found in city parks is underscored in Chapter 3 and the value of parks as social and ecological spaces is historically recounted in Chapter 4. The richness of the landscapes in parks was also once found in rural Staten Island. This particular environmental history is recounted in Chapter 5. This history provides a stark contrast with Chapter 6. The ecologically diverse Island that existed prior to the siting of three landfills was transformed by pollution problems. Chapter 6 then summarizes the history of the siting of the Fresh Kills landfill in particular with the other landfills serving as backdrop. Chapter 7 follows these histories and introduces the site as it exists today, a site undergoing important changes. However, despite the improvements made so far, the findings laid out in this chapter
show how critical invasive management is even while stymied by landfill conditions complicating ecological restoration. Chapter 8 outlines the challenges facing cleanups and regular green maintenance given budgetary lapses and a reliance on volunteer work. Finally, Chapter 9 provides a means of thinking positively over the long-term by spotlighting the mixed conceptualizations people have about healthful environments in the case of private gardens and by extension parks.

The subject of conservation is once again becoming central as it was at the time of hastening development in the metropolitan region when protecting open spaces was a key aim. While this study has focused on invasives management, reclamation and reforestation especially in the case of a polluted site disrupted by dumping, there is still much left to explore at Fresh Kills and elsewhere. Ecological shifts continue to take place and longitudinal studies will be helpful for understanding how processes unfold in industrial brownfields and what these changes mean to the people who live close to them. Further, long term research will add to my ethnography’s findings by detailing the ways in which people at the forefront of restoration efforts are improving the ecosystems constructed and maintained so far. Time and additional studies will also show whether or not budgetary constraints will hamper the gains made or whether city leaders will commit growing amounts of money to these types of projects upon seeing the advances made so far.

Sustained ecological management is critical in cities. With pollution problems very common in waterways and soils, and with disturbed environments especially prone to the colonization and spread of invasive plant species, urban ecosystems are in urgent need of intervention and stricter management. As hurricanes Irene and Sandy in 2011
and 2012 demonstrate, NYC’s built infrastructure is especially vulnerable to the effects of climate change. The city’s green infrastructure can benefit from the ecosystem services provided by natural buffers along coastlines as well as through the fostering of diverse biological communities in parks. Ensuring these benefits are preserved and enhanced will mean improved resiliency in anticipation of more frequent and stronger storms brought on by changing patterns in global climate.

These themes and others remain under-explored in the urban ecology (Schilling and Logan 2008) and conservation literature in anthropology. Anthropologists can contribute to discussions on these subjects by furthering understanding on how residents’ expectations and desires help shape the course of public works projects. Another factor that can benefit from further anthropological analysis is the question of how lay people engage with scientific data in instances of sustained management. While biology and ecology lend special attention to non-human organisms, engaging with those subjects while spotlighting communities’ engagement with natural areas including urban contexts can help re-humanize the natural world beyond the human domain.

My ethnography of ecological maintenance at Fresh Kills and city parks is intended to call attention to the complicated and underfunded work of ecological restorations and urban cleanups. This focus is intended to underscore the invaluable work performed by committed environmentalists and idealists working for a healthier and more ecologically diverse city. This work deserves to be backed by city government in the form of adequate budgetary contributions in recognition of the efforts of municipal workers, volunteers, scientists, nature lovers, and others.
What’s next?

NYC has recently undergone a rise in wildlife populations. This study discusses the growing number of deer now inhabiting Staten Island parks. But deer are not the only animals currently inhabiting parks in large numbers. Canada geese populations have grown as well and become problematic in several city parks. The Central Park Conservancy regularly hires border collies to scare away the gaggles of geese that have made the park their regular home. And more than becoming pests in parks for their prolific “output,” Canada geese present a special menace to aircraft that can be brought down by birds. The engines of planes absorb these large birds posing threats to passengers and damages to aircraft, resulting in incidents like the one dubbed the “Miracle on the Hudson” on January 15, 2009. Wild turkeys have also become a similar problem, albeit for cars, on Staten Island. With growing populations in residential neighborhoods on South Beach, wild turkeys have become a threat to drivers much as deer have. While introducing previously extinguished species to their past ranges has been an appealing idea, animals lacking natural predators soon come to present problems requiring special management. Restocking animals has meant that populations have exploded and they now pose various hazards including automobile collisions proving fatal for animals and sometimes for humans, too. Moreover, threats to infrastructure and human and pet safety are two of the main complaints.

This unexpected and exciting development of animal sightings and growing wildlife numbers is currently unfolding beyond NYC as well. It is especially worth noting given it is an unexpected reversal of older patterns of mass extinction also taking place in cities and suburbs throughout the U.S. Plants and animals presumed
extinguished or existing on the margins in small numbers have started to reappear and in some cases are undergoing population explosions (Sterba 2012). As urban population density has fluctuated, particularly following deindustrialization, cities have begun large-scale cleanup efforts in surrounding waterways and disturbed un-built environments. Broader policy measures are being designed for enhancing the diversity of biota within city limits. This has meant that for the first time in centuries, some cities and their hinterlands are more forested than they have been since the earliest periods of settlement. This is especially true of cities and suburbs in the northeast coast of the U.S., as Jim Sterba explains in *Nature Wars: the Incredible Story of How Wildlife Comebacks Turned Backyards into Battlegrounds* (2012).

In this book, Sterba documents this unexpected reversal in animal populations, asserting that despite perceptions to the contrary, Americans today are more truly “forest people” than they have been since the 18th century when early settlers began cutting down forests on a massive scale. He argues that ecosystem damage has historically been overlooked in favor of our excess, inspiring the backlash that became the conservation movement.

> Our battles over critters and trees are mainly about how to deal with excess, and while they are being fought we tolerate enormous cost and waste—because we can afford to (Sterba 2012:272).

Waste and excess once again emerge as lessons for wildlife management. Exploitation of natural resources caused a conservation response that has led to the many positive changes Americans today are unable to see because we are all so accustomed to associating our behaviors primarily with destruction. For this reason, Sterba says
Americans have not yet realized that they are living in a largely greener world than their predecessors did.

Sterba further points to the unbroken band of northeast forest now prominent on satellite images, reinforced by tree censuses documenting this expansion: plants and animals are making a comeback. Growing forests have meant wildlife comebacks that are increasingly transforming suburban and urban residents into “species partisans,” or supporters of certain wildlife over others in ways that are tearing communities apart. Sterba’s book outlines some prominent and problematic comebacks, like those of the white-tailed deer, Canada geese (Branta canadensis), bears (Ursus americanus), wild turkeys (Meleagris gallopavo), and beavers (Castor canadensis), some of which have provoked new conflicts between humans and animals.

Additionally, he points out that conflicts between wild animals and people are complicated by behaviors encouraged by major industries like seed companies marketing food for wild birds that then become a “gateway” species to other “outdoor pets” (as the animal food industry refers to wild animals from birds to feral cats). These behaviors, while conducive to conservation because they encourage a human tie with undomesticated animals, are also leading to menacing situations that work against peaceful coexistence between people and wildlife. Raccoons (Procyon lotor) and bears benefitting from human food and habitats are diminishing their guard against people. This is generating conflicts centered on fear triggering subsequent community conflict as animal advocates are pitted against individuals primarily motivated by concerns over safety.
Despite these conflicts, the return of populations of plants, birds, and fish species in NYC are nevertheless a welcome sign suggesting environmental conditions are improving for people and other organisms alike. And alongside the return of animals previously extinct in the city, discoveries of richer genetic diversity than expected among animal populations in parks by researchers like Jason Munshi-South further fosters optimism that urban ecosystems can be centers of biodiversity despite problems of fragmentation and other common challenges typical in cities. But Munshi-South’s findings also give us reasons to be wary and mindful of the special needs of the rarer animals living in the midst of cities since extinction and loss of genetic diversity are a common fate for many organisms inhabiting intensely fragmented habitats.

The Hudson River makes for another instructive example of the possibilities for cleaning up environments previously thought too polluted. The East River is now also showing signs of improved health. In late August, 2012, I went fishing in the East River with one of the participants in this study. “Darryl,” a waste reduction activist and an Education Director for an environmental group based in downtown Manhattan, conducts regular outreach to raise awareness on the health of the Hudson and East Rivers. Organizations like the one Darryl works for regularly sponsor free events to encourage residents to engage with the outdoors. They do this to foster investment in the environment and encourage a preservationist ethic in younger generations. I first got to know Darryl through the growing composting networks organizing neighborhood compost centers and volunteering at waste reduction and other environmental events. At our formal interview at Union Square Park the week before the fishing trip, he mentioned this upcoming event. It was to be the last fishing date of the season. This type of
outreach raises awareness about the state of the city’s river ecologies. I asked if I could join him and we arranged to meet.

I find him on a warm but pleasant summer evening on the waterfront. A diverse group of about a dozen people were fishing with Darryl when I arrive. The individuals fishing reflect the ethnic enclaves with strong histories based in the Lower East Side.

![Fishing on the East River, NYC (photo by author).](image)

Darryl and his co-worker are preparing lines for anyone on the boardwalk who wants to give fishing a try. Fishing as catch and release is a fun way of teaching participants about the river’s ecology. Placing bait on hooks and replacing broken lines on fishing rods, they get a few rods ready for families with young children and others walking by who see an opportunity to fish for free and ask for a fishing line. They patiently show the children and adults how to successfully cast the line far enough in the water to improve their chances at catching something. Simply lowering the line below the deck we stand on more often than not means that our hooks get stuck on the debris and rubbish below the water’s surface. When I lose my hook just below, I apologize to Darryl but he says it happens all the time and he can imagine how many hooks decorate the debris below. He has also seen other fishermen lose their hooks there as well, so
losing them should not deter anyone from trying again. But getting the line in the air without tangling it on joggers running behind us or on ourselves is not as simple as it appears when the more skilled fishing aficionados do it. Many of us get tangled in our own lines, fumbling to coordinate our fingers for catching the reel and swinging the rod the right way to get the line far enough in the river and avoid losing our hooks in the debris-ridden shore.

Darryl also sets a crab trap containing a fish head that he lowers directly below where we stand. Two of the experienced fishermen in the group catch a number of fish, some of them as long as my forearm. Darryl answers questions and tells us about the different fish living in the murky waters in front of us, including bluefish (*Pomatomus saltatrix*), striped bass (*Morone saxatilis*) and red snappers (*Lutjanus campechanus*). One of the fish in his buckets looks like a warmouth bass (*Lepomis gulosus*). I get a tug on my line, and as I start reeling it in, the fish pulls back with surprising force. I keep reeling it in and holding on, but just as I pull the hook out of the water, I watch what looks like a bluefish jump off the line and nothing but an empty hook with no bait swings up to greet me.
In addition to teaching participants about the kinds of fish inhabiting the East River, Darryl also repeatedly cautions them that fish are best not consumed because they exceed acceptable mercury levels. He also regularly reassures people that an old boot or a tire will not come up on their line when they reel their hooks in for more bait—a common assumption about fishing in city waters. Undoing some of the stereotypes about urban wildlife is part of the process of getting residents (re)acquainted with animals and plants that have been pushed further outside the public’s consciousness. Most of us are merely giving the fish easy meals this breezy evening. One family, excited by the fish their children cannot reel in, marvel at the fishes’ intelligence. Darryl explains that the fish are not “smart,” per se. The boy fishing ignores Darryl and repeats “they’re so smart!” in excitement, but Darryl responds, “They have some survival instinct, but they’re not exactly ‘smart’.” They remain unconvinced and continue to marvel at the fish’s wiliness in evading them while getting an easy snack. The life of fish remains surprising and mysterious to many of their human neighbors, but outreach efforts like regular summer fishing sessions at the new greenway bordering the public housing along the East River is intended to remedy that.

Fishing presents residents with an opportunity to reconnect with the river’s ecology and enjoy the activity as recreation. The adults quietly fish occasionally asking basic questions about how to tie lines and reel, while the children yell in excitement and their parents cheer them on. Seven o’clock in the evening comes too quickly and I return my rod as Darryl and his coworker pack up. Signs of life are everywhere, showing that there are still “heartbeats in the muck” as the title of biologist and NYC ecologist John Waldman’s book suggests: “Life in New York Harbor, stressed but resilient, overlooked
but omnipresent, eternal yet surprising, goes on and on” (Waldman [1999]2013:116).

Some of the city’s wildlife is on the mend and making a comeback. Other organisms still hold on, a range of “by-the-fingernail species” as Wilson (1984:125) refers to so many organisms facing extinction, receiving less notice. These life forms are nevertheless vital to the future of healthy ecosystems.

Getting to know the city’s flora and fauna is the first step to conservation. My ethnographic study of Fresh Kills and Parks illustrates how conservation processes are being freshly explored, at times fraught with conflict and during a period of lopsided growth in favor of wealthier residents whose consumption habits conflict with resource conservation ethics they generally support. Furthermore, it demonstrates how ecological goals intersect with and conflict with other public needs. Despite the hurdles, individuals working towards building ecological diversity in NYC are making progress in the face of enormous challenges. The efforts of stakeholders and community groups are not always met by fiscal commitments commensurate with their efforts.

In My First Summer in the Sierra, John Muir discovered old and new protagonists in the unfolding actions of the vast landscape before him. Lauding all wild creatures, he says of the squirrel: “Of all Nature’s wild beasts, they [squirrels] seem to me the wildest. May we come to know each other better” (Muir [1911]1998:70). This quote suggests that whether more familiar squirrels or less familiar plants like spice bush (*Lindera benzoin*), getting to know the organisms that surround us is the first step for caring about them and for them. Performing the maintenance work that brings all species into closer intimate connections in healthier and functioning ecosystems lies ahead for NYC. That
work is already underway and will require substantial popular support to continue producing the positive outcomes already evident today.

Figure 32: A black squirrel in Tompkins Square Park, NYC (photo by author).
Appendix I

Methodology

Studying Suburbia

Studies of American suburbs frequently include discussions on the individuation of home life and the concurrent lack of community cohesion typical of suburban communities. Archaeological studies of the earliest suburbs in NYC, like the establishment of Greenwich Village in Manhattan, illustrate how the separation between domestic home life and production set in place a drive to make the domestic domain increasingly more private (Cantwell and diZerega Wall 2002). The push towards suburbanization would continue to expand, in some cases led by the very rich (Baxandall and Ewen 2000), though also driven by city residents’ general desire for more space and privacy, factors with an appeal that cut across class and ethnic identities. The popularity of and desire for homeownership has only continued to grow over time, also spanning all classes and ethnic groups. This phenomenon is documented in detail in Kenneth T. Jackson’s classic work Crabgrass Frontier: the Suburbanization of the United States (1985).

In that work, Jackson details the atomization of life showing how factors like home design and the car culture that developed in tandem with suburbanization and sprawl increasingly cloistered family life. Elements like the erosion of street life and the disappearance of the porch, a space that once served as a bridge between private and public interactions, encouraged a preference for the privacy of the backyard. The growing distance between suburbs and cities necessitated expanding ownership of automobiles. Families came into less contact with others, including their neighbors, as
the boundaries of homes were further delineated by driveways. Each family’s life
came increasingly more impenetrable. Jackson points out that the drive for
suburbanization has also been accompanied by a rejection of and disdain for community
life: “The first necessary condition for the unusual residential dispersal of the American
people is a national distrust of urban life and of communal living” (Jackson 1985:287-288). This distrust of urban life is also manifested in the case of the borough that serves
as a focus for this study. In addition to a preference for privacy, the political implications
of suburban living—even in the heart of NYC—meant that the peculiarities of Richmond
County had to be examined in the contexts of both suburban and urban experiences.
Staten Islanders’ starkly different political culture in comparison to the rest of the city,
was therefore an early focus and is discussed in more detail in Chapter 6.

Inaccessibility to individuals living in the most suburban borough in NYC made it
especially difficult to get started with fieldwork. Gaining access to residents living in the
adjacent neighborhoods was complicated because of the peculiar conditions typical of the
type of suburban living just outlined, mainly a strong preference for privacy.
Additionally, because borough organizations are unevenly involved with the Fresh Kills
conversion project, there was no single group I could join and work with. The overall
decline in popularity of civic organizations (Putnam 1995) also made finding engaged
associations to join less possible. It was not until I began working at the nursery and
regularly visiting the archives that I began to meet borough residents who were invested
in the cleanup underway at Fresh Kills. I soon came to realize that whether residents
followed the changes unfolding at the site closely or not, they all have strong feelings
about Fresh Kills based on their memories of the landfilling activities that took place over
a significant portion of their lives. Providing people with a chance to talk about their memories, however informally, was something that people were very willing to do. And while I did not seek formal interviews with everyone I met in my role as researcher, I benefitted from continuously learning what life was like living growing up with a significant source of pollution “next door.” These stories gave the archival data documented in Chapters 5 and 6 a sense of living history.

*At Home in the Field*

Despite having lived in NYC most of my life, doing fieldwork at home posed several challenges given the nature of the proposed research topic. Fieldwork can sometimes still be disorienting even when conducted “at home.” Something that appears seamless like navigating the city is not as straightforward as it might seem. The distance between my home and field site was lengthier than I realized and my lack of familiarity with Staten Island further lengthened commutes, making my field site seem less like “home.” Staten Island is at least two hours away by public transportation from Queens. This sometimes made field visits feel more like out-of-state trips. And while long commutes, regardless of length of time, are not the same as traveling out of state or abroad, this distance is noted here as only one of the unaccounted complications of doing fieldwork at home not often discussed by native anthropologists. Such complications are obscured by assumptions of the intimate familiarity “native anthropologists” have with their homes. But cities especially are multifaceted and places can be quite different from one neighborhood to the next. Such is the case with Staten Island, a distinct borough that differs from the rest of NYC in marked ways, as this study shows.
Besides distance making for long commutes, the Fresh Kills site itself is mostly inaccessible except at specific times throughout the year and is under strict monitoring jointly by the DEC, DSNY and the Parks Department. Because Fresh Kills is still mostly closed to the public but central to this study, I had to find a way to learn about its ecology and about reforestation beyond the context of the site through alternative sources. Furthermore, I needed to include more than the official narrative on the progress underway accessible through the office managing the conversion project. So while participating in that office in charge of park construction would have granted me more access to data on regular progress, working mainly with them in whatever role could have taken priority over residents’ experiences. The data collected there would have outweighed data on the expectations and desires of nearby neighborhood residents especially given the limited access I initially had to that population. A commitment to accessing residents’ perspectives on place-creation, especially in the case of a blighted site, was a central goal for me, however. Therefore, I sought alternative ways of focusing on local insights given that moving to the island was not possible without funding.

Understanding the public’s perceptions of the site is vital, especially those of Staten Islanders who are proving to be somewhat hesitant participants in the conversion process. The ambivalence among residents towards the project quickly became evident when I first started attending planning meetings and project outreach events in May of 2009. I spent the better part of the first year of field work in 2010 trying to understand low participation rates. In attempting to access varying perceptions of the conversion program underway at Fresh Kills, I was continuously reminded of the complicated relationships between experts and various publics. But without being able to move to
Staten Island to live in one of the neighborhoods adjacent to the landfill to get a clearer sense of residents’ low participation given financial limitations and the type of housing typical of many parts of Staten Island, alternative means had to be found. Richmond is a borough that tends to be more of a bedroom community than the rest of the city. Rental apartment units are not readily available in neighborhoods adjacent to Fresh Kills primarily consisting of single family homes.

Living outside of Staten Island and having little contact with residents who tend to emphasize their privacy posed an early hurdle that at first I expected to overcome by attending all outreach events organized by the team heading the park construction project. But because resident attendance was low, the multiple experiences I hoped to include were not readily accessible. While at one of the outreach lectures I learned that the reforestation effort underway at Fresh Kills emphasizes native plantings. Not knowing anything about restoration ecology, I contacted a nursery growing native plants with a working seed bank to learn more about indigenous plant species and why they are important for restoration work. I began participant-observation research at this nursery in April, 2010. I spent two and a half years there learning about plant propagation, pest management, and seed collection, among other elements central to plant production and ecological restorations. While at the nursery referred to under the pseudonym “Native Species Nursery” (NSN), I benefited from learning about both hardy and delicate regional plants from plant taxonomists and biologists who grow their plants from seed. I interviewed four plant experts working there. From them I also learned about the region’s ecosystems and more specifically about the plant species included at various restoration sites.
But helping the nursery staff grow plants still only provided a limited glimpse of the work of restoration and reforestation specific to plant species and growing strategies. Fortunately, I learned about the Natural Resources Group’s Natural Areas Volunteer Program (NRG’s NAV Program) through Parks events a year after starting at the nursery. Founded in 1984 by then Parks Commissioner, Henry Stern, NRG was assembled as a team of scientists from various disciplines for conducting research on NYC’s natural resources within the Parks Department. Their aim is “to conserve New York City’s natural resources for the benefit of ecosystem and public health through acquisition, management, restoration, and advocacy using a scientifically supported and sustainable research,” according to the group’s mission statement (available online at nycgovparks.org). I underwent in-classroom and field training and also completed 30 volunteer hours to become a “NAVigator” in May of 2012. NAV is a volunteer program set up to manage invasive species and assist in seasonal plantings in partnership with MillionTreesNYC. I began going out to sites regularly to work on recently reforested sites with members of the NRG team. We focused primarily on pulling invasives though projects can vary from planting native species to cutting down felled trees. These sessions served to teach volunteers different aspects of landscape management in urban settings.

I traveled across the five boroughs from 2012 through the spring of 2013 meeting with the small NRG team at restoration sites in various parks and marshes. The focus of their work is especially important in “Forever Wild” sites making up the “wilder” side of NYC, or preserved parkland rather than landscaped parks like Central Park, Prospect Park, or Flushing Meadows/Corona Park. These wilder spaces consist of about 10,000 of
the total 29,000 acres making up overall parkland, according to NRG. This portion of fieldwork allowed me to experience the laborious work of trekking through the more rugged terrain in the city, a type of landscape not usually associated with the Big Apple’s sleek buildings and paved highways, digging up stubborn weeds, and exploring native and invasive plants in the field. But all of the time spent outdoors still only encompasses the restoration side of what became a broader research objective to investigate the “ecology of a landfill” and thus learn about the work of urban reforestation and reclamation and supporting policy.

Reclamation on the scale underway at Fresh Kills also requires political support. With the release of PlaNYC in 2007, NYC’s environmental agenda, the Fresh Kills cleanup became the flagship “remediation” project under this plan. Other brownfield cleanups entailing pollution mediation and ecological restoration are benefiting from ongoing research yielding new data on plant resiliency and soil quality conducted in support of the Fresh Kills project. Given the large-scale environmental agenda outlined in PlaNYC, policy has needed updating to meet the administration’s goals. I began going to City Council hearings throughout the year in 2011 in addition to the Fresh Kills specific community meetings I was already attending. I attended nine City Council hearings throughout that year where the topics of greening the city’s streets with particular plant types, improving surrounding water quality, parks maintenance, and sanitation disposal were discussed. Attending these in conjunction with the Fresh Kills lectures allowed me to trace the contours of administrative discussions on topics related

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135 While the term “remediation” implies a reversal of ecological damage, taking places “back” to an original state is not possible. For this reason, I use the terms “landmaking” following the archaeological usage for referring to the process of expanding land for development, and “reclamation” which is defined by the conversion of wastelands into productive uses. Though I acknowledge the vast improvements made to remediated brownfields, I use these other terms as they are more relevant in the case of Fresh Kills.
to waste disposal and parks. The city’s official discourses on what is “natural,” “wild,”
and “sustainable,” differ from residents’ understandings, overlapping and diverging in
various ways. This study then traces various discursive groups vis-à-vis their
employment of ecological concepts for improving sustainability in different forms around
NYC.

I also consulted three different archival sources to piece together the history of the
siting of the Fresh Kills Meadows as a repository for waste and the struggles that
unfolded for the better part of the last century over that decision. The fights spurred by
this siting serve as a lens for gauging the evolving influence of public involvement in
planning decisions. It was not until the 1960s that development plans that had not faced
concerted and sustained resistance began to be blocked as New Yorkers organized against
unpopular space use decisions that sometimes entailed varied pollutions risks. Prior to
historic designations as a means of preserving landmark sites, Parks Commissioner and
City Construction Co-Ordinator Robert Moses made most construction decisions
unilaterally. Moses was also the driving force behind the siting of Fresh Kills.

The evolution from little to no public input in the earlier part of the 20th century
was epitomized by the Robert Moses era in NYC. The style of creative destruction
practiced by Moses would change as his power waned throughout the 1960s. Civic
participation in relation to Fresh Kills has diminished significantly since the days of
opposition to the siting, judging from low attendance rates at outreach and planning
events. The trajectory the city’s development took under Moses is especially marked in
Staten Island, the least developed of NYC’s five boroughs where Moses wished to leave
his special mark as he had done throughout the rest of Long Island beyond Brooklyn and
Queens, boroughs forming part of the greater metropolitan area but situated in Long Island. I pieced together this history from primary documents at the Staten Island Museum, at the College of Staten Island and at the Public Library archives in particular. At the Staten Island Museum, I went through a number of collections for two years in order to trace the popular side of the struggles as well as to gather the environmental history documented by local naturalists and amateur and professional historians. This historical material is compiled in the chapters on environmental history and the siting of the landfill at the Fresh Kills meadows. CUNY’s College of Staten Island campus houses the local politicians’ papers documenting the legislative side of this struggle. I spent a year poring over Moses’ personal papers for a distinct perspective on his approach to landfilling at the New York Public Library’s Rare Books and Manuscripts division at the Main Branch in Times Square. The extensive and diverse collection of records and naturalist papers at the Staten Island Museum based at historical Snug Harbor was particularly valuable and the archivists there were immensely helpful.

But because the site central to this study is no longer a landfill, the history of the site’s life as a dump forms more of a backdrop to the radical transformation in progress today. For this reason, this study is not arranged chronologically but thematically. Because the processes of environmental maintenance and ecological restorations are evolving and cleanups on the scale underway at Fresh Kills are unprecedented, discourses about restoration and the future of the site are diverse and situated. These discourses are shaped by the work the people involved in this study are conducting in support of the project. These different perspectives represent distinct discursive communities. In bringing these different narratives together, there emerges a partial construction of
cultural understandings of complex processes like landscape management and habitat construction throughout the narrative. From their particular vantage points, participants in this study provide partial knowledge about a process applied to a site in flux.

The fluidity of these discourses also underlies the thematic arrangement of the narrative around buzzwords like “brownfield remediation,” “restoration ecology” and “sustainability” that are still in play. This study therefore captures a moment in time as the young field of urban ecology develops and is applied to postindustrial cities like NYC. Understanding the contexts for the various types of conflicts unfolding at once benefits from ethnography, a particularly useful tool for untangling evolving processes. An ethnographic approach to situated knowledges, to borrow a concept from Haraway (1988) that underscores the partiality of knowledge based on forms of embodied experience and understandings, allows the framing of debates over changing processes within the context of individuals’ lived experiences.

As I delved deeper into the process of reclamation, the reforestation of the site quickly became a primary focus. For this reason, the work of reforestation is laid out at the very start of this study. This is followed by the history of Fresh Kills and then by supporting narrative about the future of the site in the context of the city’s ecology. The environment is viewed from differing perspectives by different discursive groups engaged with environmentalism in its various forms. These different themes required a variety of informants from different spheres.

I conducted 30 interviews with a range of participants. These were selected based on how their work informs the questions that emerged as my study evolved. Moving

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136 Discourses around reforestation are situated in and shaped by cultural ideas. Restoring some plant species over others is prioritized based on their benign impact on the environment, thus making some species more desirable than others.
from an exploration of plants to one about urban ecosystems, for example, led me to locate ecologists working in and with Parks. Most interviews were recorded and transcriptions are verbatim. Three participants were uncomfortable with being recorded so instead I took copious notes. In the instance of my interview with the Land Use Manager of Freshkills Park, Carrie Grassi, I had a glitch with the recorder and though she gave her consent to a recorded interview, it was not possible to do so. My interview with her is reproduced in Chapter 7 without direct quotes. All interviews were semi-structured, lasting on average about one hour. Questions ranged depending on each participant’s area of expertise but sometimes also included personal queries to get a better sense of the ways in which environmental commitments also influence participants’ lives and work.

To learn about urban ecology more broadly and how it is being applied in parks and brownfields, I also spoke with biologists conducting ecological research either independently or in consultation with City offices, in addition to NRG personnel. Besides members of the nursery staff, interviews with environmental experts include one interview with a member of the NRG team and an arborist from TreesNY. My interview with this arborist is discussed in Chapter 8 alongside that with a consulting ecologist researching tree survival and soil conditions in parks in support of PlaNYC. I also sought other scientists working in parks. I therefore contacted the molecular biologist featured in Chapter 3 to learn more about research in parks. The studies so far completed present valuable insights into biological adaptations in various animals in urban settings. I did this in order to gain a fuller picture of the ecological basis of the restoration practices being implemented around the city. Staten Island residents who were initially difficult to
access provided an invaluable perspective on preservation, especially among the
homemade naturalists from a borough where plans for unusual, often polluting projects
are regularly proposed. This group includes the three people interviewed who did not
consent to being recorded. Lastly, I also interviewed six people involved in waste
reduction, three of them working with the city, who are guided by an environmental ethic
to conserve and preserve resources.

The DSNY is not the most accessible of city agencies and understandably so, as
waste is a frequent source of conflict. This agency is a target of criticism on a regular
basis, making them especially guarded (Nagle 2013). Nevertheless, they are distinctive
among municipal agencies: despite having limited direct contact with the public and a
lower profile than the other uniformed services, they maintain two unpaid positions that
serve as outreach points linking DSNY to the people they serve in unique ways. These
two positions are Anthropologist-in-Residence and Artist-in-Residence, held by Dr.
Robin Nagle and Mierle Lederman Ukeles, respectively. Because this agency is often
critiqued for its performance during snow storms and year-round for waste basket
clearance and garbage pickup, those working there tend to be hesitant to participate in
research projects and media coverage. This further complicated my topic and
interviewing Sanitation personnel was not possible which meant I had to talk to
independent waste reduction activists and community volunteers instead. During my
interviews with staff and volunteers, they discussed greener solutions ranging from
wasting less to transportation alternatives.

Because the people I interviewed often referred to parks either in relation to
where they lived, or in the case of researchers and Parks staff where they worked, it was
important to have a better sense of the city’s parks and playgrounds. I therefore made regular visits to parks of varying sizes and landscape styles and engaged Urban Park Rangers in casual conversations to learn more about each site’s history whenever Rangers were present. In order to have a sense of how people relate to the city’s parks, I also went on tours guided by both private conservancies and Parks staff throughout the spring of 2010 to the spring of 2011. I attended approximately two events per season. I hoped to attend trips in all five boroughs but event variety and dates were limited, with most tours predominantly held in Manhattan. As a result, I attended events in three of the five boroughs. These included botanical hikes, historic tours, and birding walks.

While on guided tours, I began to compile a species list of plants included in Appendix II. This species list is included here for referencing some of the native and invasive plant species common in the region as well as to highlight plants and animals found on Staten Island, many of which have been lost in the rest of the city. The plants lists for native and non-native species benefited significantly from the training I received from the NRG team and the nursery staff. This list expanded to include animals spotted and discussed on field trips around city parks. The lists include only species endemic to the city or introduced, but either way found within the five boroughs. The nonnative plants list consists of plants that are particularly troublesome in the city’s parks. These lists serve as a mere introduction to the fauna and flora of NYC and the region at large and are not exhaustive. They are intended to provide more of an ecological background on the organisms inhabiting NYC that often get lost in the city’s infrastructure. It includes unfamiliar wildlife as well as animals most city dwellers think they are all too familiar with. Commonplace species are included because even when knowledge about
animals’ lives is assumed, additional information about their ecology can sometimes mean surprises. From the perspective of plants and animals, ecological ranges defy social boundaries imposed on geographic space, making NYC part of a larger region. This last point is something the map at the opening of this narrative is intended to underscore. Getting to know the organisms that surround us more intimately can offer new perspectives on the city.

Though this study began as an exploration of waste management, that focus changed over the course of the first year in the field both because of the limited access to DSNY and to Fresh Kills. Questions of brownfield remediation and urban reforestation instead became more central. This study then evolved to respond to a variety of questions shaped by the data recovered, requiring an additional year in the field in order to delve more deeply into the different tasks of reforestation and restoration. When it became clear that access to the Sanitation Department would be limited, I decided to talk to people associated with them but not officially employed by that city agency. Gaining access to government channels was not possible but makes for a necessary next step in future studies on waste and its impact on the environment. Additionally, more studies on the impacts of landfills on climate change are needed for complimenting current studies on the effects of warming temperatures on public health (Baer and Singer 2006), particularly as landfills are key contributors of methane and other greenhouse gases but are not regularly considered in environmental studies. Future research on urban conservation can further compliment environmental studies more often conducted in the developing world. Preservation in cities is a rich field awaiting future anthropological research.
Appendix II

List of Plants and Animals Compiled Over the Course of Fieldwork

The lists below begin with native plantings organized under the following subcategories: “Bryophytes,” “Grasses and Sedges,” “Herbs,” “Herbaceous,” “Vines,” “Woody Shrubs,” “Trees,” and “Fungi.” Native plants are followed by a simplified list of “Introduced Non-Natives” that are more simply broken down into “Exotics” and “Invasives.” Non-natives are not detailed by more specific sub-categories like those used for the native plants section because the list for non-natives is much shorter. Each entry indicates what kind of plant each invasive is (e.g., whether a vine, an herbaceous plant, or otherwise). A stricter taxonomic ordering of plants is not followed because it would require the breaking up of species into complicated subcategories (vascular versus nonvascular, gymnosperms versus angiosperms, etc.) that would make this list a little more obscure to readers with less familiarity with plants. This Appendix is instead intended to be user-friendly and provide a snapshot of some of the native species I came across during fieldwork.

The list of plants is followed by one consisting of the numerous animals found in NYC. This list (unlike the plants lists) is arranged in more of a taxonomic order because general audiences are much more familiar with groups of animals and how they relate to one another than they are with plants. It is broken down into the following categories: “Marine Life” (consisting of sub-categories including “Shell Fish” and “Fish”), “Insects,” “Arachnida,” “Oligochaeta” (or segmented worms), “Amphibians,” followed by “Reptiles,” “Birds,” and lastly, “Mammals.” All species are listed alphabetically by their common names within each category as these are more accessible than scientific names not commonly used by the broader public except among scientists and naturalists.

When more than one genus of a species is included, the other varieties are listed below the main entry and appear indented, alphabetized by their common names in the same fashion as the rest of the entries. Some plants do not have common names so they are listed alphabetically by their scientific name. Because common names abound—based on region, names given by cultural groups and especially in the case of plants, by their uses, among other factors—additional common names are listed within each entry where applicable. All scientific names are listed parenthetically next to the common name. The data compiled here is specific to NYC and its biological region. These lists are by no means exhaustive and are intended to provide readers with only a succinct description of the wildlife encountered in the city referenced in this study. Additionally, they are included to provide a brief background on the ecology of these organisms which would otherwise be difficult to describe at length within the text. The data for this section was collected from archival sources, details shared by Rangers and ecologists, the plant taxonomist at NSN, as well as books, and field guides. Internet sources were reviewed especially for the ethnobotanical details that are more difficult to identify from field guides. For additional information on any of these plants or animals, a list of field guides is included separately in the bibliography following this list. Also see in-text citations for additional references in the case of fauna.
Flora

Native Plants

Bryophytes

Blue-Green Algae (Cyanobacteria): More of a bacteria or algal than mossy, “Blue-Green Algae” is a phylum of bacteria that derive their energy through photosynthesis. Its name comes from the Greek words for their color with phycocianin being of a blueish pigment and used for capturing light. This organism’s ability to perform oxygenic photosynthesis represents a dramatic shift in the atmosphere leading to the near extinction of organisms intolerant of oxygen, and enhancing biodiversity. Cyanobacteria are found in almost any conceivable environment, from bare rocks to oceans, to fresh water. They can even crop up in temporarily moistened rocks in deserts. They can occur in planktonic cells or appear as biofilms in marine environments and damp soils. These organisms include unicellular and colonial species with colonies forming filaments that can differentiate into different cell types (vegetative, photosynthetic, and normal cells). Chloroplast found in eukaryotes (algae and plants), likely evolved from an endosymbiotic relation with cyanobacteria. The evidence lies in various structural and genetic similarities. Fossilized cyanobacteria have been found dating back 2.8 billion years ago. More recently, there has been an increase in interest in transforming algae to biofuels, bringing some attention to cyanobacteria and other organisms. But these organisms pose some health risks, as they produce biotoxins in various forms.

Liverworts (Marchantiophyta): The plants are called “thallose liverwort” because the thalles is the plant body and it almost grows out in branching patterns, but always flat and wide across the soil. The term “Bryophyta sensu lato” is still used in the literature. They are grouped together with mosses and hornworts but have some differences in their appearance and in their biology, which puts them in a slightly different clade, named after the most common liverwort, Marchantia. Liverworts are found mostly in shady and slightly damp environments, but some are tolerant of direct sunlight. They are common in greenhouses, where it is warm, damp and shady. This plant was thought to cure different kinds of liver diseases, which is where its name was derived from. Their shape also resembles a liver, which in old English, the word means literally “liver plant.” They are actually very useful in preventing erosion along riverbanks, but are otherwise not economically useful (the way they were when used medicinally). The aquatic variety helps create a productive habitat for invertebrates.

Mosses (Bryophyta): There are about 12,000 species of these tiny plants. They are typically less than one inch in height, growing to about four inches (up to 10 cm), with thin soft stems covered by their leaves that are simple layers. They have no roots and no flowers, reproducing via spores like fungi, liverworts and other non-vascular plants that are primarily wind-dispersed. In lieu of roots, they have hair-like rhizoid filaments that anchor them to the surfaces on which they grow. They require a damp environment as they cannot prevent water evaporation on their own and some varieties require water for reproduction. They have adapted to a variety of conditions though many prefer shade and moisture, but given their thousands of species, some are well-adapted to arid
conditions, sun, and everything in between. Mosses are cultivated for their aesthetic qualities, especially in Japanese-styled gardens. Besides being cultivated, moss is also considered a weed and discouraged from growing on lawns in particular. Mosses have versatile uses for their texture and effects: they have been used for scrubbing given their texture, for absorbing because of their sponge-like quality, for medicinal purposes, for plugging up gaps in wooden longhouses, as insulation in clothing and homes alike, for drying, for packing, and others. Today mosses are still used in the flower industry and are being experimented with for biofuels and biotechnology. Some mosses are also edible.

**Grasses and Sedges**

**American Beachgrass** (*Ammophila breviligulata*): Also called commonly “American marram grass,” is a sand dune grass that grows well on shifting sand and high winds, making it a dune-building grass effective for creating the first line of sand dunes on a coastal stretch. Beachgrass grows less vigorously in stable sand and is therefore more rarely found in more inland locations because it has been found to be susceptible to nematodes and soil pathogens more prominent in inland soils. Introduced in the west coast, it has become an invasive, native to the northern Atlantic region of North America, expanding to the Great Lakes area. The plants’ leaves are deeply furrowed on their upper surfaces, with smooth undersides. They can grow up to 2-3 feet with panicles that are spiky and reaching 10 inches (25 cm), seeding in July or August. The second Latin name literally means “short tongue” (as in “brevi” and “ligulata” respectively), for its short ligule, which refers to the junction between the sheath of the leaf and its blade, often containing fringes of hairs. This variety’s scaly leaf veins differentiate it from the European plant. This plant spreads quickly through surface runners, producing up to 100 stems per clump per year. They can tolerate a high burial and in fact produce rhizomes that can grow vertically under those conditions, essential for these plants to grow vigorously.

**Beard Grass** (*Schizachyrium scoparium*): Also known as “little bluestem,” this is a perennial bunchgrass prominent in tall grass prairies, growing alongside big bluestem and Indian grass. It is a warm season species that prefers well-drained sunny locations and is adapted to sand dune habitats.

**Blackgrass** (*Juncus gerardii*): “Black needle rush,” or “saltmarsh rush” has a wide distribution, from far northern Canada (Labrador area) to about half-way south of the U.S. and across to the west coast skipping about only seven states or so in its spread westward. It is strange that it is discontinued in some of the states but no explanation is available for those gaps in distribution.

**Bulrush** (*Scirpus*): “Deergrass” or “Weedgrass” are other common names for this type of aquatic grass with a cosmopolitan distribution with species specializing in saline intertidal environments like marshlands and wetlands. Other species prefer ponds, lakes or riverbeds. These grasses are helpful for containing soil erosion and provide habitat for wildlife. The rhizomes of the plant are used as herbal medicine, collected in the fall and
winter and dried in the sun. Its taxonomy is so complex it is currently under review by some botanists who are separating some of the species previously under this name and renaming it under new genera.

**Broomsedge Bluestem** (*Andropogon virginicus*): It is also known as “Yellowstem bluesedge,” and it is a species of grass. It is an allelopathic species that colonizes disturbed sites like mining sites, aided by allelopathy. Tolerant of fire and growing back very quickly afterward, it has become a problematic invasive species in places like Hawaii and Australia. But despite its weediness, it is also grown as an ornamental plant. It is a prolific seed producer that disperses its seed in the wind. It is especially prolific given its tolerance for poor soils and its ability to produce and disperse a great number of seeds.

*Carex swanii*: Most sedges are found in wetlands, marshes, bogs, calciferous ferns, and other peatlands, pond and stream banks, or even ditches where they predominate above other vegetation. They are also common in gardens. *Carex* are perennials. They typically have stolons, rhizomes and root stocks, but can also grow in tufts. The flowers are small and combined into spikes which are combined into larger inflorescence. Each flower is either male or female, exhibiting diverse arrangements of male-female flowers.

**Curly Wood Sedge** (*Carex rosea*): Also called commonly “Rosy sedge.” This grass extends westward to Wyoming and South as far as Texas but is not native to the West coast. Because it is a woodland plant, it needs shade to part shade, in dry to wet conditions, as it has a wide moisture tolerance. The “rosea” in its name refers to its color which is limited to one part of the flower of this elegant sedge. Suggested uses include containers for shade, groundcover, drifts, naturalizing. It is best to split in spring or early fall. It is sod forming, spreading short rhizomes.

**Cordgrass** (*Spartina alterniflora*): “Saltmarsh cordgrass” is a perennial deciduous grass common in intertidal wetlands, especially in estuarine salt marshes. It grows out into the water and acts as a habitat “engineer” in that it helps settle sediments enabling other habitat-engineers like mussels to populate a place, gradually building up the edge and attracting creatures from the higher marshes to the new spaces created. It is considered an invasive where it has been introduced because it can reproduce asexually via its dropping flowers and it can hybridize with local grass species easily. It looks as though perhaps it is an invasive in Washington but is a native in the northeast.

**Indian Grass** (*Sorghastrum nutans*): Prominent in North American tall grass prairies. It is a perennial tussock grass and is the official state grass of Oklahoma and South Carolina.

**Poverty Grass** (*Danthonia spicata*): This perennial grass, also referred to as “poverty oatgrass,” is spread throughout most of the U.S. and Canada, and along the northernmost parts of Mexico in grassland and forest habitats. Having no rhizomes or stolons, it grows in circular tufts, growing best in shady and moist areas but can grow in dry, rocky areas as well. As the leaves die back, they turn into curly ribbon-like blades that persist even
as the plant dies back for hibernation. Its inflorescences grow in narrow panicles, with seeds deposited in the soil that can persist for decades before germinating. Seeds are stimulated to germinate even in disturbed soils and this plant is often a pioneer species after events like wildfires and the like, which stimulate germination. The plant becomes less prevalent as other plants begin to settle such areas.

**Rush** (*Juncus*): It is often referred to in its common names as “Rush” and is the genus within the family *Juncaceae*, consisting of 200-300 species of grasses with nude thin leaves containing a spongy pith. Many species are quite hardy and gardeners often consider them weeds. Some species are used as ornamental grasses around ponds. Their hardy nature makes them great ornamental additions. *Juncus* characteristically grow in wetland areas all over the world and sometimes also occur in the tropics. Some cultural uses include the plant’s use for weaving with the Japanese using certain species to make tatami mats.

**Soft Rush** (*Juncus effusus*): Common to most continents therefore known as “common rush” as well. It grows in large clumps that can reach up to 5 feet in height. The number of ridges on the stem sets it apart from other species of *Juncus*. It can be divided into nine varieties, with overlapping distribution in the U.S. It is a common plant native in most temperate regions.

**Salt Hay** (*Spartina patens*): Also “salt meadow cordgrass” or “marsh hay.” It is native to the Atlantic Coast from Newfoundland, along the eastern seaboard of the U.S., to the Caribbean and northeast Mexico. This hay-like grass is found in the uplands of brackish coastal salt marshes. It is a wiry plant that grows in thick mats that turn brown in the winter time. Because it has weak stems, it is subject to bending by strong winds and incoming tides, which gives it an appearance of cowlicks and tufts. While having special adaptations for life in salty water that prevents the loss of water through its root systems, this plant is less tolerant of salt than other grasses. Healthy marsh ecosystems depend on this and *S. alterniflora* to provide food for mollusks and crustaceans, which in turn, provide the diet for birds and larger mammals at large. These plants serve as pollution filtrations and guard against shoreline erosion by serving as buffer zones. Early settlement depended on these marsh grasses for fodder. While an invaluable member of the marsh ecosystem on this coast, it is known as an invasive in other parts of the world, even on the opposite coast of the US, in areas like the San Francisco Bay Area where it can out-compete the native of that region, the soft bird’s beak (*Cordylanthus mollis*). In parts of the west coast, the grass was introduced there with the arrival of mollusks introduced to the estuaries of Oregon where oysters were brought in.

**Switchgrass** (*Panicum virgatum*): A perennial warm season grass, it is a dominant species in the North American tall grass prairies. It is used for soil conservation, game cover, and native grass pastures, but also more recently as a biomass crop for generating energy as well as for phytoremediation projects and for biosequestration of carbon dioxide. It is a hardy, deep-rooted rhizomatic perennial that begins to grow in late spring. It is an adaptable plant that can thrive in many weather conditions, making this a diverse species with many adaptations, reflecting the many different environments it has adapted to. In colder climates, its productive season can be as brief as three months. It is found
in association with other prairie species like bluestem, Indiangrass, sideoats and eastern gamagrass, and various forbs like sunflowers, prairie clover and prairie coneflowers.

**Virginian Cutgrass** (*Leersia virginica*): Other common names include “white grass” and “white cut grass.” It is a native perennial grass in the northeast region. It has smooth leaf sheaths and flowering heads with solitary lower branches containing small seeds.

**Herbs**

**Beefstake Plant** (*Pedicularis/Perilla canadensis*): Also known “High Heal All” and “Canadian Lousewort.” It is found in thickets and dry open wooded areas. It is a hairy plant with hooded flowers, with long hairy leaves that are deeply toothed and reddish. The flowers are a favorite of bees, flowering from April to June. The flowers range in color from greenish-yellow to purplish-red clustered on spikes. Some Native Americans used it as a rattlesnake bite cure. Some also used it to make a tea to reduce internal swelling. The Iroquois ate it like spinach, and early settlers boiled it and ate it in soup. It was also mixed with oats and used as horse feed by Native Americans. In folklore, this plant was used to seduce members of the opposite sex, or put in the food of couples having troubles so that they could mend their broken relationships.

**Blue Iris** (*Iris versicolor*): Common names include “Harlequin Blueflag,” “Larger Blueflag,” and “Northern Blueflag.” This iris is common to sedge meadows, marshes, stream banks, and shores in North America. It is a perennial herb that grows 10-80 cm high. It reproduces via thick clumps of rhizomes. The fully grown flowers contain six petals and sepals spread out nearly flat. The longer sepalas are hairless and have a greenish-yellowish blotch at the base. The sap can cause dermatitis and the bulbs are poisonous to humans and animals.

**Green Arrow Arum** (*Peltandra virginica*): Also “Tuckahoe,” this aquatic perennial herb grown from a large rhizome with leaves varying in sizes that abounds in wetlands throughout eastern North America, including the Florida Everglades, can also be found elsewhere in North America where it is an invasive. Because of its tolerance for low oxygen levels, its rhizomes spread to the point of having become invasives in places where this species has been introduced. They possess very variable leaves, but despite this, they tend to maintain an arrowhead shape, hence their common name. The inflorescens it produces can be male, female or sterile, varying in color from white to greenish to yellow. The fruit produced is a brown berry containing a few seeds within a gelatinous pulp. Their seeds tend to accumulate in wetland soils in large quantities. While unpalatable, Native Americans made use of it for food by cooking it for a long period of time clearing the plant of toxins that would otherwise make it inedible. The plant is used by the larvae of *Elachiptera formosa*.

**Turkey Beard** (*Xerophyllum asphodeloides*): Also called “beardtongue” and “grass-leaved helonias” or “mountain asphodel.” It is a rhizomatic perennial herb growing up to 1.5 meters tall. Its leaves are threadlike to linear with serrated edges with cream-colored flowers growing in long racemes with fruits that are capsules. Occurring in Appalachia
and the New Jersey Pine Barrens, this species grows in sandy soils where it is associated with oakwood forests, sassafras, pines, as well as other plants like *Solidago* and *Cypripedium acaule* (the pink lady’s slipper), *Hudsonia ericoides* (mountain heather), and others. It is most common in NJ and Virginia. It is otherwise threatened in other places by habitat fragmentation and fire suppression.

**Water Plantain** (*Alisma plantago-aquatica*): This is a perennial flowering herb mainly from wetland habitats that grow on mud. The word “alisma” in its Latin name is Celtic for water, describing the habitat in which this plant grows, for it is an aquatic plant growing in still shallow waters, swamps, and even flooded farmland. Its broad leaves float, and when submerged are of a ribbon-like shape. It has hermaphroditic flowers arranged in panicles have six stamens. The similarity of its leaves to the *Plantago* is the reason for its name. It is hairless. The Chinese use it as an herbal medicine for a number of diseases including diarrhea, vaginal discharge, painful urination, dizziness, night sweats and lumbar pain. It can be used as both a diuretic as well as a diaphoretic.

**Wild Ginger** (*Asarum*): These are low growing herbs distributed along temperate zones. This plant has one small bloom. They have kidney-shaped leaves and bear small brown to reddish flowers. This plant is called “wild ginger” because the rhizome smells and tastes similar to ginger root but the two are not related. It can be used as a spice but is an effective diuretic. This plant favors moist, humus rich soils. This species can be grown in shade gardens and makes for an attractive ground cover.

**Herbaceous**

**Beardtongue** (*Penstemon digitalis*): Native to the eastern and southeastern U.S., *P. digitalis* is an herbaceous plant with opposite, simple leaves on delicate fuzzy purple stems. In June, the plant produces white tubular flowers that bear hairy stamens, giving the plant its common name. These subtle flowers sometimes have a hint of pink in the radiant white atop dark green foliage (flowers are generated at the top of the plant on a longer stem over its leaves). They grow best in moist soils.

**Bellwort** (*Uvularia sessilifolia*): “Sessile Bellwort” or “Wild Oats” is a species native to northeastern woodlands of North America, growing well in wet or dry soils. It has narrow bell-shaped creamy yellow flowers that bloom in the spring. The leaves are hairless and narrow, sessile shape giving it one of its common names. The plants reproduce asexually via underground stolons; clonal colonies do not bloom. [“Stolons” are part of the taxonomy of the plants. The term parallels the use of the word in biology in the context of animals where it refers to animals with an exoskeleton. In the case of plants, it refers to the horizontal connections between plants, based on the Latin root of the word for “branches.” Stolons are runners.]

**Broad Beech Fern** (*Phegopteris hexagonoptera*): While common in Long Island, it is not common at all around the City or in NYC Parks. This is a common forest fern that grows in a clump in the Eastern U.S. growing in mildly acidic soils with triangular
fronds. This plant is an excellent garden plant because they gradually fill in entire garden beds.

**Canadian Columbine Flower** (*Aquilegia canadensis*): Referred to commonly also as “Eastern Red,” “Wild Columbine,” or “honeysuckle,” this is an herbaceous perennial native to woodland and rocky slopes in the north-eastern part of North America. It hybridizes with relative ease with other species in its genus. Its leaves are lobed and grouped in threes. Its flowers are 1-2 inches with yellow petals and red spurs and sepals. They bloom in late spring and are a great source of food for hummingbirds and butterflies as the rounded end of the spur contains nectar. The caterpillars of Columbine Duskywing feast on its leaves. The plant is easily propagated from seeds and blooms in its second year. It is relatively short lived in gardens but reseeds easily. While the plant can release the toxin hydrogen cyanide when damaged, Native Americans used several parts of the plant for medicinal purposes.

**Showy Tick Trefoil** (*Desmodium canadense*): Other common names include “Canadian Tickclover,” and “Canadian tick-trefoil.” It is a species of bushy perennial and flowering legume grown as an ornamental plant found in prairies and woods, but also in disturbed soils like roadsides. It is native to eastern North America. It has terminal elongated flowering clusters that of pea-like flowers that come in rose-purple to pink shades, with three-parted compound leaves. Its stems and leaves are covered with velvety hairs. It is a feeding source for the larval butterflies of Hoary Edge, Silver-spotted Skipper, and the Eastern Tailed-blue.

**Clearweed** (*Pilea pumila*): Also known as “Canadian clearweed,” “coolwort,” and “richweed.” They grow in extensive stands in woodlands and as weeds in gardens. Foliage is simple, opposite and dentate with depressed veins and bright translucent leaves that turn bright yellow in the fall. It has small flowers that bloom through midsummer to early autumn. The seeds are wind-pollinated and both male and female sexes on the same plant. It is often mixed with stinging nettle but can be distinguished from that plant by the missing stinging hairs and lower amount of branching of the inflorescences. It grows in moist soils, in shade and sun and is sometimes grown as ground cover for attracting deer.

**Common Milkweed** (*Asclepias syriaca*): “Butterfly flower,” “Silkweed,” “Silky Swallow-wort,” and “Virginia Silkweed” are some of its other common names. *A. syriaca* is a perennial herbaceous plant that grows from a rhizome. It has simple, broad ovate leaves and a velvety underside. The plant is also toxic to large mammals like sheep and while its bitterness was believed to be toxic, modern foragers cook the young shoots like asparagus not including any special processing for neutralizing the bitterness. The plant expanded its range after European settlement and is seen as an invasive weed in some parts. The new regions it has expanded into include Oregon and parts of Europe. The cotton-like seeds are usually used for backgrounds to mounted butterflies and can trap small insects. The flowers’ nectar has a high glucose content and has been used as sweetener by Native Americans.
Swamp Milkweed (*Asclepias incarnata*): Also goes by several other names including “Swamp Silkweed,” “Rose Milkweed,” and “White Indian Hemp.” It is an herbaceous perennial that grows on damp to wet soils. It grows best near the edge of ponds, lakes, streams and low areas, for its thick roots are adapted to soils with little oxygen. It is cultivated for its attractive flowers which are a rich source of nectar for butterflies and other pollinators. It is one of the best attractors for the Monarch Butterfly; the larva feeds on the plants’ leaves. Like other milkweeds, it has a sap that is toxic to insects and herbivores. It is a tall plant that grows up to 100-150 cm (39-59 inches) sprouting from thick, fleshy white roots. The plant blooms in summer time, and has fragrant pink to mauve flowers that bloom from a central crown and can sometimes come in white.

Common Sneezeweed (*Helenium autumnale*): Also called “large-flowered sneezeweed” grows up to a meter tall and in the late summer and fall bears daisy-like blossoms. It is cultivated as a garden perennial where plants of different height and colors are grown ranging from yellow to yellow-orange and golden. It is found throughout the contiguous mainland of North America in the U.S. and most of Canada.

Doll’s Eyes (*Actaea alba/A. pachypoda*): An herbaceous perennial plant that is part of the Ranunculacea Family and native to the temperate regions of the northeastern North American continent. The name, *A. alba* is a confused one and is actually a synonym for the European version of the plant. *A. alba* has toothed bi-pinnate compound leaves, and produces white flowers in the Spring. Its most striking feature is its fruit, a white 1 cm berry with a black stigma scar that gives the plant its common name. The fruits persist throughout the summer and ripen in the frost. In the fall the plant is of an unremarkable yellowish color. The berries are the most poisonous part of the plant, containing a cardiogenic toxin that is highly poisonous to humans though the root of the plant was boiled and drank as a tea by Native Americans after childbirth. Birds feed on the berries as they are not toxic for them and they are the plant’s primary seed disperses. This plant prefers clay to loamy soils, and as is found in hardwood and mixed forest stands, it grows best in partial to full shade with lots of water and good drainage.

Dutchmen’s Breeches (*Dicentra cucullaria*): “Dutchmen’s breeches” is a perennial herbaceous plant native to rich woods in the NYS region. The common name is derived from the white flower that resembles breeches (rather like the popular gardening plant, Bleeding Hearts, with a similar pattern of leaves and the way the flowers sit on the branches amidst the leaves). Its seeds are spread by ants in a process called myrmecochory. The fleshy outside coating of the seeds attracts the ants that take them to their nests where they eat the elaiosomes, as the fleshy coating is called, and put the seeds in their nests as debris where they end up being protected until they germinate. They have the added advantage of germinating in soil made rich by the ants’ debris. Native Americans and early white herbal medicine practitioners considered this plant medicinal and useful in treating syphilis, skin conditions, and used this plant as a blood purifier. It can cause dermatitis in some people however.
**Eastern Spring Beauty** (*Claytonia virginica*): found in moist parts of wooded areas and clearings, this flowering herbaceous perennial plant is native to the northeast of the US. It has a small white, pinkish flower that grows close to the ground, flowering between March and May, with slender leaves and its scientific name honors Virginia botanist, John Clayton. Two of its other common names include “Virginia spring beauty” and “fairy spud.” It winters through a corm adapted to eastern temperate deciduous forests but it can be found in a range of habitats including lawns, roadsides, and parks, where they are found around NYC.

**False Lily-of-the-Valley** (*Maianthemum canadense*): Also referred to as “Two-leaved Solomon seal,” “Canadian Lily” or “Canadian Mayflower.” This native species sometimes appears as monoculture and is a dominant understory perennial flowering plant with broad leaves and small clusters of white flowers. It has a fragrant starry-shaped white flower that is small and grows close to the ground (like Lily-of-the-valley, hence its common name). Leaves are alternate, stalkless, oval, and slightly notched. It is commonly found growing under evergreen or deciduous trees. Flowering occurs from late spring to mid summer. It bears a berry fruit containing 1-2 round seeds, but seeds occur infrequently and therefore plant communities in a location are often vegetative clones. These plants spread through rhizomes.

**False Nettle** (*Boehmeria cylindrica*): “Smallspike false nettle” is an herbaceous perennial native to Asia and North America in the **Urticaceae** family that includes herbaceous perennials, shrubs and small trees. They typically have ovate opposite leaves, but sometimes alternate, with coarsely toothed edges. This plant does not have stinging nettles, giving it its common name. The flowering spikes are ½ to 3 inches, growing from the axis of the central stem. Male and female flowers grow on separate plants, with male flowers growing in bunches along spikes and female flowers growing mostly continuously along the spikes. Flowers are petal-less and of a white color, blooming in late summer to early autumn. It is wind pollinated though it does produce a food. It prefers moist conditions in rich loamy soil. Some species are cultivated as ornamentals and others for their fibers. It is also a food source for certain Lepidoptera, with one species particular to one of the **Boehmeria** species.

**False Solomon’s Seal** (*Maianthemum racemosum*): Resembling the astilbe flower, bright white at the tip of long stems with shiny leaves with lines running vertically and parallel from tip to tip of leaves. A native herbaceous perennial flowering plant common in the northeast of the US, it is a woodland herbaceous perennial. It has long, alternate oblong, shiny leaves with veins moving from stem to tip and white flowers that grow at the tip of the stem. It grows from cylindrical rhizomes. The leaves are bitter and have a laxative quality. The Ojibwa boiled them to take away their bitterness and laxative effect. It was also used as a medicine for sunburn. The plants roots were smoked by different groups of Native Americans as treatment for depression and hyperactivity in children. The plant should be consumed in moderation because of its strong effects as a laxative. It has also been used as a cough suppressant.
Ferns (*Pteridophyta*): There are about 12,000 types of ferns. Ferns are vascular plants, with leaves, stems and roots, even while reproducing via spores and having no seeds or flowers. While differing from lycophites given the true leaves on those plants, ferns differ from gymnosperms and angiosperms (plants reproducing via seeds and flowers) and unlike these, the ferns’ gametophyte is a free-living organism. While ferns appear in the fossil record back to the Carboniferous period (360 mya), today’s plants are of the Cretaceous variety (145 mya), when flowering plants came to dominate and “the great fern radiation” occurred resulting in today’s diverse varieties. While some ferns have medicinal purposes or as used as ornamental plants, most are not of significant economic value and are sometimes treated largely as weeds. Others, however, have much value for soil remediation purposes.

**Christmas Fern** (*P. acrostichoides*) gets its common name from its leathery, glossy evergreen fronds. It resembles the Pacific Coast Fern (*P. monitum*) but is missing the large clumps of fern that *P. monitum* has. The Christmas fern is easy to grow in many different types of soils and is a notable fern for soil conservation on steep slopes. While the fronds grow erect until the first hard frost, they recline flat on the ground after that, effectively retaining dead leaves in place until they turn to soil. *Athyrium* have 180 different species and make a great food source for Lepidoptera larvae.

**Hay-Scented Fern** (*Dennstaedtia punctilobula*): This fern smells just like fresh hay, the reason for its common name. The fronds stand upright in the direction of light source and it is a native species common in forests in the American NE. This fern’s presence discourages new tree seedlings as it is not browsed by deer which makes for dense stands forming a carpet that prevent new trees from growing. Its spores are found on the underside of fronds, and it is persistent and grows randomly.

**NY Fern** (*Thelypteris noveboracensis*): The base of the plant’s stem tapers back from its broadened leaves closest to the base, similar to the ostrich fern which is the only other native fern with this type of tapering pinnae. Its fronds are pale green above and brown and scaly at their base. This fern is most common in open canopy patches allowing it to benefit from extra sun light. It does best in moist woods with filtered light. This fern is a wetland indicator and is considered an endangered species in Illinois.

Ferns have a problem with cryptic species, species that look just like one plant but are genetically different, which when interbred produce infertile offspring. Traditionally, there are three groups of ferns that have been considered discrete groups: the *Ophioglossaceae*, *Marattiaceae*, and *Leptosporangiate*. The *Marattiaceae* are a primitive tropical group with large fleshy rhizomes thought to be a sibling taxon group to the *Leptosporangiate*. Other “allies” are thought to be closely related and more recent research in genetics suggests that whisk ferns might be true ferns (e.g., clubmosses, spikemosses, quillworts, horsetails, etc.).
Cultural contexts for ferns include mythical connotations in legends about mythical flowers and fruits. In Slavic folklore, ferns are thought to bloom only once a year and whoever sees a fern flower is thought to be happy and rich for the rest of her/his life. Finnish folklore has a similar tradition albeit in this instance the person to find the seed of a fern in bloom on Midsummer Night is thought to be able to travel invisibly to the place where eternally blazing Will o’ the Wisps called “aarnivalkea” mark the spot where a hidden treasure is found. The spot of the treasure is thought to be protected and only the holder of the seed can be led there. Fern patterns and fern collecting were popular in the Victorian period. Dried ferns, too, became a popular pattern of design and nature printing.

Asparagus Fern, Sweet Fern, Air Fern and Fern Bush are mistakenly named ferns even though they are not true ferns. Fern Bush is a rose plant, and Air Ferns are sold as “ferns” that can live on air but are actually painted skeletons of animals related to the jelly fish that are treated as plants for a consumer market.

On Fern Reproduction: Ferns reproduce via gametophytes, a small lettuce-like plant with sexual organs housing gametes, with a sporophyte that is an ascendant frond. The typical life of a fern begins with a sporophyte phase producing haploid spores by meiosis. A spore grows by mitosis into a gametophyte which then produces gametes (both egg and sperm on the same prothallus), which then a mobile flagellate sperm fertilizes an egg still attached to the prothallus. The fertilized egg is then a diploid zygote and grows by mitosis into a sporophyte (the typical fern plant).

Fringe Loosestrife (*Lysimachia ciliate*): Fringe loosestrife has a fringed stem, hence its common name. It is an herbaceous plant with opposite simple leaves and small yellow flowers that bloom in the Summer time. It is common from Southern Canada and across the U.S. except in the Southwest. It can be an invasive, but the suckers can be removed to keep plant populations under control.

Giant Sunflower (*Helianthus giganteus*): Also “tall sunflower.” Giant sunflowers are native to the eastern US, Southern Canada and Nova Scotia, Ontario, west to Minnesota, and south to Mississippi and Georgia. *H. giganteus* is a perennial herbaceous plant that grows up to 4 meters, most commonly found in wet meadows, swamps and valleys. *Helianthus* has 52 species and various subspecies all native to North America but with cultivars raised in parts of Europe as ornamentals or for food. The domesticated variety, *H. annuus* is the most commonly known; it is a tall annual with a thick, hairy stem, usually bearing one to several terminal capitula that are sterile.

Indian Hemp (*Apocynum cannabinum*): “Rheumatism root” and “wild cotton” are other common names for this perennial herbaceous northeastern plant. The “cannibum” in its scientific name is not a reference to the hallucinogenic drug but to the fibrous character of both plants. They have strong purplish stems and simple, long broad opposite leaves
that are smooth on top with white hairs on their underside, a white coating like that on plums. *A. cannabinum* cream colored clustered flowers at branch ends or on stalks that bloom in the summer time, producing white five-lobed corolla with large sepals, the outermost whorl on angiosperms. Seeds are produced on spindle-shaped pods. It is also referred to as “Amy root” or “dogbane/hemp dogbane,” is poisonous especially for dogs, producing cardiac arrest if ingested. This fibrous feature has made it a useful plant to Native American groups who use it for making things from clothing, to fishing line, and nets. As one of its common names indicates, this plant also has medicinal uses for treating rheumatism, as well as syphilis, fever, dysentery, asthma, and intestinal worms. It can induce nausea and serve as a mild hypnotic and sedative given its ability to slow down pulse. Preferring moist soils, it grows in wooded areas, hillsides and ditches. Because of its ability to sequester lead, it is a plant used in phytoremediation. Growing up to six meters in height (two feet), the plants reddish stems produce a milky substance that can cause blisters on skin. Considered an invasive in gardens for its fast growth from spreading roots, it is hard to control through herbicides but is managed mechanically in farms where its spread can mean significantly diminished yields.

**Ironweed (*Vernonia)*:** Consists of about 1000 species of forbs and shrubs in the *Asteraceae* family. They grow in damp, sunny spots and in moist, swampy areas. They might be commonly called “ironweed” because they look metallic as they die back for the winter. Some species are edible. Others are known for their intensely purple-colored flowers. Named after English Botanist William Vernon, this genus has distinct subgenera and subsections, which has led botanists to break them up into smaller subgroups and distinct genera. Some of the edible species are consumed in West and Central Africa and are bitter greens. Some genus also have medicinal uses, some being used for treating diabetes, persistent headaches and joint pains associated with AIDS. The North American varieties (*V. altissima*, *V. fasciculata*, *V. flaccidofolia*) have a blood purifying effect as well as serve as a uterus toner. Some of the East African varieties are included as an ingredient in paint and coating plasticizers for their high oil content.

**New York Ironweed (*Vernonia noveboracensis)*:** An herbaceous plant from the daisy family with attractive purplish-pinkish blossoms borne in summer and fall that spreads by seeds and runners. They have alternate simple leaves. Best grown in moist soils and can become an aggressively weedy plant in the right conditions.

**Jack-in-the-Pulpit (*Arisaema triphyllum)*:** Seeds and flowers look like they are turned over and tucked in under a “hood” resembling old-fashioned pulpits, giving the plant its common name. This is an herbaceous perennial plant, occurring in moist woodlands across the northeastern US. The leaves are trifoliate, which sometimes leads to them being confused with poison ivy. The spathe is known as the “pulpit” in this plant, which wraps around and covers the spadix (or the “Jack”), housing flowers of both sexes. If properly dried and cooked, the plant can be consumed, but it otherwise causes high irritation of mouth and other areas because of the chemicals it contains. Meskwaki Indians would chop the herb's corm and mix it with meat to poison enemies by putting it out for them to eat. The flavor of the toxins was disguised by the meat. It meant pain and death to those who consumed the mix. It was also used to determine the fate of sick individuals. Dropping a seed in a cup of stirred water, depending on the direction in
which the seed spun, four times clockwise, the patient was expected to recover, but if the seed spun less than four times recovery was not expected.

**Jewelweed** (*Impatiens capensis*): “Common Jewelweed,” “Spotted Jewelweed,” “Orange Balsam” (rule of thumb suggests that Balsams apply to Tropical species and Jewelweeds to northern species). There is maybe a different species commonly referred to as “Touch-me-not Jewelweed,” and maybe “Jumping Jewelweed.” (?) It is an annual plant native to North America. It normally grows in bottom soil, in ditches or near creeks, and often found growing near its less common relative *I. pallida*. The seed pods are pendant and have projectile seeds that burst with force when even just lightly touched when ripe (hence the name, “touch-me-not”). The leaves appear silver or “jeweled” underwater (which is possibly where the common name came from) and the stem is rather translucent. “Capensis” refers to it coming from the cape, which the biologist who gave the plant its name wrongly believed that it was native to the Cape of Good Hope. *Impatiens* is a genus of 850-1000 species or so that are widely distributed across northern regions and the tropics, but genetic studies might reveal that some of these species need to be broken up as some plants are closer to other families like *Hydrocera*. Flowers are produced from early summer to early frost. The leaves have a cuticular, a coating on the surface that is water repellent and gives them a greasy feel. Tiny air bubbles become trapped on the underside of the leaf giving them a shiny appearance that is especially visible underwater (as mentioned above). The name “Impatiens” refers to the “impatience” of their seeds that also give them their name “touch-me-nots”; this characteristic of projectile seed dispersal is also called explosive dehiscence and rapid plant movement. This plant is a common food for some species of Lepidoptera and bees even while its leaves can be toxic to other animals, including the Budgerigar which does eat the plants flowers. The northeastern varieties are used medicinally to treat insect bites and bee stings as well as poison ivy, with a common refrain saying, “Wherever poison ivy is found, jewelweed is close by.” The balsams found in shampoos are not related to this plant but rather to the *Myroxylon*, Canada balsam, and others.

**Joe-Pye Weeds** (*Eutrochium*): Herbaceous flowering plant in *Asteracea* family. It has clusters of pink flowers and broad leaves and it is purple where its leaves grow in a whirl pattern. It is a native to this region. It is named after Joe Pye, a Native American healer from New England who used the plant to heal a variety of ailments with this plant.

**Late Boneset** (*Eupatorium serotinum*): “Late thoroughwort” is a fall-blooming herbaceous plant with simple or compound, opposite or alternate leaves. It grows to a meter to two meters tall with inflorescences that hold white disc florets organized into larger heads that look like a single, radially symmetrical flower. Its range is over the whole of the north east as far as the Texas-Mexico border. It grows in dry to moist open sites, in part shade, and can hybridize with *E. perfoliatum* and other members of its species, but unlike some of the other members of its species, it does not wind pollinate but relies on insects for pollination. It is deer resistant and a good food source for nectar-feeding insects and granivorous birds.
Kidney-Leaf Buttercup (*Ranunculus abortivus*): A native plant with tiny yellow flowers and leaves at the base only. The leaves are kidney shaped giving the plant its common name. Its very delicate form and cute small flowers have made its name a term of endearment usually used for children. The buttercup is from the crowfoot family and is mostly herbaceous, with some woody climbers. Leaves are usually divided or lobed. Some *Ranunculaceae* are used as herbal medicines because of their alkaloids and glycosides.

Smooth Solomon’s- Seal (*Polyganatum biflorum*): Other common names include “Smooth Solomon’s Seal” and “King Solomon’s Seal.” It is one of fifty flowering plants of this genus. Its rhizomes have many joints with deep depressions, some of them resembling seals, which give the plant its common name. Its leaves are opposite, smooth, shiny and broad. It has clusters of white flowers at the end of its branches. Some species have medicinal uses, some are edible and cooked like asparagus, with roots that after appropriate treatment, make a rich starch. Some of its medicinal uses include treatments for menopause, mending broken bones, treating acne and blemishes and other forms of skin irritation, its medicinal properties are good to use topically. When consumed as tea, smooth Solomon’s seal makes good medicine for a range of conditions from insomnia, to kidney pains and even infertility.

Spotted Joe-Pye Weed (*Eupatorium maculatum*): Most are referred to in their common names as “bonesets,” “thoroughworts,” or “snakeroots.” They are also in the Aster family (as is the Sunflower) and contain 36-60 species. Most are herbaceous perennial plants with a few shrubs. Some taxonomists have split the plants into a variety of families, and *E. maculatum* comes up as *Eutrochium maculatum*, as “Joe-pye weeds.” The name “boneset” refers to the medicinal use of the plant for setting broken bones, but it could also refer to its use to treat dengue fever which used to be referred to as breakbone fever, named after the bone pain it causes. The name “thoroughwort” comes from *Eupatorium perfoliatum* which is named after the perfoliate leaves of the plant where the stem appears to pierce the leaf (“thorough” and “through” were not distinguished one from the other in older English). Though poisonous to humans and livestock, it is used in folk medicine to treat uric acid producing gout, as well as for treating arthritis, influenza, migraine, intestinal worms, malaria, diarrhea, and dengue fever as well as bones as stated above. The toxic compounds in the plant can produce liver damage, however, and research into the medicinal uses of the plant is still in their infancy. The word “maculatum” refers to spotting, which the plant has in purple on its stem. “Spotted Joe-Pye weed” thrives in marshes and swamps but human-made wet environments like wet fields and seepage areas work well for this plant as well, along with moist ditches. *E. maculatum* is a specific butterfly food and habitat plant.

Stiff-Leafed Aster (*Ionactis linariifolia*): Commonly called the “Stiff-leafed Aster,” was named *Aster linariifolia* by Linné but was reclassified as a separate genus in 1897 by Edward Lee Greene. Its flowers mostly occur in violet and are rarely white which is common in others of the same genus. It has lanceolated leaves and slender stems.

Trout Lily (*Erythronium Americana*): This herbaceous flowering plant is in the *Liliaceae* family. Its common name, “Trout Lily” indicates its relation to the Lily family and refers
to its mottled leaves which are said to resemble brook trout. Trout lilies grow in communities that can be up to 300 years old, with yellow flowers tinged with red that bloom in early Spring.

**Virginia Knotweed** (*Polygonum/Persicaria virginianum*): Also known as “Jumpseed” or “Jumpweed” for the way in which seeds sprout from the plant, jumping everywhere at once. The “knot” in knotweed refers to the bump where the leaves are based on the stem of the plant. This plant is in the buckwheat family. It likes moist environments. Has a greenish-white flower from July to October, and smooth shiny leaves. There are some cultivars of this plant including variegated varieties.

**Violets** (*Viola primulifolia*): Very difficult to distinguish from the common blue violet (*V. soraria*) when not in bloom, both of them have very rounded heart-shaped leaves, and nearly identical ranges. They are very easy to grow and are quite adaptable. Violet seed capsules dehisce over some distance as they are expelled. The white flowers are abundant from late winter to early spring. They are great plants for shady areas.

*V. palmate*: Three-lobed violet, or early blue violet. This is one of the showiest violets, preferring full sun to partial shade. Forms 8 inch clumps completely covered with flowers. Bloom time occurs in April, May, June and September. It grows in dry mesic soil, and is a bare root plant.

*V. pubescens*: “Downy yellow violet” is its common name. Found in dry mixed and deciduous woodland from Nova Scotia to Virginia, blooming from April to May.

**White Aster** (*Symphiotrichum ericoides*): Also known as “Heath Aster” is native to much of North America. It is an herbaceous perennial from the composite family that can be found throughout the US, Canada and parts of Mexico. It can be found growing in dry to moist soils and open habitats. It is characterized by its small white to faint pinkish flower rays with yellow centers. *Aster ericoides* (the old species name of the plant) sold by horticulturalists are usually cultivars involving the European garden plant *Symphyotricum dumosum*, *S. lateriflorum*, *S. pilosum*, and *S. racemosum*, which apparently has happened since the C19th.

**White Avens** (*Geum canadense*): An herbaceous plant with simple palmately lobed leaves and segmented ones; some of its leaves are round while others are almost fernlike. It flowers in the spring and its bloom—on this particular species of Geum—is white. It is a genus of about 50 species in the Rosaceae family native to Europe, North and South America, Asia, New Zealand and Africa. It a plant with hairy broad leaves. It can also flourish as a potted plant.

**Wild Geranium** (*Geranium maculatum*): Grows in dry to moist woods. An abundant perennial herbaceous plant, with upright stems, flowering in Spring to early summer; these flowers range in color from rose-purple, or pale to violet-purple (rarely white). It is used in herbal medicine and is commonly found in gardens, but what gardeners call “Geranium” is not the same as this because this is the true geranium.
**Wintergreen** (*Pyrola*): Small herbaceous evergreen plants with rosette leaves and small simple flowers ranging from white, to pink or cream. They are small plants with ovate leaves with slender stems that have curved flowers and are distributed across the temperate northern forests. Preferring damp, shady locations, this plant can exist as either photosynthetic or non-photosynthetic for reasons not entirely understood yet.

**Wood Anemone** (*Anemone quinquefolia*): An early spring flowering plant, this perennial herbaceous plant can carpet woody areas spreading easily via rhizomes. The flowers are white, flushed pinkish (looking a bit like the flowers of *C. virginica*) and the leaves are deeply lobed with toothed margins. *Anemone* is a genus of plants in the buttercup family *Ranunculaceae*.

**Woodland Blue Stem Golden Rod** (*Solidago caesia*): An herbaceous perennial plant, this plant is erect and oftentimes forms colonies. It has small yellow flowers that grow above the foliage on branches. It is found in a variety of habitats but is not very shade tolerant. It is quick to colonize disturbed areas. In Asia it is an invasive that has caused the extinction of about 30 species.

**Vines**

**American Bittersweet** (*Celastrus scandens*): A robust perennial vine with yellowish-green to brown stems that can twine, American bittersweet has unscented flowers at the tips of its branches with small pea-sized bright orange fruits that are toxic to humans but a favorite food source for birds. It gets its common name from Europeans settlers who named it after a Eurasian nightshade called “Bittersweet.” These plants prefer a well-drained moist woodland soil, and like the invasive varieties, tends to wrap around other plants for access to light that can result in the choking of saplings by preventing growth. It is in the vine family and is native to central and eastern North America. Bittersweet has medicinal purposes, especially for treating tuberculosis.

**Carrion Flower** (*Smilax herbacea*): A common native in the northeast, it used to not be very visible in Forest Park-Queens but has become much more prominent in the past two years. The blooms form clusters of small greenish flowers. This plant is a climbing, flowering plant that is woody and thorny. Carrion flowers can be herbaceous or “woody” vines with alternate simple leaves that have prickles on the stems or leaves. Catbriers, prickly-ivies, and green briers, are also referred to as “Carrion Flowers.”

**Creeping Eunymus** (*Eunymus fortunei*): A woody evergreen vine that climbs up plants in a similar way to ivy (but is not related, presenting instead an example of convergent evolution). Leaves are arranged in opposite pairs with inconspicuous flowers. It is widely used as an ornamental plant with some cultivars growing as bushy plants rather than climbing vines. It has become a problem and is considered an invasive species in the Eastern U.S. and Canada.
**Hairy Bush Clover** (*Lespedeza hirta*): Also “hairy lespedeza” and the lespedeza genus in general is also called “bush clovers.” Its habitat is dry sunny places, including roadsides, growing in dry sandy soils. It grows up to 2-3 feet and ¼ inches long, and flowers from July to October producing a creamy white flower marked with red. It is a genus of 40 species of flowering plants in the pea family, as they are trailing vines, are also classified within another tribe, *Desmodieae*, and the smaller subtribe *Lespedeza*. They tend to be grown as ornamental garden plants but are grown as forage crops mostly in the South. They help with soil erosion prevention and soil enrichment. Most *Lespedeza* species are classified as legumes for the bacteria in their roots capable of nitrogen fixation from the air into soils, which reduces the need for fertilizing soils.

**Halberd-Leaf Tearthumb** (*Polygonum arifolium*): A climbing vine with sharp thorns that enable the plant to climb. These thorny structures effectively pierce skin, accurately giving it an appropriate common name. It is part of the *Polygonum* family, or the knotweeds, to which mile-a-minute weed also belongs. Buckwheat is sometimes included in this genus. It grows primarily in temperate northern regions, ranging from prostrate to woody vines growing high on trees. Other plants can even grow floating in ponds. Its scientific name comes from Greek root words for “many” (“poly”) and “knee” (“gonu”) in terms of what appear as swollen jointed stems. It provides food for various Lepidoptera as well as for humans. It has between 65-300 recognized species, depending on the circumscription of the genera by botanists.

**Poison Ivy** (*Toxicodendron radicans*): A sturdy vine with a three almond-shaped smooth and shiny leaf clusters growing alternately. Mostly known for the production of urushiol, a clear liquid compound found in the sap that produces itch when touched, poison ivy is a native to the region. It is found in wooded areas, widely dispersed throughout North America and parts of mountainous Mexico, this plant is a not a true ivy, and can be found along peripheral areas to wooded forests. They can grow as shrubs, groundcovers, or as vines going up supports, with older plants sending out lateral vines that appear to be shrub limbs. They are very much adapted to a variety of soils and are not particularly sensitive to humidity though they cannot grow in arid places. When it rains and everything is wet, avoiding contact with its sap is impossible. Two common refrains the Parks Department uses for helping park users identify poison ivy are: “Don’t be a dope and touch the hairy rope” and “leaflets three, let it be.” The “hairy rope” refers to the reddish “hairs” on the vine that assist it in growing vertically.

**Roundleaf Greenbrier** (*Smilax rotundifolia*): When there is a fire, the first plant to come back is the Roundleaf Greener. It is a woody vine native to the Eastern US. It uses its petioles to climb on other plants. The stems are round, green and have sharp spines. The flowers are greenish, blooming from April to August. Its berries are dark and ripen in September. It is commonly found in clearings and by the roadside. When it is found in a clearing, it usually forms very dense population. The stems can be cooked and eaten like asparagus and the leaves can be added to salads and are similar to spinach.

**Virginia Creeper** (*Parthenocissus quinquefolia*): A woody vine native to central and eastern North America, but also found in parts of Mexico and as far north as Manitoba,
and west to Texas. It has medicinal purposes for which Native Americans used it for treating diarrhea, swelling, and lock jaw. It has palmately compound leaves, composed of five leaves with toothed margins. It is a not a true ivy (Hedera), and is named based on the region it is very common in, Virginia, and the second Latin name refers to its “five leaves.” The leaves turn a flashy red in the fall and the plant produces dark purple berries that are a valuable winter food source for birds but are toxic to humans and other mammals. It is a better alternative than English ivy because it does not pose any threats to masonry as it does not grow into infrastructure the way English ivy does. It also only climbs about halfway up trees, which means benefiting from sunlight without compromising the trees on which it grows. It is adapted for this climate and therefore will not climb all the way to the top of trees. It can shade out other plants on which it grows, preventing them from conducting photosynthesis. It is preferable to English ivy for not only is it indigenous but it lives in harmony with trees. It is cultivated as an ornamental plant for its attractiveness especially when growing on walls.

Woody Shrubs

**Buttonbush (Cephalanthus occidentalis):** Other names include “Button-willow,” “common buttonbush,” and “honey-bells.” C. occidentalis is a deciduous shrub or a small tree with opposite elliptic to ovate leaves. Its flowers are arranged in dense spherical inflorescences and each flower has a fused white to pale yellow four-lobed corolla. The fruit is a spherical cluster of nutlets. It is a plant common in wetland habitats, including swamps, floodplains, mangroves, and other habitats, usually among other members of the moist forest understory. Its seeds are food sources for waterfowl and other birds with Wood Ducks using the plant for protection for their nests. Insects and hummingbirds also feed on its nectar and bees use it to make honey. It is mostly common in the eastern US, including being part of the flora of the Everglades, reaching as far south as mid-Texas where the range continues southward in Mexico, and appears again in the San Joaquin valley (C. californicus). Buttonbush is cultivated as an ornamental plant for its nectar; this “honey plant” is aesthetically pleasing and is often included in gardens and native plants landscapes. It is a good plant for controlling soil erosion. While it has medicinal uses, it also has toxic properties.

**Chokeberries (Aronia photinia):** Deciduous shrubs in the Rosaceae family commonly found in wet woods and swamps. Chokeberries are cultivated as ornamentals for their berries which contain a chemical making them high in antioxidants. The plants leaves are alternate with crenate edges (rounded toothed edges) and margins that turn a vibrant red color in the fall. The flowers have five petals and five sepals, produced in urn-shaped corymbbs (an effect that brings all flowers to about the same level because the pedicles of the lower flowers are longer than those above), and its fruit is a small pome with a very bitter flavor. There are red and black chokeberry varieties; there is also a purple variety that originated as a hybrid of the other two but can be considered a separate species. The Red chokeberry has flowers that are white or pale pink with red fruits that persist in the winter. The black variety is smaller (in size and leaf size) and has white flowers and black fruit. The purple variety has fruit that is dark purple to black that does not last through winter but has a range similar to that of the black chokeberry that is different
from the red. In Germany where neither of the other varieties exist, the purple chokeberry thrives on its own (they are self-fertilizing so they can breed on their own) with German botanists recognizing it as its own species. The plant is sometimes categorized differently by different botanists for its close relation to *Photinia*. They are understory plants growing on woodland edges but making good garden plants. Their berries are used for jams and for flavoring and coloring yogurt. The red berries are sweeter than the black berries and can be eaten raw. The pigmentation of the fruits on the plant protect it from too much ultraviolet radiation carried out by absorbing light on the blue-purple spectrum mediating intense sunlight and helping the plant regenerate. The rich antioxidant content of the fruit may be helpful in reducing oxidative diseases like colorectal cancer, cardiovascular disease, peptic ulcers, liver failure and other conditions.

**Devil’s Walkingstick** (*Aralia spinosa*): A viciously thorny northeastern native with spiny stems, petioles, and leaf midribs. Some of its other common names include “Angelica Tree,” along with the names it shares with the unrelated species with which it is often confused, *Zanthoxylum clava-herculis*, commonly referred to as “Hercules’ club,” “Prickly Ash,” “Prickly Elder,” and “Toothache Tree.” However, it does not have the medicinal properties that *Z. clava-herculis* has. [It does not appear to actually be a native to NYC, as its range does extend to NY State but much more centrally than coastally from the looks of maps of its range.] It grows well in clay soils, preferring rich, moist soils, growing in the periphery and understory of woodlands. It is a deciduous shrub or small tree with bipinnate leaves, with trunks typically around 6-8 inches wide with creamy white flowers produced in large composite panicles that flower in late summer. The leaves are the largest of any continental tree in the U.S. but the leaves are so compound the casual observer might find it hard to believe they are one and that large. In the fall, the leaves turn into an unusual bronze red with a hint of yellow, making the tree particularly conspicuous. The plant has a single, palm-like appearance due to the way in which it grows as groups of unbranched stems of up to 12-20 feet, usually forming clonal thickets emerging from rhizomes.

**Elderberry** (*Sambucus canadensis*): “American Elderberry” spreads across North America, east of the Rocky Mountains and south of eastern Mexico, down to Panama, growing in a range of soils from dry to wet but needing sunny locations. With pinnate leaves arranged in opposite pairs of five to nine leaflets at about 10 cm long and 5 cm broad, this deciduous shrub bears large corymbs of large white flowers. It is an herbaceous plant, likely the most common in this area. *Sambucus* bears dark purple fruits in the fall that are edible (as are its flowers), even while the rest of the plant is poisonous. The berries are turned into syrup in different parts of Europe. The fruit has medicinal uses as cough syrup; they are also often turned into dyes, jelly and wine. Because of the sturdiness of the plant’s stems they have been hollowed out and used as spouts as well as musical instruments. It has medicinal uses, including for treating the H1N1 influenza virus. The roots, twigs, seeds, and roots, however, contain cyanide. Its berries are also a valuable food source for birds.

**Holly** (*Ilex*): The holly native to these parts is sometimes referred to as “mountain holly.” Having between 400-600 species of flowering plants in the *Aquifoliaceae*, the species are
evergreen, deciduous trees, to shrubs, and climbers growing in tropical to temperate regions worldwide. This genus is an example of allopatric speciation, some separating from other *Ilex* species as the continents drifted apart, producing a great deal of variation (hence the different types of plants from evergreens to climbers). The fossil record indicates that they were present well before the Cretaceous period, with most of the temperate varieties disappearing about 10,000 years ago by the Pleistocene. The plants that survived the geographical pressures did so in coastal enclaves and archipelagos, farther away from the colder regions. They are very slow-growing plants with simple alternate glossy leaves, typically with a toothed or serrated leaf edges. *Ilex* has small four-leafed flowers ranging from greenish to white. Pollination is carried out by bees and other insects from blooms that grow on different parts of the plants based on the plant’s sex. Besides the small flowers, *Ilex* has small fruits, or drupes, a small berry that is usually red but some range from brownish to dark brown to black (rarely green or yellow). The fruits ripen in winter and while vomit-inducing and diarrhea producing in humans they are an important food source for birds. Holly used to also serve as fodder in the winter for cattle—at least the less spiny varieties—until turnips seem to have displaced it as a food source. Yerba Mate is a type of holly and while the plant is highly toxic, it has been domesticated for the purpose of making it into a beverage considered healthful by different cultures. *Ilex mucronata* is the species native to the NY region. It has smooth edges and dull surfaces, unlike the European ivy that has toothed edges and is shiny. It is also easily identifiable by its fruit which is of whitish to greenish-yellow color, unlike the red European berries associated with the plant from Christmas decorations. Male and female flowers inconspicuous, appearing on separate plants and both sexes are necessary for pollination.

**Honeysuckle** (*Lonicera canadensis*): This is a flowering deciduous perennial with hairless, simple opposite leaves of ovate shape. Typically flowers at the end of April through May, with fruit appearing in early June to late August. The flowers are white and bell-shaped and hang downwards in pairs. The bark is of a silvery color to reddish gray and slightly peeling on the larger stems. The fruits feed many frugivores, including the Robin. Its habitat is dry to moist upland woods, usually occurring in wetlands. It is on the Global Conservation Status list.

**Lowbush Blueberry** (*Vaccinium angustifolium*): Native to central and eastern Canada and the northeastern U.S. this species of blueberry grows as far south as Virginia and as far west as Minnesota and Manitoba. This plant derives its second Latin name from the fact that the plant has narrow leaves (“angust” and “folium”). The leaves are glossy and of a green-blue hue in the summer time, with bell-shaped white flowers and fruit that is dark blue and sweet. It grows best in well-drained acidic soils in forest understory, sometimes growing in such thick stands it is the only plant in any large area. It is fire-tolerant and will colonize an area after a fire. French blueberry growers burn down fields of blueberries every few years in a process called "brûlis" (from brûlé, or burnt). Native Americans, too, practiced this method in states like Maine to stimulate blueberry shrub growth in forests.
Pinxterflower (*Rhododendron periclymenoides*): A 3-6 ft shrub with deciduous simple foliage that turns yellow in fall and is shaped like basil leaves. Tubular flower clusters have vase-shaped showy light pink flowers, with a faint fragrance and two inch stamens. This is a native type of Azalea that grows best in rich humus soils, on the acidic side and medium-range moisture. It can also grow in sandy soils, however.

Northeastern Blackberry (*Rubus semisetosus*): Its flowers have paper-thin white to pale pink petals. A perennial shrub, with biennial stems have compound leaves and bladed edges, bearing an edible fruit that is dark resembling raspberries (which are related plants), though it is not a true berry but rather the result of multiple drupelets. It is reddish in color when unripe and darkens as it matures. The quality of the fruit is impacted by the number of visits made by pollinators. They are a food source for caterpillars and deer, small birds and foxes that spread the plants seeds across wide areas. It is used in various ways for human food, as jam, wine, for deserts, raw, on baked goods, etc. Additionally, they are a good source of fiber and have chemicals for good cardiovascular health. Blackberries are susceptible to fungus and certain types of flies.

Northern Bayberry (*Morella pensylvanica*; *Myrica*): Some of the plants’ other names include “Wax-myrtle,” “Candleberry” and “Sweet Gale.” Listed as Exploitably Vulnerable in NY, Northern Bayberry has a range from the northernmost parts of Canada (found throughout Ontario), as far south as Virginia and as far west as Ohio. It is a spreading branchy shrub, a perennial with simple fragrant gray-green leaves that turn tan and persist throughout the winter in the less temperate regions where it grows. It can grow up to 4.5 m tall and has broad, serrated and sticky leaves that have a spicy scent when crushed. It has clusters of small white, hard, round, and wrinkled berries with a blue-purple waxy coating used for making bayberry wax candles. The berries on the female plant remain over the winter. The root nodules have nitrogen-fixing microbes that help the plant grow in poor soils. It blooms in July and grows in clay, loam and sandy soils. It is beneficial as a food source for many winter birds and attracts butterflies, serving as host for the Columbia silkmoth. While the waxy coating is indigestible for most birds, some have adapted to it, notably the Yellow-rumped Warbler in North America. Bayberry’s essential oil is extracted from the leaves but it is mildly toxic for its high eugenol content. The waxy elements in the bayberry have traditionally been used not just for making candles but as a natural insect repellant because of the chemicals in its leaves. It is also used to spice beer and snaps in Denmark.

Roses (*Rosa*): With over 100 species, the *Rosa* genus belongs to the family *Rosaceae* that consist of climbing plants, shrubs, or trailing varieties, with mostly prickly stems. The flowers range in sizes and shapes but are showy in color and scent ranging from white to yellow, red, and variations of these colors and mixtures as well. Leaves are usually placed alternately on the stem, usually long and pinnate with leaflets sometimes having serrated edges. Most rose species have five petals divided into two lobes, with five sepals below the petals. Most roses are deciduous with an aggregate fruit referred to as the rose hip. What are referred to as “thorns” are actually prickles that are an outgrowth of the plant’s epidermis. Most ornamental varieties are grown for their flower, popular as cut flowers. The rose hips are high in Vitamin C, one of the elements making roses one
of the ingredients in herbal medicine, but they are mainly known for their cultural value based on their aesthetic appeal.

**Carolina Rose** (*Rosa carolina*): “Carolina Rose,” “Pasture Rose,” or “Low Rose,” this shrub in the rose family is another native to the eastern U.S. region, found in nearly all states and parts of the Canadian Provinces east of the Great Plains. It is also commonly found in varied habitats from open woods, to thickets and along roadsides. The stems have straight needle-like thorns throughout, distinguishing it from similar species albeit with curved thorns (like *R. virginiana* and *R. palustris*). It flowers in early summer and has small light pink fragrant flowers.

**Virginia Rose** (*Rosa virginiana*): The “Prairie Rose” or “Common Wild Rose” is the most common woody perennial rose native to the eastern part of North America. It produces pink blossoms that grow alone or in clusters on shrubs that grow up to two meters in height; the plant also produces fruit that is bright red in color, small and round. The stems are covered in hooked thorns and turns color in the fall, from brown to yellow, scarlet, and crimson, for weeks. These colors are evident as the plant is young as well.

**Silky Dogwood** (*Cornus amomum*): This is a native species of dogwood, with opposite simple leaves of elliptic shape, growing from Ontario to Quebec and south to Arkansas and Georgia. Leaves change from green to brown and are shed in the fall and winter. It produces creamy white flowers in cymes, or simple inflorescences, in May or June. With a brown to maroon bark, it has slender stems. Its fruit is a small, deep blue colored berry that like the gray dogwood ripens in late summer. Silky dogwood grows best in wet soils.

**Smooth Sumac** (*Rhus glabra*): In the family *Anacardiaceae*, smooth sumac is among the easiest shrubs to identify as its appearance changes throughout the year (though when it is not fruiting, it can be confused with *R. vermix*, or poisoned sumac). It has alternate compound leaves, with serrated margins that turn scarlet in the fall. It has tiny green flowers produced in dense panicles that stand erect and are followed by dense crimson berry clusters; the flowers appear in the spring and the berries remain through the winter.

**Spice Bush** (*Lindera benzoin*): Also called “wild allspice,” “northern spicebush,” or “common spicebush.” It is a medium-sized deciduous bush with alternate, simple, broad, oval leaves. This is a native from the northeastern US, to Ontario, south to northern Florida and west to Kansas and Texas. It has bright green broad and rounded leaves with thick veins. A genus of 80-100 flowering plants with large, broad alternate leaves that when rubbed slightly gives off a fragrant herbal scent, “strongly spicy-aromatic,” giving the plant its common name. It is mostly endemic to eastern Asia but there are three species native to eastern North America. The fruits are small, black, purple, or red. It grows up to about 5 m and is part of the understory thickets. It produces showy clusters of yellow flowers that bloom in early spring before the plant’s leaves begin growing. This plant also produces berry-like red drupes that are an important food source for birds. But in order to produce berries, both female and male plants are needed. The spice bush
is used by a variety of species of butterflies and moths (Lepidoptera) as food for their larvae. A crucial food source for the swallowtail (Papilio troilus) and the silkmoth (Callosamia promethea). The silkmoth folds the leaves over with silk and the larvae are contained within, marking leaves as though with brown bird droppings. The swallowtail larvae can be found in the wintertime and look like dead leaves still hanging from the branches. Because this is a rich food source for Lepidoptera, it is an ideal plant for butterfly gardens. Both swallowtail and moth present in lesser numbers resulting from the defoliation of these plants. Additionally, birds also rely on its berries for food.

Viburnum (family): Also referred to as “arrowwood” because it grows straight up from the ground and Native Americans used it to make arrows out of it for its straightness. It has “skeletonized” leaves, or deeply marked leaves with hard veins. It can have a burned rubber kind of smell. It has berries and flowers. Viburnum has broad dark foliage, with opposite leaves toothed or lobed, as they come in great varieties. These plants are deciduous, with flowers that range in color from white, to cream, and slightly pink. Besides flowers, these plants bear berries that are spherical, oval, or somewhat flattened drupes that range in color from red to purple. They are popular plants among gardeners for their rich dark leaves, their flowers, and scent. In parks, all existing non-native species get cut down and openings in canopy are heavily planted to counter the spread of invasives.

Arrowwood Viburnum (Viburnum dentatum): A native bush growing from southern Canada to northern Florida, east to Texas, native to the east coast. It has simple, opposite leaves, with serrated edges giving it its Latin name “dentatum,” as in teeth. It fruits in berry-like drupes that are an important source of food to birds for their high fat content. The berries appear blue. The plant’s foliage is an important source of food for butterflies. Flowers are creamy in color and bloom in clusters. The plant is additionally attractive for its color in autumn when its foliage turns yellow to red.

Blackhaw (Viburnum prunifolium): “Blackhaw,” “sweet haw” or “stag bush” are some of the common names of this plant. It is native to the southeastern U.S., from Connecticut to Kansas, and South from Alabama to Texas. It is a deciduous shrub or small tree growing up to 15 feet and 8-12 feet wide. It has a crooked trunk and stout branches with a reddish-brown bark and very rough old stems. The flower buds are ovate and a brilliant creamy white and grow in clusters that remind me of hydrangea clusters. Its leaves are simple, oval and acutely serrated. The berries are of peculiar character with long oval berries that turn a deep purple when ripe. V. prunifolium is aesthetically pleasing to gardeners and is medicinal for a suit of gynecological conditions from premenstrual cramps to helping recovery after birth, and preventing miscarriages.

Leatherleaf Viburnum (Viburnum rhytidophyllum): A coarsely textured evergreen bush or small tree, this species gets its common name from the deeply veined, darkly colored leaves appearing blueish-green on the surface and pale green on the underside. Its stems are a fuzzy brown. This plant produces a
fragrant creamy flower in the spring in clusters, as well as blue berries in June that plump through September and blacken as they mature.

**Maple-Leaf Viburnum** (*Viburnum acerifolium*): A small shrub native to the easternmost parts of North America, it has opposite pairs of lobed leaves, giving the plant its common name as it resembles the Maple leaf. Though its leaves resemble young maples, its berries make it more easily identifiable as a separate species. It has small flowers with five petals and its fruits are purple berries that grow in drupes. Like *V. dentatum*, this plant is also an important food source for birds as well as moths and butterflies.

**Wild Strawberries** (*Fragaria vesca*): “Woodland strawberries” or “Alpine strawberries” are a northern variety that grows an edible fruit. Though they are normally referred to as though synonymous, wild strawberries and Alpine strawberries are distinct; the latter have a reputation among gardeners as actually being rather difficult to grow from seed. Commonly found among trails, plants growing further north need more sunlight than plants in southern areas that get little light. Strawberries are also tolerant of mild fires and a variety of soil types, including stone and gravel. Its leaves are arranged oppositely and are pinnately compound with serrated edges. They bloom in the early summer and its flower is small and white with a bright yellow center. The fruit is bright red, one of the few fruits with seeds on the outside of the fruit. Their taste ranges by cultivar. Strawberries are not true berries. This plant has been invaluable for genetic studies of the *Rosaceae* family in general due to its small genome size, short reproductive cycle, and ease of propagation. Archaeological studies have found that *F. vesca* has been used since the Stone Age for its strong taste. Seeds are known to have been taken along the Silk Road to the Far East as well as to Europe where it displaced the garden variety which was better suited for breeding given its large fruit and greater variation. Wild strawberries, in turn, quickly lose their vigor given their extensive fruiting patterns. This plant has medicinal uses and its stems, leaves, and flowers are boiled for tea to treat diarrhea.

**Witch-Hazel** (*Hamamelis virginiana*): Is a deciduous large shrub growing on average to 6 m tall with a dense number of stems at the base, with stems that are light brown and smooth with an inner bark that is scaly and reddish purple. It has flowers that are pale to bright yellow, rarely bright orange or reddish, with four ribbon-shaped petals and four short stamens, growing in clusters that bloom in the middle of fall and last until the end of fall. Its fruit is a hard woody capsule that splits explosively at maturity releasing two shiny black seeds a year after pollination. Witch-hazel serves as an astringent. Hamamelitannins demonstrate a certain activity that is useful for treating colon cancer. The leaves and bark were used by Native Americans in treating external inflammations.

**Trees**

**American Beech** (*Fagus grandifolia*): Also “North American beech” is a North American native growing along the east coast from Nova Scotia to Ontario in Canada, south to northern Florida, west to Wisconsin and as far south to eastern Texas. The trees in the southern part of the range are sometimes identified as either *F. grandifolia* or *F.*
caroliniana but this does not mean they are distinct in terms of the flora of North America. *F. grandifolia* is a deciduous with a silvery-grey bark that can grow quite tall, 20-35 meters (66-115 feet). Its leaves are simple and sparsely toothed, with winter twigs that are unique among American trees, long and slender with two overlapping sets of scales on the buds. It is a tolerant species that grows well in shade more so than other trees, found in forests in their final stage of succession often associated with Sugar maples, yellow birch, and eastern hemlock, along well-drained moist bottomlands. It is an important tree in American forestry with strong, tough wood, sometimes used for ornamental purposes. The mast—its crop of nuts—is an important food source for vertebrates (wild turkeys, red/grey foxes, rabbits, squirrels, opossums, pheasants, raccoons, ruffed grouse, porcupines, black bears, and humans). Its leaves are feed Lepidoptera species. Now extinct passenger pigeons, too, used the American beech as a valued food source. Their extinction was at least in part driven by the clearing of oak and beech forests.

**American Chestnut** (*Castanea dentata*): This species was wiped out by chestnut blight (a fungal disease) but has grown quite tall in Forest Park, Queens; one of the tallest trees around the city is in this park. It is a deciduous tree, in the beech family native to the northeastern US. It is a prolific bearer of nuts, and its foliage, too, provided an important source of food for white tailed deer, wild turkey and passenger pigeons. Black bears used the nuts to fatten up for the winter. This tree’s nuts were commonly sold on streets around the holidays and are the nuts referred to in the phrase about “chestnuts roasting on an open fire” in Christmas jingle. The wood, rich in tannin, made it resistant to decay and therefore a great source for furniture, shingles, and home construction.

**American Elm** (*Ulmus americana*): Less commonly known as “White Elm” or “Water Elm,” the American elm is an extremely hardy deciduous tree that can withstand very cold temperatures from Nova Scotia, to Alberta, Montana, south to Florida and west to Central Texas. It has alternate leaves, is hermaphroditic with perfect flowers, meaning they include both male and female reproductive units and therefore capable of self-pollination. American elms occur in a variety of habitats, including floodplains, swampy grounds, as well as hillsides and other well-drained soils. It is an important member of four major forest cover types in this region: Black Ash—American Elm—Red Maple; Silver Maple—American Elm; Sugarberry—American Elm—Green Ash; and Sycamore—Sweetgum—American Elm. Its leaves serve as food for various Lepidoptera types. The elm has been susceptible to Dutch Elm Disease (DED). The largest surviving elm forest is in Winnipeg, Canada. Its biology has spared it from extinction, given that its seeds are wind-dispersed and young trees grow quickly bearing fruit at a young age. And while young trees have succumbed to the disease as well, scientists have reason to believe that the original genetic diversity of the population affected by DED will be preserved given the biological advantages just outlined. It has been a popular street tree for its tolerance of high stress conditions, as well as for its graceful shape with a broad canopy that provides great shade. Its wood has few uses because of the tendency of the wood to curve given its contorted fibers which make it tough to saw though the mechanical saw has changed that and since it is easy to screw screws to it the wood has been used for different purposes like making barrels. There are special historical and
cultural significances to a few large elms around the US, in Pennsylvania, Maine, and elsewhere.

**Ash Trees—White and Green Ash** (*Fraxinus*): There are grim predictions for this tree: 10-15 years down the road, they are expected to disappear from NYC. This devastation could be serious and may be worse than the ALB infestation. Ash trees have faced attacks by the Emerald Ash Borer (EAB) from Asia making the devastation by the DED and Chestnut Blight look like mere episodes; EAB threatens 7.5 billion trees.

- **White Ash** (*F. americana*): Upland. The name “white” ash derives from the blueish-grey to green (glaucoous) underside of the leaves that have a “white” or opaque coloring in comparison to the upper side of the leaves. One of the most used trees for everyday purposes, making it a highly cultivated tree. Its wood is hard and white and is the preferred wood for baseball bats. Its wood is very perishable when it comes in contact with ground soil so it is used mainly for indoor construction use.

- **Green Ash** (*F. pennsylvanica*): Grows well in swampy areas. The most widely distributed of all the ashes and is one of the most popular ornamental trees, popular for its good form and its resistance to disease. Hardy in climatic extremes. It is not a very popular street tree despite its resistance to disease and its popularity as an ornamental tree because it is not very long-lived (on average living between 30-50 years, on rare occasion less than 100 years). It has long, slender petiolules, pod like clusters of them. It is one of the first trees to turn colors in the fall and its color is a golden-yellow.

**Bitternut Hickory** (*Carya cordiformis*): Also called “swamp hickory,” is a large pecan hickory. It is a very long-lived hickory, living up to 200 years. It is a large deciduous tree, growing up to 35 meters. Its common name describes the nature of the tree’s nut, a bitter nut related to the pecan. Hybrids between the pecan and the bitternut hickory are known as are hybrids between it and the shagbark hickory. These trees grow in moist valleys along streams, along wet low lands but can also grow in nutrient deficient soils. Its range includes the eastern U.S. from southern New Hampshire, Vermont, Maine and southern Quebec, to southern Ontario, central Michigan, northern Minnesota, south to eastern Texas and east to northwest Florida and Georgia, while most common in the north east. It has a hard and durable wood which makes it good for using in furniture production. Native Americans used it for making bows. Bitternut hickory has a smaller number of leaflets than the pecan and is made recognizable by this as well as by the sulfur-yellow winter buds and its four-valved fleshy cover which splits open in the fall. No other hickory has the sulfur colored buds the bitternut does.

**Black Birch or Cherry Birch** (*Betula lenta*): Native to region, this plant is a medium-sized deciduous tree with a bark that is unlike other birch trees, dark blackish-brown and cracking into scaly plates. The twigs when scraped or chewed have a strong taste and scent of oil of wintergreen. It used to be used for oil of wintergreen before it was synthesized. It has a strong sap that when boiled looks more like molasses. It is a food source for Lepidoptera.
Gray Birch (*Betula populifolia*): A deciduous tree native to N. America from Ontario, to North Carolina. The leaves are alternately arranged, ovate, and tapering to an elongated tip with serrated edges. They are glossy and dark green. The bark is chalky to grayish white. The flowers are wind pollinated. Its wood is medium hard and makes for good material for drum shells, furniture, plywood, and for burning as well.

Black Cherry (*Prunus serotina*): Also “wild black cherry,” “mountain black cherry,” or “rum cherry” is a deciduous tree with dark berries that are edible but tart (fruiting at the same time as bittersweet). It is an east coast native in North America with a range from Quebec and Ontario, down the eastern U.S. to central Florida, and west to Texas, with disconnected populations in Arizona and New Mexico. This species has also found a home in the mountains of Guatemala and Mexico. *P. serotina* can grow up to 30 m tall, with delicate small white fragrant flowers in clusters of 40 or so, on any one raceme and have five white petals and 20 stamens. The leaves are simple and broad with serrated edges. The word “serotina” in its scientific name refers to the “late” time in which the trees bloom in comparison to other cherry species. Wilting leaves are poisonous, containing cyanogenic glycosides that can be deadly to farm animals and removal of dead trees with wilting poisonous leaves is made difficult because the trees grow in large numbers given they take advantage of land clearing and grazing. The cherries are green to red when unripe, turning black when ripe, hence the plant’s common name. The fruit is acidic but also sweet and it is readily eaten by birds and is often used for jams, as well as flavoring soda and in ice creams, a taste favored over sweet cherries for their sharper taste. The fruit are also used for baking and in some instances, for flavoring liquors as well. Trees of this species are recognizable not just by their fruits but by their dark grey to black, very broken up bark that can look like thick burned potato chips, though the bark of young trees resembles that of birches in that both barks are thin and striped. Its wood is sometimes used for smoking foods for the unique taste it lends. Scratching its young twigs gives off an almond scent, making this another distinct identifying factor. Its long, shiny leaves resemble those of the sourwood. Blackcherry is very closely related to choke cherry (*P. virginiana*), even while the latter is categorized as a shrub and has smaller and less glossy leaves. It is a long-lived tree (with some having a recorded age of 258 years) but one that is prone to storm damage and black knot fungus also weakens these trees. It is well-known in the Allegheny National Forest of Pennsylvania. It also serves as host to a variety of Lepidoptera. Introduced as a decorative species to western and central Europe, it has become an invasive species there, negatively impacting forest community biodiversity and ability to regenerate. This species is planted for decorative purposes elsewhere as well. Beyond its fruit, it is also prized for its wood given the “cherry” woods lush reddish color as well as for its hardness and density.

Black Tupelo Tree (*Nyssa sylvatica*): Is grey and flaky when young but becomes furrowed with age, similar to alligator skin. The Tupelo tree is an important food source for migrating birds in the fall, with marked dark blue fruit growing in clusters. Its early changing color is thought to attract birds to it as a food source on their migration. The hollowed sections of trees as limbs decay, etc., make perfect homes for Virginia opossums, squirrels, raccoons, and honey bees. “Nyssa” refers to the Greek water nymph
while “sylvatica” to woodlands where the trees commonly grow. The leaves are variable in shape—from oval to elliptical—as well as in size, alternate and crowded at the end of branches, with shiny upper surfaces and wavy edges. The trees produce small flowers in clusters colored greenish-white. The fruits are oval with 1-3 per flower cluster, of a black-blue color, with an oily texture and sour taste. The bark is scaly and of a light reddish brown color, producing a heavy, strong, yellowish wood. It flowers from May to June when its leaves are barely halfway grown of a yellowish green coloring, with five toothed petals in a cup shape. *Nyssa sylvatica* is found in upland wetland habitats, an important species for its flowers and fruits as food sources for bees and birds, as well as its hollow trunk for den animals. It is a key source for wild honey.

**Box Elder** (*Acer negundo*): Other names include “box elder,” “boxelder maple” and “maple ash.” In Manitoba, it is known as “Manitoba elder” and “elf maple.” This species is a small, fast-growing but short-lived with several trunks that can form impenetrable thickets. *Acer negundo* has pinnate compound leaves, with 3-7 leaflets, unlike the simple palmately lobed leaves of other maples. The leaves are translucent and light green and later turn yellow in the fall. It has small flowers on drooping racemes in early spring, with seeds that are prolific and fertile when they fall in autumn and can sometimes persist through the winter. Occurring in paired samaras, a type of fruit with flattened wing-like fibers that are paper-like, seeds are more easily spread by wind. This species is a sun-loving plant that grows in flood plains and other disturbed areas with ample water supply. Human actions favor this tree as it grows well around houses and in disturbed areas. Several birds and squirrels rely on its seeds as a food source. This was the wood used for Anasazi flutes found north-eastern Arizona, predating the earliest known American flutes by 1,200 years, dated at 620-670 CE.

**Butternut** (*Juglans cinerea*): Also called “White Walnut,” a native species to the eastern U.S. and southeastern Canada is a deciduous tree that can grow up to 20 meters tall and has a light grey bark with pinnate leaves that are a brighter yellow green than many other trees. It has inconspicuous flowers that are yellow-green catkins (which are cylindrical flower clusters sometimes with no petals, making them inconspicuous, containing many unisexual flowers that are wind-pollinated) appearing simultaneously in spring along with the trees’ leaves. The fruit is a nut produced in bunches of 2-6, oblong, and surrounded by a green husk that ripens in the fall. Butternuts grow quickly but are not very long-lived, rarely living longer than 75 years. It grows best on well-drained soils and does not do well at all in compacted and/or infertile soils. It is found in association with other hardwood types like Sugar Maple—Basswood, Yellow Poplar—White Oak—Norther Red Oak, Beech—Sugar Maple, and River Birch—Sycamore, and others like elm (*Ulmus*), *Acer*, *Carya*, and others, and in the northeast also with sweet birch (*Betula lenta*). It is intolerant of shade so it cannot be covered over by forest canopy or it cannot compete. It suffers from “butternut canker” caused by the fungus *Sirococcus clavigignenti-juglandacearum*, which is recognizable on the tree by its dying limbs and cankers on the lower crown. It is also susceptible to fire damage and while generally sturdy, also to storm damage. Because its wood is light, it takes polish well and is soft and easy to carve, commonly used for furniture for these characteristics. Its nut grind and bark were once used for dying homespun cloth between light yellow and dark brown.
Some Civil War uniforms faded from grey to a tan or light brown, which resulted in Confederate soldiers being referred to as “butternuts,” which in association with homespun cloth of the same color gave the soldiers this derisive name. Medicinally, it has been used to treat small pox and dysentery as well as other stomach and intestinal problems. It is listed as “Exploitably Vulnerable” in this region but is on the endangered species list in Canada.

**Chestnut Oak** (*Quercus prinus*): In the White Oak group, *Q. prinus* is native to the eastern U.S. where it is the most important ridgetop tree from Southern Maine to South-Western Mississippi. Sometimes referred to as “rock oak” because of the rocky environments it inhabits, the chestnut oak is an important canopy species in oak-heath habitats. This species is not always great for timber unless grown in good conditions when they can grow straight and strong. It is easily recognizable for its thick and highly ridged grayish brown bark, the thickest among the North American oaks. Its acorns are among the largest among the American oaks. Its leaves are alternate.

**Dogwood** (*Cornus*): Woody deciduous plant with a few species that are herbaceous perennial shrubs and a few others are species of woody evergreens. The *C. florida* is the flowering tree common in the northeast. The common name might have been derived from an older version of “dagwood,” wood used for making daggers. They have simple untoothed leaves and its flowers are tightly clustered. Dogwoods are used as food plants by larvae including the Emperor Moth. Many Christians consider dogwoods religiously symbolic for the shape of their flowers which are cross-shaped and because they flower around Easter time. The Korean Dogwood is being planted more and more around NYC because a fungus has been killing off the native species.

**Hawthorne Trees** (*Crataegus*): The small white flowers resemble the multiflora rose and the berries look like a cross between gooseberries and cranberries. Commonly called “Hawthorne” or “Thornapple,” this plant is a native to Europe, Asia and North America and is a member of the rose family (which explains why its flowers look like the *Rosa multiflora*). They are shrubs or small trees that grow best in temperate regions. They have very variable leaves with serrated edges that grow spirally arranged on long shoots. The fruits provide food for a variety of animals and its flowers provide nectar for a number of insects. The plants also make a great food source for a large number of Lepidoptera species. They are sun loving. The Hawthorne is one of the species highly recommended for water conservation landscapes. The fruit sometimes known as “haw” is structurally a pome containing 1-5 pyrenes that resemble the “stones” of peaches, plums, etc. that are drupaceous fruits.

**Hickory** (*Carya tomentosa*): A great tree with a name derived from the Powhatan language of Virginia. Hickories have pinnate leaves and produce large nuts. “Tomentosa” refers to the coarse hairs on the underside of the leaves that make them more readily identifiable. Growing from Massachusetts to NY, parts of southern Ontario, west to eastern Kansas, south to eastern Texas and northern Florida, it grows especially well in humid climates. It grows best in fertile soils. Trees produce both male and female flowers that bloom in the spring from April to May. Seed production is lengthy,
taking about 25 years and good seed producing years alternate with light years. Squirrels are the primary seed dispersers for this species, but other animals ranging from birds to reptiles and mammals consume them too, including the white-footed mice. Seeds are heavy and large. It provides food for different species of *Lepidoptera*. These are great trees because their wood is firm and hard and resistant to shock, making it a valuable tree in eastern forests, particularly as it combines a lot of different features which alone can be found in other woods but as a combination are found in the Hickory. Hickory is good for burning in stoves and is a favorite for BBQ grilling. Shagbark hickory makes for something similar to maple syrup and has edible nuts; nuts from other types of hickory are too bitter for human consumption but make good animal feed.

**Flowering Dogwood** (*Cornus florida*): This small deciduous tree has a range from southern Maine, west southern Ontario to eastern Kansas, and south to northern Florida and eastern Texas. These plants have opposite, ovate simple leaves that appear to have entire margins but are in fact finely toothed when viewed under magnification. The flowers grow in groups of about 20 per inflorescence of small, inconspicuous flowers of greenish-yellow bracts (or leaves that appear as petals), surrounded by large white, pink or red bracts that appear as petals. Flowers are bisexual typically flowering in April in the plant’s southern range and in April or early May in more northern parts. In forests, they typically grow along the edges of woods on dry ridges.

**Linden Oak Tree** (*Quercus alba*): Believed to the largest White Oak in the U.S. It is a long-lived oak tree, with trees reaching up to 600 years. Its leaves are silvery pink and covered in a soft down in spring. Its bark varies from light gray to dark gray and white. Its flowers appear in May. Its acorns are oblong, light brown and shiny and are a source of food for a number of animals like birds, squirrels, rabbits and deer, as well as Native American groups who regularly consumed them. This tree is adapted to a variety of environments, to dry and moist habitats, and alkaline to acidic soils. Despite this and the other advantages to this tree including a rich canopy for shade, it does not do well in urban conditions especially given its intolerance for soil compaction.

**Mulberry Tree** (*Morus rubra*): This plant’s foliage is very varied, with alternate, lobed simple leaves with serrated edges. It has multiple fruits that are white to green and yellow when immature, of a pinkish color as they mature, and of a dark purple or black when ripe. These plants feed silkworms and birds love it as well, so they are not very good for restorations. Many of the existing varieties are native to warm and temperate regions in Africa, Asia, and the Americas. *M. rubra* is the species indigenous to the NE region. Extensive hybridization with the white mulberry from Asia threatens the native variety. The taxonomy of the plants in this species are disputed, including for reasons having to do with hybridization. The ripe fruit is sweet and consumed in pies, and other foods. The fruit is thought to have medicinal properties so it is often used in jam, wine and other food products.

**Muscle Tree** (*Carpinus caroliniana*): Also “Musclewood.” Small hardwood tree of the hornbeam type, also referred to as “Ironwood.” A native to the region, from MN, to Southern Ontario to Maine. It can reach 20-30 feet, often with a fluted and crooked
trunk. Its bark is smooth and sinewy, hence the common reference to “muscles,” and its color is a greenish-grey with alternate, deeply veined leaves. It is common along the borders of swamps. It is a shade-loving tree that prefers moderately fertile and moist soil. Its range also goes as far south as Central America, including parts of Honduras.

**Northern Swamp Dogwood** (*Cornus racemosa*): Also commonly called “gray dogwood,” is native to southern Canada and the northeastern US. Its common name comes from the shrub’s distinctive grey stems in the form of the plant’s old growth. Its leaves are oppositely arranged, and while the plant grows upwards, it does so in a rounded way. It has white flowers with four petals that grow in clusters produced in May and early June. After flowering, the plant produces fruit that ripens in late summer. The bright white fruit (when ripe) attached to the plants on bright red pedicels, a stem that holds one flower or fruit at a time on an inflorescence. This species provides food for many birds and turns reddish or purplish in the fall.

**Oaks—White, Red, and Black** (*Quercus*): Have spiral leaves and bear acorns (usually containing 1 seed, rarely 2-3). The majority of oaks around NYC are White, Red, and Black Oaks.

- **White Oak** (*Q. alba*): “Shingled” bark. Normally a very tall tree with a bark that ranges between light grey to dark grey and white. It has rounded seven-lobed alternate leaves. It is a very tolerant tree in terms of the different habitats it can flourish in. However, it is not very tolerant of urban conditions because it does not handle soil compaction well.
- **Red Oak** (*Q. rubra*): “Ski slope” pattern to bark. Native to N. America. Dark, reddish grey bark. Alternate leaves with 7-9 lobed oblong-ovate leaves. The most important tree for timber use in US.
- **Black Oak** (*Q. velutina*): This oak has the “puzzle piece” pattern to its bark. It is in the red oak family and it is a relatively small tree. Has alternately arranged bristle-tipped lobes separated by deep U-shaped notches. These U-shaped sinuses on leaves are one of the main ways of identifying the trees by their leaves. They occur on warm, moist soils (in most parts except in New England where they grow on cool moist soils).

**Pin Oak** (*Quercus palustris*): Its Latin name “palustris” means “swamp” because this oak grows well in swampy areas. It is the most common street tree of the oak family which while seemingly an unusual thing given what its Latin name indicates, actually makes sense since tree pits tend to have swamp-like conditions which the trees are adapted to. The wetland conditions it is used to make for shallow root systems used to acidic soils. Its leaves are broad with 5-7 lobes with U-shaped sinuses. Its fall coloration is usually bronze with some red leaves. It is usually associated with silver maple-American elm in forest environments. Native Americans use the bark to make a medicine for intestinal pain. Its fibrous root system makes it easy to transport and propagate, making it a favorable tree for the urban canopy of NYC. The common name, “pin” oak may refer to the many small twigs common on these trees or to the fact that their hard wood (but of significantly lesser quality than that of red oak) made for pins in wooden building construction.
Quaking Aspen (*Populus tremuloides*): The American species shares the same common name with the European variety, as well as “mountain or golden aspen,” “trembling poplar,” “white poplar,” and funny sounding names like “quakies” and “popple,” and many others still. They have a distinctly smooth pale bark with black scarrings and grow quite tall, further making them look very distinct. These trees have glossy green leaves that are dull beneath, making them shimmer in the breeze; they become golden yellow in the fall. But it is not this shimmering that gives it its common name but rather the flexible flattened petioles that results in the quaking or shaking of its leaves. This species proliferates through their roots and thus create large stands that are clonal colonies of one individual. Some clones turn color in the fall earlier than other nearby clones even while they share the same root structure. Though they produce seed, they rarely grow from seed. Propagation by seed is limited given that male and female plants are necessary while clonal colonies consist of individuals of the same sex. Additionally, their seeds lack a protective seed coating and food source, making them viable for only a brief period. This species is the most widely distributed tree in North America, ranging from Canada to Central Mexico, with boundaries only limited by permafrost, to which the quaking aspen is intolerant to. Despite this intolerance, it is found across the whole of the Canadian provinces, and Alaska. Limits to its range in high elevations contain some dwarf varieties. There is an element in their bark that acts like a quinine substitute that was used by Native Americans in the west. Its leaves are a food source for a variety of Lepidoptera. In Canada it is used for pulp for making books and other products. Because it is used for pulp, fire, building, and because it is cleared for agriculture, aspen numbers have decreased. Moreover, this species has also suffered a rare disease that has decimated entire colonies but the cause of the disease is yet unknown.

Sassafras (*S. albidum*): There are three extant and one extinct species native to northeastern America and eastern Asia. The leaves are large broad lobed leaves, with orange-brown bark but a deep red-brown bark in the mature plants. Every part of the plant is fragrant, with a citrus-like scent when crushed. It has tiny yellow flowers that bloom in the spring. There is a rumor among the scientific community that studies supporting the “hazards” of Sassafras were concocted by the beverage industry that wanted to replace Sassafras with synthetic sweeteners, which gave the plant a bad reputation as inducing cancer and liver damage. Sassafras tea can be used as an anticoagulant. It was prized in Europe for its durability as well as for serving as a cure to gonorrhea and syphilis. It was once the second most popular export to Europe behind tobacco. Sassafras is consumed by white-tailed deer in summer and winter. Animals from bears, to groundhogs, butterflies, and many others, use this plant as a source of food. It is one of the ingredients in Gumbo, and its roots are one of the ingredients in root beer.

Sugar Maple (*Acer saccharum*): Looks very much like the Canadian maple leaf, this deciduous native that grows from 25-35 m (82-115 ft). This is an extremely important species to the woodlands of the region because of the associations it makes with different birches and maples, and other common forest associations. These trees are very shade tolerant (most tolerant of deciduous trees), and engage in “hydraulic lift”, which means
they lift water from lower soils to more topical layers benefiting the trees themselves and the plants around them. It is susceptible to pollution and toxins which makes it more vulnerable in particular in urban areas where it has been replaced by the Norway maple. Along with the black maple, it is commonly used for producing maple syrup. This deciduous native tree ranges from the northeast in Nova Scotia, south to Georgia and west to Texas. Leaves are long and wide with palmate lobes. This is the tree that sheds samara fruit, the little paper thin squared U-shaped leaves that spin as they blow through the air. This species is a critical species to northeastern hardwood forests and pure stands of *A. saccharum* are common. It is among the most shade-tolerant species.

**Winged Sumac** (*Rhus copallina*): Also referred to as “Shining Sumac,” is a species of flowering plant in the cashew family, a deciduous tree that can grow up to 3.5-5.5 meters/11-18 feet. This plant is especially valued for its lustrous dark green foliage that turns spectacular orange and red in the fall. It offers a showy display along highways and roadsides as it usually colonizes disturbed spaces. It has tiny greenish-yellow flowers in terminal panicles that turn into bright red clusters of berries late in the year that serve as a food source for birds in the winter. The flowers bloom yellow in the summer. It is recommended for parking lots and median highways as it can handle compaction, poor drainage, drought, and pollution. It is a good reclamation plant. The tree can grow in part shade or full sun and can tolerate sandy, loamy, clay, slightly alkaline, acidic, and well drained soils.

**Cactus**

**Eastern Prickly Pear** (*Opuntia humifusa*): A native cactus in southern Ontario, Montana, west to New Mexico, and south to Florida, “Indian fig,” as it is also called, is a flattened perennial cactus with a bright yellow waxy flower shaped like a bowl that blooms from mid-June to early July on the mature segments of the cactus. The prickly pear also produces fruit that reddens as it ripens from a green color, usually staying on the cactus until the following spring, containing anywhere from 6-33 seeds that are flat and light in color. It is shade intolerant and prefers well-drained soils.

**Fungi**

**Brick Top Mushrooms** (*Hypholoma sublateritium*): Less present than its relative, the inedible Sulfur Tufts (and the edible *Hypholoma capnoides*) it has a fruiting body that is generally larger than either of the other two. While considered inedible and poisonous in Europe in the U.S. and Japan, it is a popular edible fungus. They are found in dense clusters on stumps and roots from October until early frost in New Jersey, Pennsylvania and West Virginia. The caps have a dark brick red coloration in the center with paler margins, sometimes with red-brown flecks in the middle, or with flaky veil remnants that are easily washed off in the rain or otherwise. The gills are crowded, starting yellowish and turning grey as they age. The stipe is yellow and darker below.

**Conks** (Bracket fungi): These resemble mushrooms and grow in wide mushroom like patterns in large clusters, growing on rotting debris. Bracket fungi are defined by their
growth form instead of their phylogeny. This group of fungi contains members of multiple clades, with the term reserved for polypores. Molecular studies so far have revealed that there are some odd relationships among the different clades. It is commonly called “Turkey’s Tail” and that is very much what it looks like. They are parasitic and/or saprotrophic (meaning they conduct extracellular digestion). Some bracket fungi are cultivated for human consumption or for medicinal purposes.

**Honey Fungus** (*Armillaria*): A parasitic fungus that lives on trees and woody shrubs. They are very long-lived and very large organisms. This genus includes 10 species, including a luminescent type that might be responsible for the phenomena known as foxfire and maybe also will o’ the wisp. This is a very destructive fungus, responsible for root disease or “white rot.” Because of its parasitic nature it does not need to regulate its own growth as it can continue to thrive on dead wood. In Manitoba, due to the presence of many Ukrainian immigrants, the fungi is not known as “Honey Mushroom” but rather as pidpenky which means “beneath the stump” named after where they grow on trees. They are highly prized by Ukrainians, considered one of the best wild mushrooms, though they must be thoroughly cooked as they are slightly poisonous. Early signs of white rot caused by *Armillaria* include the dying back of leafy branches and a lack of leaves in the Spring. They can be identified by their concave cap and especially the ring around the stipe. Its ecology is parasitic.

**Milk Caps** (*Lactarius*): These mushrooms are characterized by the milky fluid emitted for which these fungi get their name. Their flesh has a flaky consistency. They have about 400 species worldwide, and their caps differ as well as the color of the latex (fluid) they exude which can be white, cream, orange, violet, among other colors. It is the most prominent genera of ectomycorrhizal fungi.

**Sulfur Tuft Mushrooms** (*Hypholoma fasciculare*): Also known as “Clustered woodlover,” is a common woodland mushroom present when hardly any other mushrooms are. It proliferates widely and in clusters (to which the Latin word “fasciculara” refers to) on trunks, stumps and dead roots of broadleaved trees. It is bitter and poisonous, causing vomiting, diarrhea and convulsions, with a delay from 5-10 hours after consumption. It is smooth and sulfur-yellow with an orangey brown center and whitish margin. Its habitat is among decaying wood given the diminishing lignin content in dying deciduous wood relative to coniferous wood. It appears any time from spring to autumn.

**Turkey Tail Mushrooms** (*Trametes versicolor*): This is an extremely common polypore mushroom found throughout the world. This species gets its common name from it resembling wild turkey tails. They are used in Chinese medicine for enhancing immunity in cases of cancer; they have been found to be useful in clinical trials for the treatment of gastric, esophageal, colorectal, breast and lung cancers. They also have a bioremediation effect, helping with the biodegrading of various pollutants. These mushrooms can serve as food for certain caterpillars as well as for the maggots of *Platypezid* fly. They have a leathery texture, with their caps showing concentric zones.
Exotics

Bachelor’s Buttons (Centaurea cyanus): “Blue bottle,” “Cornflower,” “Boutonniere Flower,” “Hurt Sickle,” and “Cyani Flower,” are some of the other common names for this small annual flowering plant in the Asteraceae Family. *C. cyanus* has grayish-green stems, lanceolated leaves, with flowers produced in small flowerheads of a strong blue color. It used to grow as a weed in corn fields but is now endangered in its natural habitat due to agricultural intensification especially given the over use of herbicides that destroy its habitat. For this reason, it has been included in the List of 101 species PlantLife is working to bring back from the brink. It has become naturalized in North America and Australia from Europe and given its beauty it has been introduced into gardens as an ornamental plant. As a cultivar, it has been bred in different pastel colors including pink and purple. It is used as a cut flower in the Canadian flower industry. Cornflowers are commonly used in herbal tea blends, of special fame in the Lady Grey Twinings blend. In folklore, the flower was worn by young men in love whose loyalty or the truthfulness of their feelings were gauged based in terms of how quickly the color faded from the flowers they wore. As a medicinal plant, a wash using cornflower is helpful for treating conjunctivitis or for treating tired eyes. Some of the north-European countries use it as the symbol of a region or as the symbol for a political party (as is the case in Finland, Sweden, Estonia, and others). It has special meaning in Prussia as well where the military uniforms are of the same color, and where Queen Louise of Prussia was fleeing Berlin and escaping Napoleon’s soldiers, she and her children hid in a field of cornflowers and to keep them quiet, she weaved garlands of the flowers for her children. The flowers were also used in the funeral wreath for Egypt’s Pharaoh Tutankhamen. In France, it is the symbol of Armistice 11th of November 1918, which has made it a common flower for veterans. It was JFK’s favorite flower as well, which was then worn by his son on his wedding day in honor of his father.

Burdock Root (Arctium): This root is a member of a number of species in the biennial thistles. This thistle has dark green leaves that are coarse and ovate, as well as identifiable heart-shaped lower leaves, hollow stems and prickly heads that easily catch on fur and clothing, as well as birds’ feathers, sometimes trapping birds to their death. It gave the inventor of Velcro the idea for an adhesive based on its texture and the hooking quality of its fibers. Lepidoptera use it as a food source and their roots are consumed by people in different countries as a root vegetable with a sweet taste and pungent scent. It used to be a bittering agent for beer used in Europe and as Bur oil for topical treatment of the scalp. In Chinese herbal medicine it is used as a purifying agent.

Burning Bush (Euonymus alatus): A non-native species favored by gardeners from Eastern Asia, China, Japan and Korea, that is best avoided. It is legally banned in Massachusetts and New Hampshire because it has become an invasive in those states. The word “alatus” is from the Latin word for “winged,” referring to the shrubs four corky ridges, or “wings.” The common name refers to the fiery bright colors the bush turns in autumn.
Chinese Lespedeza (*Lespedeza cuneata*): Also known as *Sericea lespedeza*. As its common name suggests, it is a native to Eastern Asia. It is a warm season herbaceous perennial that can grow between 3-5.5 feet tall with leaves that alternate along the stem. Each leaf, in turn, is divided into three smaller leaflets that are oblong and pointed, and also covered densely with flattened hairs that give the plant a silvery appearance. It has a woody stem that is fibrous when mature, with stiff, sharp, flattened bristles. It bears a flower that is creamy white to pale yellow that blooms singly or in clusters from late July to October. This plant is a threat to meadows, prairies, and open woodlands, as well as wetland borders. Its prolific seeds become embedded in the soil where it develops an extensive seed bank that makes it difficult to eradicate it and doing so is important because it crowds out native plants through thick stands. Its high tannin contents make it unpalatable to native wildlife and livestock, further promoting its growth. This plant occurs throughout the eastern US, to Minnesota and Texas, and as far south as northern Florida. It was first introduced in the southern U.S. for the purpose of bank stabilization, for foraging and cover, and soil improvement. The plants are commonly treated with herbicide but the chemicals used are not always cleared for wet areas.

Common Chicory (*Cichorium intybus*): An herbaceous, somewhat woody perennial with bright blue flowers. It is also commonly called “blue sailors” and “coffee weed.” It has a tough grooved and somewhat hairy stem and flowers from July until October mostly with flowers of a blue color, rarely in white or pink. The leaves are eaten as greens in salads, is commonly used as an additive roasted as a coffee substitute, and in its cultivated forms looks a bit like lettuce (e.g. radicchio, endive). As a coffee substitute, it has been used in various places from Germany to New Orleans during periods of scarcity. Chicory is known for its high levels of toxicity that while existing throughout the plant, are concentrated at the root. Chicory is thus used for treating internal parasites and is used widely as a forage supplement. It has been used regularly in Germany to treat gall stones, sinus problems, and gastroenteritis. It is also a popular for foraging, particularly a variety pioneered in New Zealand. The cultivated chicory plant dates back to Egyptian time and has been used in various ways over time, for example with Medieval Monks in Europe growing the plant. Familiarity with this plant led to its use as an additive in coffee when coffee was introduced to Europe from the new World.

Japanese Holly (*Ilex crenata*): An escaped garden plant, it has spread in some wilderness areas. It is a species of holly from Eastern Asia that is an evergreen shrub or small tree with glossy, small dark green leaves, a white flower, and a black druped fruit containing four seeds.

Japanese Pagoda Trees (*Styphnolobium japonicum*): These trees are from a very small genus of three or four species, formerly classified under the genus *Sophora*. They are often used in bonsai gardening but make attractive street trees for their compound, shiny waxy foliage and their summer flowering which makes for an attractive display after many other trees have bloomed. It is planted because it is tolerant of poor urban soils and poor air quality, also for being relatively disease- and insect-free.
Periwinkle or Myrtle (*Vinca minor*): “Common periwinkle” or “creeping myrtle” are two of its other common names. It is a trailing viny shrub that creates clonal colonies close to the ground, rarely climbing vertical surfaces. It has waxy, dark and shiny green leaves with smooth edges (different from the hairy edges and larger leaves found on *V. major*). These leaves sometimes have a hint of a blueish-purple hue that hints at the color of the plant’s blooms sprouting in early spring to early summer months. The color “periwinkle” is derived from the color of this plant’s flowers. Because it has few natural predators and spreads easily in moist temperate areas in a variety of soils, it is a favorite plant among gardeners, especially because it smothers weeds and provides an attractive ground cover. Eradicating it requires pulling it up completely by the roots and repeated chemical treatments. Spraying while the plant is in place is not enough as its leaves shed herbicides easily.

Sarsaparilla (*Smilax regelii*): Derived from the words “shrub” (zarza) and “little grape vine” (parilla). “Wild Sarsaparilla,” “False Sarsaparilla,” “Wild Liquorice,” “Rabbit Root,” “Shot Bush,” or “Small Spikenard,” are some of the common names for this plant, a native plant to Central America. The plant produces large compound leaves that are finely toothed along the edges, also growing tiny white flowers in the spring that grow in globe-shaped clusters, usually in threes. It has broad, almost heart-shaped leaves with curly vines (like grapes) and bears red berries. This species is so common in habitats like northern hardwood, beech-maple, and hickory forests that serves as an indicator species for the existence of these habitats. It is used for candying and flavoring, like sassafras. It is an ingredient in sodas, like old-style root beer, and there is a drink by this name (spelled slightly different). It has antioxidant properties that make it a medicinal plant, used for treating herpes, eczema, as well as syphilis (which is one of its early uses when introduced to the Americas). There are Honduran and Jamaican varieties of this plant that bear those countries in their common names.

Skimmia japonica: This variety has no common name. This plant is an ornamental shrub with creamy yellow to white flowers and small round berries ranging in color from red to purple. It is frost resistant and has several cultivars. It is originally from Japan, as its name suggests and is grown in Chinese and Bonsai gardens.

Invasives

Asiatic Bittersweet (*Celastrus orbiculatus*): “Oriental bittersweet,” “Round-leaved Bittersweet,” or “Chinese Bittersweet” is an invasive in North America. This species can hybridize with the native bittersweet (*Celastrus scandens*). The most distinct element of this plant is its thin, spindly vine of silver to reddish brown bark with white spots. Its leaves are round and glossy and grow in an alternate pattern. Its roots are poisonous and of a bright orangey-brown color. The vines wrap around trees so tightly that they can choke the life out of trees. The plant is poisonous throughout (as in all parts contain toxins). Before anyone realized it was an invasive, this plant used to be used along roadsides to control erosion. They have made popular holiday decorations because of their bright orangey-reddish berries and colorful vines. The plants can form dense
monospecific stands that affect community structure for other plants and in this way eclipse native species. When there is a large colony of this plant, the best way to get rid of it—after asking an expert to verify the species since they look very much like the native bittersweet—is to pull up the plant community at the root and apply glyphosate which is best to do in the wintertime; many other herbicides are not very effective on oriental bittersweet though it seems to be sensitive to RoundUp. It is one of the top 10 worst invasives.

**Barberry** (*Berberis*): Also referred to as “Pepperidge Bush.” This is another invasive with a purple leaf that is a gardening favorite. It is a cultivar that reproduces asexually. It has edible berries, rich in vitamin C with a very sharp flavor, and used medicinally. These plants are also used ornamentally and even for crime prevention since the bushes grow very thick and are thorny, deterring break-ins. The flowers and berries grow in close racemes and the foliage turns attractive vibrant colors making it additionally appealing to gardeners. It is also a favorite for Lepidoptera, especially the Mottled Pug.

**Chinese Cork Oak Tree** (*Quercus variabilis*): This is the tree featured in *A Tree Grows in Brooklyn*. It is a real problem around the city. It is extremely allelopathic, working very much like garlic root in how its smell contributes to its increased survival chances. Its leaves smell like stale peanut butter and the tree itself smells worse, especially when cut down. There are very few female trees; sometimes it is unisex so getting rid of it is a challenge. Roots and bark are a neon yellow color. The Chinese use this tree for medicinal purposes. Its flowers are wind pollinated and its bark is corky with deep fissures, giving it its common name.

**Common Reed** (*Phragmites australis*): There is some debate over whether the common reed is introduced or native, as there seems to be very little visible difference between the European and American varieties but the European species is much more vigorous. The acid released by the plants is transformed into two toxins by ultraviolet light. This toxin is harmful to seedlings and other susceptible plants growing in the common reeds’ vicinity. In addition to producing Gallic acid, *Phragmites* produces thick stands spreading runners throughout the area, helping it spread quickly. It grows tall (over six feet), as floating mats in standing water or moist ground. It can grow in environments with high salinity and is therefore commonly found in estuaries and marshes. The plant flowers in late summer, its bloom taking the form of a large purplish panicle. *Phragmites* can be useful for phytoremediation and is planted along sites for processing grey water. Its reeds are used for basket weaving, for making a particular type of flute, and sometimes for consumption of its young shoots. It is also consumed by grazing goats, which is one way of controlling this plant’s growth since grazing animals weaken the plant and it either grows only as tall as other grassland plants or eventually disappears altogether.

**English Ivy** (*Hedera helix*): A common species found in gardens, this plant has become an invasive in parts of the U.S. for its ability to choke out other plants and create fields of monoculture when growing horizontally and killing trees when growing vertically. Its name “helix” refers to the way in which it winds round and round, and it does this on
trees as well as buildings, growing an extensive root system that can cause damage to buildings, including a scarring that requires resurfacing. It also makes for great habitat cover for mice and other unwanted animals. It has medicinal uses: its berries and leaves provide relief to coughs, and its leaves are also useful for making a wash for sore eyes.

**Garlic Mustard** (*Alliaria petiolata*): This native to Europe, parts of Africa, central Asia, and others was imported here by the Dutch as a biennial herbaceous culinary herb that increased available food during early settlement; it provided a real advantage during the periods of hunger endured by new settlers. The leaves get bitter the longer they mature. They form clumps of round dark and textured leaves growing close to the ground in their first year that are used as salad greens or for pesto sauce. In their second year, they form densely clustered, white cross-shaped flowers. Each plant contains seeds in rows where there can be 1,000 seeds in one plant. This vast quantity of seeds is released in mid-summer so it is important to pull the plants before they go to seed. It is one of the plants on the list of most noxious plants in this part of the U.S. They contain allelochemicals which suppress mycorrhizal fungi from growing which is what enables them to proliferate so vastly, making them invasive. Seeds can germinate for up to five years, and because white-tailed deer will not eat them because they produce chemicals that make it unpalatable to animals, and will eat other plants instead, making garlic mustard especially advantaged over native species. Additionally, deer stomp the ground where garlic mustard grows making their spread hard to contain.

**Japanese Honeysuckle** (*Lonicera japonica*): A native to East Asia, this vine has round smooth leaves with white flowers that fade to yellow and are sweet-smelling. It is an invasive that can grow up to 10 meters (33 ft) or higher. Getting rid of the plant is a labor intensive process that requires soil depletion of nutrients, applying glyphosate immediately after cutting; herbicide must make direct contact with root. Besides bittersweet, this is a very tough to kill plant, especially because it is an evergreen (which is literally translated from Chinese as “winter enduring vine”). They have anti-bacterial and anti-inflammatory properties and are used in Chinese Medicine to treat fevers, influenza, and ulcers (sometimes in conjunction with Forsythia).

**Japanese Knotweed** (*Fallopia japonica*): This large herbaceous plant perennial native to Japan, and other Asian countries, is one of the most persistent invasives around NYC. It has hollow stems with raised nodes that make it look like bamboo, especially after it has died back for the winter when hollow shafts of a pale color are left above ground once the plant has died back. Its leaves are broad and oval, its flowers small erect racemes, cream or white in color, blooming in late summer to early fall. It is listed as among the 100 of the worst invasive species. It is very damaging to infrastructure because of its very strong root system. Its rhizomes can withstand cold temperatures, and the plant is adapted to a variety of soils, making it easier for it to spread as well as making it especially hardy. In order to eradicate this plant, it is important to kill the roots, which is difficult because of the extensive root system. The plant needs to be cut back for several years above ground as well in order to weaken it. Despite being an invasive, it is valued by beekeepers for their flowers which provide a type of nectar referred to as “bamboo honey” to bees at a time of the season when there is little else in bloom. Its young spring
shoots are also consumed by humans much like rhubarb for its similar sour taste, albeit more intense than rhubarb.

**Mile-a-Minute** (*Persicaria perfoliata*): Also referred to as “Devil’s tail,” “Devil shield,” and “Tearthumb,” for its persistence, the shape of its leaves resembling a triangular shield, and its thorny quality that tears at fingers when pulling the vine. It is an annual trailing vine native to eastern Asia. Its most characteristic features are its light green triangular leaves and downwardly-barbed stems. It has small white flowers that are not very showy; its fruits are more conspicuous than its flowers, with a black or reddish-black seed. It colonizes areas with poor soils, does well in warm weather, growing wildly in edge habitats, and disturbed areas like road shoulders. It is found in prolific numbers throughout NYC’s parks. Its inconspicuous flowers do not require pollination by insects, particularly since it is a prolific seed producer. Birds and ants are the primary seed dispersers. Deer, chipmunks, and squirrels also seem to consume the vine’s fruit and could be contributing to its spread. Pulling it before it seeds is the best traditional method for keeping it under control and pulling it is not difficult.

**Mugwort** (*Artemesia vulgaris*): This herbaceous plant was brought over by the Dutch to flavor beer before hops was used. It has an herb-like smell when pulled up, and a somewhat unpleasant smell is also a way of identifying this plant. It is a very common plant in nitrogenous soils and is therefore very common along roadsides. It is an herbaceous perennial plant with a woody root. Mugwort has medicinal properties. In Medieval times, it was used as an insect repellant especially in gardens; it was used on feet by Roman soldiers wearing sandals to protect against fatigue; and it also has magical references, used by Pagans as early as the tenth century. The buds and leaves were used shortly after flowering for flavoring fat, meat and fish with its bitter quality. In Ayurvedic medicine this plant is used for cardiac illnesses. In traditional Chinese medicine, it is even used to assist in breech births for repositioning babies’ skulls. Mugwort pollen is one of the main causes of hay fever and asthma, with its highest concentration being between 9-11 AM. Its pollen flies only a short distance, so cutting the plants down can relieve allergies.

**Multi-Flora Rose** (*Rosa multiflora*): A rose species native to E Asia, China, Japan and Korea, multi-flora rose is a climbing shrub that can choke out other plants. It is now considered one of the top 10 invaders despite being encouraged in the 1940s as a natural hedgerow for bordering grazing, as a response to soil erosion, and to attract wildlife. Their leaves can be used for identifying the plant because they are very rough with pronounced veins that are thick and prominent. They usually have small white flowers found throughout the whole of the plant.

**Norway Maple** (*Acer platanoides*): Eastern and Central European and Southwestern Asia native that grows so robust its canopy blocks sunshine from penetrating the forest floor, changing the plant communities in areas where these trees grow. This is one example of how non-native plants can significantly alter habitats. It has a gray-brown bark that is slightly grooved and yellow-green flowers with five sepals and petals that bloom in the spring before the leaves sprout. The leaves are palmately lobed with five
points with each lobe having 1-3 teeth and otherwise smooth, and a point in the center that is “threadlike” rather than rounded as in the case of the sugar maple. It also emits a milky substance when a leaf is cut, which the native sugar maple does not secrete. Because there is no herbivory in the case of the Norway maple and because it secretes substances into the ground that suppress undergrowth, the result is bare muddy conditions that produce runoff when it rains. For these reasons, it is seen as an invasive and has even been banned in some states. Though these are long-lived trees, they have short existences in NYC, living hard and short lives. They do not have enough room above or below ground for growing as large as they can get, which can mean roots girdle and kill the tree. Its shallow roots can also pose problems for sidewalks and tend to prevent other plants from growing around the tree. It grows fast and lives a short, harsh life outside its native range, leading one NRG staffer to identify it as the “rock star” of trees.

**Porcelain Berry** (*Ampelopsis brevipedunculata*): This is an ornamental vine native to areas in the Asian continent that has been cultivated for gardens. It is generally similar to—and therefore often confused with—wild grapes (*Vitis* genus). It has a distinctive medium blue fruit and is an invasive in both urban and pastoral settings in the region. It is easily identifiable by its strangely colored blue berries that appear as though made of porcelain, giving the plant its common name. Its leaves have serrated edges with distinct veining and almost heart shaped.

**Tree of Heaven** (*Ailanthus altissima*): “Malodorous tree,” is the literal translation from its Chinese name, as this tree comes from northeast and central China to Northern Korea. It is a deciduous tree in the Simaroubaceae that grows rapidly, sometimes reaching 15 m (49 ft) in 25 years. Despite being the fastest-growing tree in North America, they are short lived trees, living up to 50 years. While the tree prefers moist and loamy soils, it is highly adaptable to different conditions and pH values. It is able to grow where few other trees can grow and its aggressive root system can cause damage to sewers and pipes.

*Ailanthus* has a long and rich history in Chinese lore and herbal medicine, used and revered for treating a variety of diseases including mental illness and baldness. The roots and bark are still used in Chinese medicine mostly as an astringent. Its leaves can be used internally inducing incoherence and sleepiness, or externally for treating boils, abscesses and itchiness. Besides its medicinal uses, it is also grown for breeding the Ailanthus silk moth for making silk. In addition to the silk moth, other species of Lepidoptera also use it as a food source. While an invasive, this tree has made American lore, popularized by the novel *A Tree Grows in Brooklyn*. Brought to Europe in the 1740s and North America in the 1780s, at a time when *Chinoiserie* was dominating European art, it was believed to be an attractive garden specimen but soon came to be undesirable given its smell and its suckering habits, with sucker shoots appearing a distance from original trees. Perhaps because of this (?), it can quickly take advantage of disturbed areas, out-competing other species with it allelopathic chemicals, particularly its production of ailanthone, which inhibits growth in other plants, thus providing an advantage other species; the inhibitor is just about in all parts of the plant but especially in its bark and roots. It is considered a noxious invasive in other countries besides the US. Despite cutting, the tree can re-sprout quickly, making it difficult to eliminate. It is
an opportunistic plant that reproduces quickly through the plethora of seeds it produces, as well as by shoots. Studies in a hemlock-hardwood forest in NY have found that it utilizes a “gap-obligate” style for spreading quickly over short periods of time (rather than growing slower over longer periods of time), taking advantage of gaps in the canopy as the term suggests.

Ailanthus is one of the most pollution tolerant trees, absorbing even sulfur-dioxide through its leaves. High levels of Mercury have been found built up in the tissues of the plant. It can withstand cement dust and fumes from coal tar operations, as well as resist ozone exposure quite well. Because of its ability to withstand pollution, it has been used to re-vegetate where acid mine drainage has damaged places. Despite its resiliency to harsh elements it is not very tolerant of shade. It also has a defense mechanism for guarding against auto-toxicity, shown by a study using herbicides that discovered that the seedlings of the tree are not harmed as those of a variety of other plants when exposed to chemical spraying. It has acquired the urban names of “Ghetto Palm” and “Stink Tree.” It is also counter-nicknamed “Tree of Hell” because of its prolific nature, a play on its common name but underscoring its invasive character.

Until 2008, a Tree of Heaven was the centerpiece to the Noguchi Museum’s sculpture garden where Noguchi had spared the tree after buying the property. It had grown to be 60 feet tall and Noguchi and his friends and staff would sit under the tree to have lunch. It was found to be dying around the time the building would be undergoing renovation, so the Detroit Tree of Heaven Woodshop, an artist collective, was hired to take down the tree and create benches, sculptures and other amenities with it that are now found in the renovated grounds of the Museum. Upon counting the rings, the tree turned out to be about 75 years old. The Noguchi Museum staff hoped it would regenerate from a sucker.

**Wineberry** (*Rubus phoenicolasius*): A non-native with delicious berries very much like raspberries. A species of raspberry that is a perennial bearing biennial stems. It was introduced as an ornamental plant but has escaped cultivation and is now an invasive in Europe and the northeastern US. It grows in nutrient-rich soils so it does not need nutrients from insects. Native to China, Japan and Korea, this plant was introduced to the region for its potential for hybridizing with the native raspberry. It normally does not produce any flowers and in its second year it grows side shoots rather than grow taller. Flowers come in the second season in the late spring on short and bristly racemes. The fruit is orange to red and produced in summer or early autumn. The fruit is covered in a protective calex that is coated with hairs that produce a sticky fluid. Despite its sticky fluids and hair, it is not an insectivorous plant and does not get its nutrient from insects but rather from nutrient-rich soils.
**Fauna**

*Marine Life*

**Shell Fish**

**Oyster** (*Crassostrea virginica*): A bivalve mollusk with a hard calcium shell, oysters are great cleansing agents, suckering in detritus and plankton. This function in their ecosystem makes them a foundation species, or a species with a strong role in their habitat, as well as ecosystem engineers, or a key species for rebuilding healthy ecosystems. In addition to cleansing waterways, they provide a hard substrate like corals do that create habitat for a variety of other species, thus improving diversity where oyster beds are found. The complex reproductive cycles of oysters are water temperature dependent (therefore regional variation is typical), after reaching sexual maturity at four months. Energy is stored through late summer and early fall for producing between 75-150 million eggs. Once the gametes have begun maturing in late spring, they are deposited in the water column where they are fertilized. The larvae are free swimming with small shells and developing a hinged shell between 12-24 hours. They sink to the bottom and attach to a hard surface, especially more mature oysters, remaining hermaphroditic for about a year. Males can change to females once for the first and second spawning, and females can change back to males after that. See Mark Kurlansky’s (2006) social history for details on oysters and their cultural importance in NYC.

**Fish**

**Bluefish** (*Pomatomus saltatrix*): A fish of temperate and subtropical waters found in many parts of the world, but in the eastern coast of the U.S., they are found on most of the continental shelf in energetic waters like beaches, though also in estuaries and brackish waters. They migrate north by April, periodically into the open ocean traveling in schools. As adults, they feed on schools of forage fish, as bluefish are aggressive and fast swimming. The fish they consume depends on season and area so varieties range from sardine like fish to striped anchovies. They can bite pretty severely, nipping through gloves used by fishermen to handle them and it is advised that people should refrain from wading in waters with schools of bluefish. They are highly coveted as sports fish and for consumption, filleted or fried.

**Red Snapper** (*Lutjanus campechanus*): Found primarily in the Gulf of Mexico, it is sometimes found as far north as Massachusetts, with a range of habitats based on their growing need for cover as they get larger as they mature and their dietary needs change. They live in numbers of fish of about the same size, staying close to reefs where they live in large schools, being a gregarious fish. In addition to reefs, they will also live next to settings like oil rigs and ship wrecks. They are prized as food caught both recreationally as well as commercially. They are caught with baits that include live bait, cut fish or artificial lures, though they will pursue the latter less. They nibble and pick at the bait and must be reeled in carefully. The rates of catches are monitored because their numbers are of concern, especially because young red snappers get caught in shrimp traps.
making them especially vulnerable. Commonly on menus nationally, genetic studies have found that they are often substituted for less expensive fish in many restaurants.

**Striped Bass** (*Morone saxatilis*): “Pimpfish,” “Rockfish,” “linesider,” and “striper,” are some of the other common names used for this fish. They are one of the saltwater fish of New York, having a native habitat from the St. Lawrence River to the Gulf of Mexico by Louisiana, and have been introduced to lakes around the U.S. They spawn in freshwater and are fully adapted to that environment as well. The Hudson River is one of their natural spawning areas. Hybrids of striped bass and white bass are among the species commonly used to stock lakes outside their natural range. They have a long body, striped longitudinally with dark colored stripes from behind their gills to the base of their tails. They can grow up to more than six feet, but are commonly about half that size, and can live up to 30 years. As of 2007, they are a protected game fish. While their numbers had plunged throughout the 1980s, they have recovered and healthy populations of various ages are now reported by the Atlantic States Marine Fisheries Commission.

**Warmouth Bass** (*Lepomis gulosus*): Also commonly called “warmouth sunfish,” “Redfish,” “Molly,” “Red-eyed Bream,” and “Strawberry Perch,” this fish is darkly colored in mottled patterns, generally with a golden belly. Males have a bright orange spot at the base of their dorsal fins. They range in size from 4-10 inches (10-25 cm), with reddish-brown streaks radiating from their eyes. It has a heavy body with a large mouth. The warmouth bass is mainly a southern fish, having a range from the mouth of the Mississippi to the Gulf of Mexico and the Atlantic coast. It has a western range throughout Texas and the Rio Grande as well as a northern one, in the Great Lakes basin. They are a hardy fish that can live in water with little oxygen, in rivers, ponds, and backwater streams. They are highly adaptable, preferring slower moving waters that tend to have pollutants that settle in the water. They spawn from May to July on rock and gravel substrates, and unlike other fish, they do not nest in colonies. Females lay their eggs and males inseminate them and aggressively defend their nests until after the eggs have hatched. The males’ eyes turn red at this time, and they typically grow faster than females. Because they are not migrating fish, they are relatively easy to manage, with management including monitoring pollutants, population levels, and effects of pollution on the fish. This monitoring is conducted by sampling water once a year for 10 years, followed by five-year testing cycles after that.

[Other fish found in NYC listed by the DEC’s Fish Atlas include: Bowfins, Lampreys, Minnows and Carps, Mooneyes, Mudminnows, North American Catfishes, Perches, Pirate Perches, Paddlefishes, Sculpin, Sticklebacks, Sturgeon, Suckers, Sunfishes, and Trouts. None of the fish on this more expansive list were spotted or discussed by participants during fieldwork but are included here to provide a sense of the diversity of fish around NYC.]

**Insects**

**Asian Long-Horned Beetle** (*Anoplophora glabripennis*): Or ALB for short is also known as the starry sky or sky beetle for the 20 white spots on its shiny black back.
These beetles can fly for short distances given the limitations imposed on it by its size and weight which means that infestations can be curtailed if caught early as the insects cannot disperse very far, very quickly. Fecundity is affected by different factors such as the larval host plant and ambient temperature. Because larvae do not pupate before reaching a critical weight, they can winter and usually take a year or two to complete their life cycles. They lay their eggs in the same trees where they emerge as adults. The gallery development and exit holes severely affect the health of trees, weakening their integrity. In its native environment, ALB primarily affects trees in the genera *Acer, Populus, Salix,* and *Ulmus.* In the U.S., it has feasted primarily in *Acer* followed by *Ulmus* and *Salix* but has completed development on other species including *Betula, Populus, Pruna,* and a few others. Infestations can be detected by inspecting for exit “D” shaped holes on the larger branches of the crowns of affected trees displaying yellowing or lacking leaves when there has otherwise been no drought. Sometimes there is sap and “frass” (or sawdust) present on the ground or lower branches. ALB has been present in the U.S. since 1996 when discovered in Greenpoint, Brooklyn, believed to have arrived in the U.S. in wood packing material. ALB has cost NYC about 6,000 trees; thousands have also been lost in other cities as well. Packing material in China is made to be kiln dried or treated to guard against future infestations. These beetles have the capability to significantly alter the composition of hardwood forests in North America. Some of the information for this entry was collected at the Citizen Pruner 2011 training program led by Sam Bishop, TreesNY arborist.

**Bed Bug** (*Cimex lectularius*): With six life stages, and sexual maturity achieved only at its mature stage, the bed bug molt six times before achieving sexual maturity. Each of its prior stages lasts about a week each depending on temperatures and food availability. Males pierce the abdomen of females and inject them with their hypodermic genitals, with sperm traveling to storage areas and fertilization eventually occurring in the ovaries. Males try to mate with the largest bed bugs, sometimes leading them to mate with other males but the eggs produced in those cases are sterile. They have mandibles and maxillas that are elongated and “beak-like” for feeding. The blood pressure of their prey facilitates feeding for bed bugs. They can live up to a year without feeding in colder temperatures. They are attracted to their prey through carbon dioxide and also by temperature; they cannot tolerate very high levels of carbon dioxide, however. Adults are of a light-brown to a reddish color, oval-shaped, and flattened with no hind wings but vestigial front wings that appear more like pads. Nymphs are translucent. They communicate about nesting and feeding through pheromones. Their management can include pesticide and non-pesticide solutions. Steam cleaning and sealing everything in plastic, vacuuming and washing are all means of treating an infestation, as well as disposing of contaminated materials. Using pesticides is common to gain control over the possible spread of these insects more quickly.

**[European] Honey Bee** (*Apis mellifera*): Etymologically the scientific name means literally, honey-bearing bee. Native to Europe, Asia and Africa, this honey bee is an introduced species in the Americas. It has many subspecies resulting for its vast spread and genetic isolation from other groups as it spread over a large range. The queen lays her eggs in mid- to late-winter in preparation for spring, following a nuptial flight with
drones that inseminate her with enough semen for fertilizing eggs over the course of a few years. She lays less fertilized eggs closer to the end of her life. They have been observed to live up to eight years but beekeepers exchange queens every year or every other year to ensure that they will produce the optimal amount of worker bees. Drones die after mating or are kicked out of the hive in more temperate regions since they do not collect pollen and therefore do not contribute food to the colony. They die from the cold and starvation. The worker bees tend to the hive in their first days of life, cleaning and feeding larvae, later building cells, receiving nectar and pollen from older bees. The rest of their lives are spent foraging. “Royal jelly” is consumed by the queen and her attendants in the first three days of the larval stage, later switching to a diet of pollen and nectar. Only the queen is fertile so any fertile eggs laid by worker bees are haploid eggs, which develop into drones. Drones mate only with the queen and not with worker bees. Changes in queens happen when a queen is weak and her pheromones are decreased throughout the hive, when the queen suddenly dies, or when the population gets to be too large, at which time a queen will take half the workers and settle elsewhere leaving behind a younger queen with the other half of the workers. Two young virgin queens can emerge. Virgin queens will seek out drones congregating from different hives in one place; she is detected by them by her smell. While they use pheromones for sending out a number of messages like colony recognition, alarm, and others, they also use the round and waggle dances as a means of relaying messages to others. They use these dances to communicate to other bees the location of rich sources of nectar and pollen. The round dance communicates distance and the waggle dance provides details on location of food sources in relation to the hive and other organisms. A great deal of scientific interest has been paid to bees due to their social structure and their means of communication. Beekeeping, too, has contributed to sustained attention to them. More recently, bees have garnered a lot of attention because of a phenomenon called “colony collapse disorder,” when a bee colony disappears. This phenomenon is right now associated with the use of neonicotinoids found in pesticides in use in industrial countries. While European countries have already taken steps to stop the use of the common pesticides containing these chemicals, the U.S. has not and government officials are calling for more studies before discontinuing the use of associated pesticides. This entry includes information collected at a beekeeping workshop attended at NYC’s Grow Together Annual Conference in 2011 offered by Sara Katz with Bronx Green-Up.

**Dragon Fly** (*Anisoptera*): Its suborder name in Latin refers to its uneven wings, with their hindwings being broader than their forewings. Wings are transparent and are held away from their bodies while at rest, differentiating them from damselflies which are similar—elongated, with large multifaceted eyes, though typically smaller than dragonflies; the eyes of the damselflies, however, do not touch and are set apart. Like other insects, they have six legs but are not very good walkers, and are instead very efficient flyers, propelling themselves in six different directions (up, down, side to side, forward and back). They prey on insects like mosquitoes, living around marshes, ponds, lakes, and streams. Other insects they consume flies, bees, wasps, and ants. They, in turn, are eaten by birds, spiders, fish, frogs, lizards, and even other larger dragonflies. Female dragonflies lay their eggs on water or on floating or newly emerging plants. Most of their lives are spent as nymphs, eating with the help of extending jaws, and breathing
through their rectum which can help them move quickly and away from predators by expelling water through their anus. Their larval stages depend on their size, with the larger dragonflies having a larval stage of up to five years. They have negative associations in several cultures that include the words “devil” and “snakes” in their common names, or are referred to as “eye poker,” and the like. For the Navajo, however, they symbolize pure water. For the Japanese, they are signs of summer and early autumn and have positive associations like strength, happiness and courage. “Oding,” or the catching of *Odonata*, the Order, is popular in many cultures. The following species have been found on Freshkills Park: the common green darner, swamp darner, unicorn clubtail, eastern pondhawk, Needham’s skimmer, 12-spotted skimmer, black saddlebags, blue dasher, and slaty skimmer.

**Magicicada (Cicadidae):** Referring to the 13- and 17-year periodical cicadas, Brood II is common in NYC and neighboring regions, west to New Jersey, across Long Island, and just north of the Bronx. Living most of their lives under ground, feeding on the roots of deciduous trees’ xylem about a foot underground (30 cm), mature nymphs emerge after 13 or 17 years (depending on the brood type), all at once and in great numbers once the soil has been about 64 °F (17 °C) for about three consecutive days. They emerge all at once in a survival strategy called “predator saturation,” the strategy being to overwhelm predators by sheer numbers. Tree growth is diminished the year before cicadas emerge, but is enhanced the following year by the decomposition of the carcasses which enrich the soil with nitrogen. Their predators, ranging from birds, to lizards, wild turkeys, and other animals, too, are better off after the appearance of the periodical cicadas. Their emergence at prime numbers is theorized as being a response to potential hybridization with broods of different cycles. Their life cycles above ground last only about two months, with males congregating around each other in chorus centers aimed to attract female mates. Their adult life is spent looking for mates and reproducing and by mid-July they are all gone. Males have hollow abdomens, facilitating the sounds they manufacture, and despite their choral sounds, they will make distinctive sounds to an individual female. Receptive females respond to mating calls with a flick of their wings. Both sexes can mate multiple times, although females seem to primarily mate only once. After mating, females will cut V-shaped slits into young twigs and branches and lay their eggs approximately twenty at a time, in total about 600 or so, which after about 6-10 weeks, hatch as newborn nymphs and drop to the ground where they burrow to live for the next 13- to 17-year cycles. Periodical cicadas are consumed by people of several cultures and have medicinal functions in Chinese Medicine for treating rheumatoid arthritis and other diseases. The “Dog Day Cicada,” are the annual species commonly seen/heard on Staten Island. Some information, including details on cultural uses of cicadas, was gathered in part at the SIM cicada exhibit 2013 as well as from the WTD collections found at the Museum’s history and archives department.

**Mosquito (Culicidae family):** There are about 3,500 species of mosquitoes worldwide, with most having four life stages: egg, larva, pupa, and imago. Adult females lay their eggs in standing water (any type of water, from sweet to salty, pond, puddle or artificial like a bucket of standing water) and the first three stages are aquatic, lasting 5-14 days depending on species and temperature. The mosquito emerges from the pupa as it floats
on the water surface. A lot of variables factor into the life-span of blood sucking mosquitoes which can live from a week to several months. These factors include sex, species, season and conditions. Both males and females feed on nectar and plant juices but the females need to take in “blood meal” for iron and certain proteins before they can lay eggs and tend to be vectors for infectious diseases. Their mouths are adapted for piercing animal and plant skins. Their saliva is a relatively simple compound composed of fewer than twenty dominant proteins. Their saliva contains elements that are anticoagulant to minimize the accumulation of platelets and other coagulants that would otherwise clog their proboscis as they feed. These compounds cause an allergic reaction that result in inflammation and itching. The following are some home remedies that alleviate the itching and swelling reactions: sudsy ammonia can be used, as well as tea tree oil; other remedies include using scotch tape or sucking from a straw on affected area to help counter the tension on the skin to relieve the itch. Mosquito dispersal occurs vis-à-vis transport ships that collect water in unused tires, as well as ships bearing flowers and other plants, as well as in trucks and other vehicles shipping plants and other cargo that bear the larva and pupa or adult mosquitoes. The viral diseases most commonly spread by mosquitoes include dengue fever, yellow fever, malaria (transmitted by Anopheles), Chikungunya (transmitted by Aedes aegypti), elephantiasis (Lymphatic filariasis), and the West Nile Virus (from the Asian Tiger mosquito). Some of the older mosquitoes date back to the Cretaceous period, as exemplified by the 79 million year old sample preserved in Canadian amber. There is an older sister species dating back to 90-100 mya. Genetic analysis determine that Culicinae and Anophelinae clades may have diverged about 150 mya. Old and New World Anopheles may have diverged about 95 mya.

**Stink Bug (Pentatomoidea):** “Stink bugs,” “Shield bugs,” or “Chust bugs.” From the super family Heteroptera and suborder Hemiptera categorized for their sucking mouthparts. There are about 700 bugs in 14 or 15 families. Pentatomoidea’s well-developed scutellum, or the hardened extension of the thorax over the abdomen, is their most characteristic feature which can be triangular to semi-elliptical in shape. They usually have an antennae with five segments. The tarsi usually have two or three segments. Shield bugs have glands in their thorax between the first and second pair of legs which produce a foul smelling liquid. This liquid is used defensively to deter potential predators and is sometimes released when the bugs are handled carelessly. The nymphs, similar to adults except smaller and without wings, also have stink glands. The nymphs and adults have piercing mouthparts which most use to suck sap from plants, although some eat other insects. When they group in large numbers they can become significant pests. Other species that resemble pentatomoids are found in the superfamily Coreoidea.” When killed, the stink released attracts more of these insects.

**Arachnida**

**Chigger (Trombiculidae):** Also known as “harvest mites,” “red bugs,” “scrub itch mites,” and “berry bugs.” These insects inhabit forests, grasslands, wooded areas, berry bushes, and orchards along streams, and lakes and can even be found in gardens or parks. Their populations are most numerous in early summer when weeds and grasses are heaviest.
They are related to ticks and are microscopic. They undergo the states from egg, to
larvae, nymph and then adult. The larval mites are the ones that need to feed on skin
cells but not blood of other animals. They inject their hosts (which can be anything from
a rabbit, to a toad, turtles, quail, etc.) with an enzyme that allows them to form a hole in
the skin by breaking it down, rather than actually “biting.” This hole is called a
“stylostome” and it allows for the larvae to chew up tiny parts of the inner skin which is
what causes the severe irritation to the host in the form of red bumps like hives or skin
rashes. After feeding, they drop to the ground and become nymphs that mature to adults
with eight legs that then feed on plant matter and are harmless to humans. The females
then lay 3-8 eggs in a clutch under the roots of a plant or on a leaf, and are dead by
autumn. Chiggers are not confirmed on Staten Island.

**Tick (Ixodida):** There are three families of ticks. *Nuttalliellidae* comprises its own single
species, existing only in parts of the African continent from Tanzania, Namibia and South
Africa. The other two groups, hard ticks and soft ticks, vary in terms of life stages.
*Ixodidae*, or hard ticks, are characterized by a hard shield and have three distinct stages
lasting a year. *Argasidae*, or soft ticks, have several nymphal stages ranging from
months to years. While ticks exist around the world, they need moisture to undergo their
metamorphosis so they are found predominantly in places with warm, humid climates.
They feed a bit like mosquitoes, or by using an anti-coagulant following piercing of the
skin of their prey, that facilitates blood extraction. Blood is necessary for progressing
from one life stage to the next and without blood meals ticks will die. Like all arachnids,
ticks have eight legs, with each consisting of six segments that include muscles but with
limited lateral motion. Their tarsus leg includes an organ for detecting scent and other
chemicals from potential hosts, as well as changes in air currents and temperature. Tick-
borne diseases include Lyme disease, relapsing fever, Rocky Mountain spotted fever, tick
paralysis, and others. Ticks must be removed at the head. Fine-tipped tweezers are best
for removal. Increasing deer populations have meant rising rates of Lyme disease, as
studies in Connecticut have demonstrated.

**Oligochaeta**

**Earthworm (Lumbricidae):** Forming a group of about 33 species of mainly European
descent, earthworms can belong to three general groups, deep burrowing groups that use
these burrows to access the surface of soils, topsoil and deep soil dwelling groups, and
compost leaf litter dwellers. Most prefer neutral to acidic soils, though they vary in
habitats, to which soil pH and food availability is key. Forming the base of many food
chains, earthworms enrich soils for plants and are a good food source themselves for
many bird species, mammals and invertebrates like beetles, slugs, and snails. Some
humans eat them as well. With moist skin enabling their breathing, they are tube-shaped,
and segmented, processing food throughout the whole of their length. They ingest and
process organic and dead matter alike. Because they are hermaphrodites, they contain
both sexual organs on segments 9-15 (all earthworms are born with the number of
segments they will have as adults) and copulation and reproduction are separate
processes. They copulate ventrally, side by side, followed by each worm’s viscid ring
becoming red much after the worms have separated. When the worm backs out of this ring, or the clitellum, both the sperm from the other worm and the individual depositing the egg sac, is included for fertilizing the cocoon where the eggs will incubate. Most earthworms have the ability to regenerate when cut, it being possible to grow two whole worms from one bisected individual. They are beneficial to plants if not to archaeologists because they use their muscular bodies for extending and contracting when moving through the soil with the aid of a lubricant on their skin, their burrowing process enables air to go through the soil, improving the structure of the soil and mixing up stratigraphic layers in the process. Their conversion of materials into a rich hummus adds fertility to soils, breaking down larger matter and elevating the level of nutrients present in soils. See Darwin ([1881]1989) for a very detailed account of worms, their habits and habitats.

**Red Wiggler Worm** (*Eisenia foetida*): Also referred to as “redworm,” “Californian earthworm,” “trout worm,” and other names, this species of worm—along with the subspecies *E. andrei* (sometimes listed as *E. foetida andrei* and lighter in color)—is ideal for vermicomposting because they do not burrow deeply and prefer conditions very similar to those of humans, or the warm temperatures preferred by humans. They are startled by noise, so when kept at home, they require a dark cool space where they will be not be disturbed by loud sounds. They are adapted to processing decaying material, thriving among rotting material like decomposing vegetable matter. Of European descent, they are now a cosmopolitan species found everywhere except Antarctica. When threatened, they release a yellowish chemical containing an odor, giving them their second Latin name referring to the “fetid” smell produced. Though hermaphroditic, they still require more than one individual for reproduction, following the process listed above for **Lumbricidae** in general.

**Amphibians**

**Salamander** (*Caudata*): Characterized by their lizard-like appearance, salamanders range in habitats, with some being fully aquatic and others living in moist ground also used for cover, but their moist skin makes being in or near water necessary. Unique among vertebrates, they have the capacity to regenerate lost limbs. They drop their tails to escape predators, and they escape while their tails wiggle around on the ground. Their skin is moist because they produce mucus that acts as lubricant when they swim and help them regulate salt in salty water. Their skin is smooth and not scaly, with varied coloration patterns ranging from drab, to spots and stripes in various colors, or with translucent skin depending on habitat. They shed their skin as they grow, eating the skin cast off. They produce a white milky toxin through their skin that acts as defense, also producing pheromones for attracting mates via their skin. Their breathing is made possible through a variety of means, either through gills, or open slits that appear as bumps on the sides of their heads, through their skin, or through the use of lungs. They vary in sizes from a little larger than one inch, to salamander species found in China that are larger than five feet. In North America, however, they are all relatively small from about 4-7 inches or so. Land dwelling salamanders have a long, sticky tongue that helps them feed on insect prey while water dwellers do not use their tongue to catch prey. The
vision of some salamanders is trichromatic and extends into the ultraviolet range, though underground dwellers have reduced eyes, some even having a thin layer of skin over their eyes. Fertilization can occur either internally when males deposit a sac of sperm in the female’s cloaca, or externally when females deposit the eggs either in ponds or moist dug out earth and the males fertilize them there. Salamanders have been in decline for decades and are extinct in parts of NYC. Staten Island, however, is the home to some healthy populations. They are threatened by development and habitat fragmentation, climate change and a fungus that while also affecting frogs, has hit salamanders especially hard. Also refer to Munshi-South (2013) on genetic varieties in NYC parks and the challenges they face in the city, as well as Haskell (2012) for more on the lives of different of salamanders in a Tennessee forest.

Western Chorus Frog (*Pseudacris triseriata*): Also called the “striped chorus frog,” and the “midland chorus frog,” this native to Canada and the U.S. is tiny, about an inch and a half (40 mm), of greenish-grey, brownish, to olive in color with a light creamy underside. Males are usually smaller than females, easily telling them apart from females not based on their size unless seen together, but by the yellow vocal sacs under their chin when calling that appear as darker flaps of skin when not in use. Living next to permanent water sources decreases chances of predation so chorus frogs stick to streams, marshes, grassy pools, and the like in prairies and mountainsides. They congregate together and vocalize in warm nights, making that the best time to see them. Hiding spots on land, deep under leaf litter in moist dark places, also make for good hibernation areas. They reproduce from March through May with males calling out to females for weeks or months, females laying anywhere from 500 to 1,500 eggs over the course of the breeding season. Eggs are deposited in one cluster at a time, containing anywhere from 20-300 eggs in a gelatinous cluster under water attached to plants, in flooded fields, swamps, or shallow ponds. Tadpoles hatch from the eggs after 14 days and grow into froglets 40-90 days after that. This is one of the indicator species used for gauging impacts of human disturbances to ecosystems because while well adapted to human impacts on the environment, the health of the frogs has been affected and their numbers have fallen recently. They are also being born with deformities and their reproductive success has been diminished. Changes to their morphology, whether in the larval or adult stages, inform ecologists on the health of the environment at large especially on the effects of pesticides and the like. They otherwise serve as effective controls for mosquitoes.

Pine Barrens Treefrog (*Hyla andersonii*): One of the smallest species of tree frogs measuring about 1-3 inches, the Pine Barrens tree frog is native to New Jersey (as its common name indicates), North and South Carolina, and parts of Florida. They are mostly green, with wide purple stripes bordered by white bands along their sides, and gold to orange markings on the inside portions of their legs. Their habitat is mainly moist peat bogs and shallow ponds, and as adults when they dwell on land they prefer mossy areas. They are tolerant of high acidic levels in water and lay their eggs in 3.8-5.9 pH levels. They are an endangered species due to habitat loss, but there is reason for optimism as they may still be in existence in parts of Georgia in addition to the other four states where they are found on the east coast.
Reptiles
Northern Snapping Turtle (*Chelydra serpentina*): A large fresh water turtle, the Northern Snapping Turtle has a range from southern Canada, south to northern Mexico, west to the edge of the Rockies. Known for their aggressive temperament, their species name refers to their highly mobile head, which combined with their beak like jaws, they use in “snake” like motion to snap and bite at prey. They do not pose threats to people as they normally move away when encountered by humans. Their bodies are too large to tuck into their shells as is common for other turtles, so they have developed their snapping abilities and fierce tempers as a response to menaces. They also have the ability to release a musky odor through their hind legs in response to threats. This species of turtle is rugged, and meaty, making them a good specimen for turtle soup. Depending on the age of the turtle, they can grow to be quite large, weighing in at around 35 lbs (16 kg), and living up to almost 50 years in captivity and on average about 30 years in the wild. They live in shallow waterways like ponds, streams and can even live in brackish waters in estuaries. Omnivorous, they eat both plant and animal matter including frogs, fish, reptiles, and small mammals. Mating from April through November, females can hold on to sperm over several seasons and use it as needed. Sandy soil away from water is the preferred location for laying up to 80 eggs in one year, covering them over with sand for their protection while they incubate which can take anywhere from 9-18 weeks, depending on temperatures. The snapping turtle was made the state reptile of NY in 2006.

Birds
American Goldfinch (*Carduelis tristis*): Also known as “wild canary” and “eastern goldfinch,” is type of goldfinch with a range from mid-Alberta to North Carolina during the breeding season. It ranges from southern Canada to Central Mexico during the winter season. During the mating season this species displays especially marked sexual dimorphism, with the male turning a radiant yellow rather than its drabber olive coloring during non-mating season; it is the only finch in its subfamily that undergoes a complete molt in the spring and again in the autumn. A social bird and a granivore, this type of finch congregates in large flocks while migrating and feeding. It has a conical beak and agile feet for gripping at stems while it consumes seeds. This is a monogamous species that displays some aggressive territoriality during the time of nest construction. Deforestation has created open meadows that are this bird’s natural habitat though it has also benefited from human environments particularly in the form of bird feeders. Its Latin name refers to “thistle” and “sorrowful.” *C. tristis* is the most common of goldfinches. It has a series of warning calls and its ordinary song consists of warbles and twitters. Zinnias, cosmos, thistle and bee balm are a few of the main sources of food that make suburban gardens a good home to these birds, in addition to backyard feeders (though there is some controversy regarding what is an adequate food source for these birds). Unlike other animals upon whose range humans encroach, the American Goldfinch has benefited from human co-habitation.
American Kestrel (*Falco sparverius*): A small falcon and the most common in North America, it is the only kestrel found in the Americas. Its genus refers to the curvature of the bird’s beak which is hooked, and it is not a hawk as its common name “Sparrowhawk” erroneously suggests stemming from confusion with the Eurasian Sparrow Hawk not genetically related to the Kestrel. Occupying habitats ranging from deserts, meadows and grasslands, kestrels need available perches, open spaces for hunting, and crevices for nesting. With a lifespan of less than five years in the wild, kestrels are not long-lived, mostly the result of collisions with automobiles or direct killing by people, and predation forming a small percentage of their causes of death. Feeding mainly on insects like grasshoppers and dragonflies, they also consume voles, mice, and lizards. Kestrels are also known to consume animals like bats, snakes, and squirrels, though most of their prey is retrieved from the ground. They reproduce in the same places which provide older birds an advantage as they are very familiar with a nesting site. Males perform diving displays for females, announcing their availability and territory. Males provide food to females before and after they lay their eggs. Females are promiscuous for a few weeks before ovulation, a practice assumed to stimulate ovulation prior to laying eggs. Typically four to five eggs are laid at a time. They are of a creamy color with grey splotches. Incubation usually lasts 30 days, at which time the fledglings are mainly the female’s responsibility. After 28-31 days, the young are able to fly and leave the nest.

American Oystercatcher (*Haematopus palliatus*): “American Pied Oystercatcher” is another one of this bird’s common names. Their common names refer to their diet, consisting of mollusks for which their beaks are adapted for cracking being long and thick for prying open their prey. Dependent upon habitat, their diet can include earthworms, as well as fish, crabs, and other sources of food. With a range from New England to Florida, west to the Gulf Coast, found also on the Pacific coast of Mexico, Central America to northern spans of the South American continent. It is a coastal bird, nesting on beaches and coastal islands. Recognizable by their black heads, dark wings, white chest, and long orange beak, these birds also have long pale to orangey colored legs. Their numbers have been declining, likely a result of threats to coastal habitats. Oystercatchers are monogamous, breeding in the summer months in simple nests consisting of scrapes in the ground, with incubation duties shared though most of it conducted by females and males defending territory. The length of incubation is between 24-39 days. They will sometimes deposit their eggs in the nests of other species, abandoning their young to be raised by others. Though American kestrels were likely found at Fresh Kills when there were sandy beach areas prior to landfilling, these birds have not been found at the site more recently.

American Robin (*Turdus migratorius*): A migratory songbird from the thrush family with a reddish-orange breast. There are seven species, ranging throughout North America south, throughout Mexico and most of Central America. But the North American Robin is not part of the Central American clade and is instead closer to the African species of *Turdus*. These birds used to be killed for meat but are protected under the Migratory Bird Act. The American Robin might be a key host of the West Nile Virus, despite Jays and Crows being among the first to appear dead, signaling the
presence of the virus. The virus lives longer in Robins given that they do not die as quickly, spreading the virus along to more mosquitoes and eventually more humans. Robins have a long and complex song. They lay blue eggs, for which “Robin’s egg blue” the color is named. Their eggs are poached by squirrels, snakes, and other birds. About only 25% of their young survive and while they can live up to 14 years, they average only two years. They are important in North American culture, as the Tlingit and other tribes have stories about them where Robins are created by Raven to please people with their songs. Robins are associated with the first signs of spring.

**Baltimore Orioles** (*Icterus galbula*): Small birds named for their coloring which resembles the coat of arms of Lord Baltimore, Baltimore orioles have pointed bills with white bars on their wings. The male bird is orange in its underside and the females are yellowish-brown and dull orange on their breast and belly. The birds have a long flutey whistle that gives away the birds’ location before it is visually spotted. They breed from Maine to Wisconsin, south to Central Mississippi and northern Georgia, wintering in Florida, Central America to northern Southern America, and the Caribbean. They are a solitary species outside the mating season and are considered generally monogamous. The males display with fanned tails and lowered wings to females who if interested will respond with a type of wing quiver announcing receptivity. Females build nests at the end of branches of trees like maples, apple trees, elms and others, made of whatever materials are available. They lay eggs that are pale grey to bluish white in color with an incubation period of 12-14 days. Offspring fledge after about two weeks. Both parents feed their young by regurgitating food for them consisting of insects, nectar, and the deepest colored berries.

**Bobolink** (*Dolichonyx oryzivorus*): These small mostly black birds with bright yellow heads and white on their shoulders, along their backs and rumps, sometimes with creamy napes as well, also have small finch-like beaks. They migrate great distances, spotted as far south as Argentina, Paraguay, and Bolivia. Migrating in groups, they will feed on agricultural rice, making them pests in certain areas, though they typically feed in grassy fields in North America consuming seeds and insects in grassland habitats. Their nests are cup-shaped, built on the ground, where they lay 5-6 eggs; both parents care for their eggs. Their habitat has shrunk so their numbers have been declining, and the presence of horses helps their populations as they can also make use of the hay available as horse feed.

**Canada Geese** (*Branta canadensis*): Easily recognizable for their long black necks and heads with white “chinstraps” and brown-grey bodies, these geese have become public nuisances in parks for the exorbitant amount of waste they produce as well as for their large populations and sometimes aggressive behavior. Primarily herbivorous, Canada geese are attracted to places with fresh cut lawns that make for ready-made food, making parks especially hospitable. They will sometimes also eat insects in addition to grass and the seeds spread by park goers who enjoy feeding the local birds. In addition to these foods, they eat aquatic seaweed and have been known to pick through garbage in cities. Their waste is a nuisance not only on land but also in water, assumed to be the cause of fecal coliforms in beaches. Moreover, they also pose risks near airports, causing planes
to come down when these large birds are absorbed into plane engines. Though their numbers had declined severely with one species even considered extinct until the 1960s when it was discovered alive in Minnesota, their populations have rebounded in certain areas, including NYC. Their waste and the bacteria it contains along with their rather aggressive posture towards humans, makes them unwanted in a number of areas, including Central Park. Native to northern regions of the United States and Canada, they nest in elevated areas near streams, lakes and ponds. They have few predators besides humans but those include coyotes, grey wolves, and sometimes large predatory birds like owls and eagles. Their V-shaped flying formation announces spring and autumn as geese migrate. They mate for life unless a mate dies at which time the remaining goose will find a new partner. On average they have an average of five eggs (mostly ranging from two to nine) that are incubated for 24-28 days by both parents, though mainly by the female. Molting season takes place around breeding season for about 20-40 days, making the birds flightless and easier to capture for groups managing their populations. Their flight feathers grow back around the time their goslings are also ready to take flight. Parents lead their goslings in a line, with one parent at the front and the other at the back for protection. They aggressively intimidate other beings with hissing sounds and bites, but sometimes join other geese with goslings. The goslings leave their parents after they migrate for the spring when they head back to their birthplaces. See Jim Sterba (2012) for insights into the impacts of Canada geese in cities.

**Cormorants** (*Phalacrocoracidae*): These are medium to large coastal sea birds (not oceanic) that have colonized inland waters. Cormorants’ ancient ancestor may have been a fresh water bird. They are fish eaters, diving for small eels and fish, and even water snakes. After feedings, birds will often sit ashore in the sun with wings outstretched. They have preening glands that keep their feathers water proof, though some are water permeable. There seems to be a combined function to their plumage that allows for drying in air while birds are in flight. Cormorants are colonial nesters that use trees, and sometimes rocky cliffs for laying light chalky blue colored eggs. Both have been spotted at Freshkills Park. Great Cormorants are present in Freshkills during the winter, while the double-crested cormorants are around all-year especially during the breeding season.

**Eastern Bluebird** (*Sialia sialis*): A small thrush of about six to eight inches in length and NY State’s bird, the eastern bluebird is bright blue on top and reddish brown on chest in the case of males. Females are of duller shades of those colors with a grey crown. These very social birds consume mainly insects and other invertebrates, combined with fruit when insects are not available in the colder months from plants like the wild grape, dogwood and sumac. Despite being territorial during breeding season in the spring and summer months, they can otherwise congregate in large numbers. Both parents cooperate to nurse eggs built in abandoned woodpecker cavities providing protection from predators, with the female laying on average four to five eggs, raising two broods a season. Fledglings are grey and speckled, and one young has been observed to stay at the nest to help raise the next brood. They tend to live short lives in the wild, being at the mercy of predators like chipmunks, raccoons, and snakes, as well as due to cold weather and food shortage, depending on their environments. Nesting boxes have been critical
for conservation because they help control for pests, providing bluebirds with a safe place for having their young that is inaccessible by predators.

**Great Blue Heron** (*Ardea herodias*): This large wading bird common is in wetlands and coastal areas. It has rusty colored thighs, is of a grayish color ranging to blue, with black and white colored feathers streaking down the front, and long plumes around breeding season. Its beak is long and yellow, and along with its legs, it turns orange around the breeding season. Immature birds are of a duller coloring. Most vocal during the breeding season, these birds make croaking sounds. Found throughout most of North America, their range can be found along southern parts of Canada, as far as Alaska, parts of Mexico, the Caribbean and South America in any type of wetland. Because they are highly adaptable, they are also present in densely built areas as long as there are waterways with enough fish for them to eat, though they will also opportunistically make use of shrimp, crabs, small mammals, small birds, amphibians, reptiles, and insects. They nest in trees mostly growing directly in water where there is less predation. The first nest in NYC was found in 2013 on Staten Island. This species of birds breed in colonies called heronry, with an average of 160 nests per colony. They lay pale blue eggs in bulky nests once a year, with replacement clutches if nests are destroyed. Eggs are incubated for 28 days and offspring are fed regurgitated food by their parents. The first bird to emerge is usually especially aggressive when competing for food with siblings. Turkey vultures, hawks, raccoons, bears, and other predators consume heron eggs and nestlings and when predation on nestlings and eggs occur, some herons will sometimes abandon their nests.

**Great Egret** (*Ardea alba*): This species other common names refer to the birds’ large size, including “large egret.” Also called the “American egret,” this large wading bird has all white plumage and is only slightly smaller than the Great Blue or Grey Herons. It is also referred to as the “common egret” given it is widespread across the North America. There is no sexual dimorphism among the great egret. As is common of large waders, great egrets are slow when in flight, tucking in their long necks while in the air. Great egrets consume fish, small mammals, insects, reptiles, and frogs, slowly stalking their prey in shallow waters, allowing their prey to come to them by standing perfectly still, and spearing them with their long hard beaks. Their numbers had dwindled throughout the 19th century as they were hunted for their plumage for the millenary trade. They have also dropped in numbers more recently due to habitat loss, especially in the southern part of the US. However, because they are a highly adaptive species, they have been making a comeback to wetlands and marshes in urban and peri-urban areas.

**Gull** (*Laridae*): Gulls range in size but are generally medium to large in size, often of grey or white coloring with black markings on their heads and/or wings. They have somewhat long bills that are slightly hooked, and webbed feet. They tend to have heavy bodies and long wings and legs. Most gulls are ground nesting and carnivorous, feeding on live food like fish or crabs, or scavenging opportunistically. They are among the least specialized of birds when it comes to their diets in comparison to other sea birds. They are known to sometimes use bait to attract fish, and to crack shells by dropping them on hard surfaces. They are not able to dive very far beneath the water, which means they...
must feed with other animals making use of animals from deeper waters. Many gulls nest in large colonies of boisterous groups that defend their territories and attack intruders using a mobbing behavior. They will return to a nesting site after breeding there once. Most species breed once a year in predictable seasons lasting between three to five months. Gulls are monogamous, building their nests as part of their bonding process (even while contributions are not exactly equal). Their clutches on average consist of three eggs, with smaller gulls having only two eggs. The eggs are usually of a tan to dark brown and olive color with dark splotches serving as camouflage. Both sexes incubate their eggs for 22-26 days. Both parents feed their young until they fledge after brooding for one or two weeks; most of the feeding, however, is done by the father while the mother broods and guards. They have a cosmopolitan distribution, with ranging rates of migration depending on species. As the Fresh Kills landfill grew following its opening in 1948 until the 1990s there were large numbers of herring gull, ring-billed gull, laughing gull, and greater black-backed gulls in particular inhabiting the site.

**Killdeer** (*Charadrius vociferus*): A medium-sized brown plover with a brown cap, white belly, black stripes on their faces and necks, their rumps are an orangey color and their eyerings are of a similar colorful shade. They spread over parts of Canada and throughout the US, wintering in Central America. The killdeer live in grasslands and meadows, as well as on shorelines, their range has been expanded by their ability to exploit agricultural areas. They nest in shallow depressions on the ground, laying speckled eggs resembling rocks that blend into the environment. Mother birds are best known for their “broken wing act” which they perform to distract potential threats from their nests, attracting predators to them and away from their nests. Once the predator comes after them, they fly away. As other shorebirds, their young are precocious, able to move immediately after hatching. Their common name is an onomatopoeic imitation of their calls.

**Osprey** (*Pandion haliaetus*): The “Sea Hawk” or “Fish Eagle” is a large raptor that settles close to bodies of water that provide a ready food source. They tolerate varied habitats and are found on all continents except Antarctica. Its species name suggests it is an obligate fish eater. It has four recognized subspecies and despite its propensity for fish, it is not considered a Fish Eagle (though it does look somewhat like an Eagle, with dark, brown wings and a white chest). Linné classified ospreys under the species name *Falco haliaeetus* and it is unusual in that it is a single living species spread throughout the globe. The name “Pandion” is named after the Greek King Pandion of Athens who was turned into an Eagle. The etymology of “Osprey” is less clear, with a mix of Anglo-French, Latin and Medieval Latin roots referring to “bone-breaking” and “bird of prey.”

**Red-Tailed Hawk** (*Buteo jamaicensis*): Breeding throughout most of the U.S., it is one of three species collectively called “chickenhawks” though they rarely feed on chickens. They inhabit a range of habitats, from tropical rainforests to deserts, coniferous forests and deciduous ones, rural and urban areas; their preferred habitats are mixed forests with fields. They do not live in unbroken forests. These hawks can be found throughout North America. They weigh an average of a little over two pounds, with females being 25% larger and heavier than males, both being of a brown coloring ranging from dark to
light and in between depending on region and not on molting, with a whitish underbelly and a dark band across their bellies. Their brick red tails give them their common name.

This species has benefited from human manipulations to landscape. Cutting down and reforesting different parts of the country have expanded their range by opening up hunting grounds and/or creating nesting sites. Because they are very adaptive and are not disturbed by human presence, their numbers have spread though their population was lessened throughout the 1990s on Staten Island, most likely due to the closing of Fresh Kills. Red-tailed hawks are carnivorous birds, feeding on rats, squirrels and rock pigeons, also making NYC a hospitable environment for them. Other food sources include bats, reptiles, fish, crustaceans, earthworms and insects, small dogs, cats, jackrabbits, and others depending on habitat. They share an ecological niche with the Great Horned Owl but that bird of prey hunts at night, allowing both to inhabit the same ecological niche. Reproduction can happen after courtship flights or without. Males fly with females during these flights and perform impressive aerial displays for about 10 minutes at a time, diving and falling, using vocalizations. They create stick nests lined with different available materials, pine needles, bark, corn cobs, and the like. A clutch of one to three eggs results in the months of March to April and is incubated primarily by the female for 28-35 days. The eggs hatch anywhere from 2-4 days at the end of the incubation period. The female stays at the nest and the male provides them with food. Hawks do not reach reproductive maturity until three years of age. The red-tailed hawk has spiritual significance to Native Americans.

**Red-Winged Blackbird** (*Agelaius phoeniceus*): Found throughout most of North America and many parts of Central America, from southern Alaska to the Yucatan peninsula, from California and southwestern Canada to the eastern coast of the whole of the U.S. The southernmost populations do not migrate. Their habitat is grassy areas like meadows and prairies, preferring wetlands, and found at both freshwater and saltwater marshes, especially where cattails are present. *A. phoeniceus* populations are generally migratory, though some breed in northernmost places like Newfoundland and Alaska. Red-winged blackbirds have a range of predators, from barn owls to other large birds like crows, magpies and herons that prey on blackbird nests. Snakes, raccoons, minks, and foxes feast on both eggs and birds of all ages. The red-winged blackbirds, in turn, eat a number of different things as they are omnivorous though they do eat a lot of insects like dragonflies, damselflies, butterflies, flies and moths, particularly during mating season. Snails, carrion, worms, spiders, mollusks, and frogs are also known to form part of their diets. Additionally, they also eat blackberries, blueberries, and other fruit, even consuming seed from backyard birdfeeders. Its common name describes the appearance of the male birds, which are of shiny black plumage with a red shoulder bordered by a yellow band, but these birds are sexually dimorphic and the females are mostly of a dark brown color on top with some lighter shades of brown on their faces and their bellies, giving their chests somewhat of a striped appearance. Their coloring might serve as camouflage when they are on their nests incubating their eggs. Females are also smaller than males. Young birds resemble females, except they are paler, and both males and females have pointy sharp bills. Their Latin genus name refers to their belonging to a flock while their species name refers to their deep red color. Their clutches consist of on average four eggs, rarely five. The eggs are of a pale blueish green shade and glossy,
incubated by the females only. This is a polygynous species and the males defend the range of up to 10 females. They are considered pests in agricultural areas and pesticides are usually used illegally to diminish their numbers.

**Ring-Necked Pheasant** (*Phasianus colchicus*): Deriving its common name from the white band around its dark (blueish) green neck, this bird is a native to Asia and is an introduced species for game in the U.S. The hens are not as showy, of mottled tan and brown coloring while the males are golden and brown, with purple, green and white markings, a distinctive red wattle and long barred tails. Their natural habitats are woodlands, wetlands and grasslands, feeding on the ground but roosting in trees. Males are polygynous and have harems of females, nesting on the ground producing a clutch of about 10 eggs in April to June. Eggs take 23-26 days to hatch. Chicks stay with their mothers as they mature quickly, resembling adults by about 15 weeks. They are successful as introduced species because of their adaptability to a range of climates and their readiness to breed in captivity. They are bred in captivity to be released as game. They are sometimes struck by cars, making them a bit of a problem even while they are also a source of food as cooking wild game grows in popularity.

**Rock Pigeon** (*Columba livia*): “Street pigeons,” “feral pigeons,” or “city doves/pigeons,” are descendants of domesticated Rock Pigeons that have returned to the wild, explaining why they are highly adapted to cities and to large numbers of people. Wild and domesticated cliff-dwelling pigeons will readily interbreed because they are the same species. They are heavy, short birds with waxy beaks, usually with dark grey feathers and slightly iridescent breasts, speckled with white feathers and in other colors in some instances as well. Found all over the U.S. and in southernmost parts of Canada, some areas in southernmost South America, as well as throughout Europe, parts of Australia, parts of the southern African continent, and parts of south Asia and China, they are introduced species in these regions. Their natural range spans sub-Saharan Africa, the Middle East, Mediterranean Europe, as far east as India. The ready supply of food in cities has enabled pigeons to inhabit such varied regions as well as reproduce throughout the year. Males court females by puffing up, making low sounds while walking rapidly towards the female they select. She will often fly off to a nearby area and he will follow her, repeating this until she allows him proximity to her. He will bow repeatedly as he approaches her and will do half pirouettes, eventually mounting her briefly, flapping his wings for balance. Pigeons nest in groups and prefer old or damaged buildings and will take advantage of air conditioning units, gutters, and other infrastructure for building their rudimentary nests where both parents will contribute to incubating their eggs, with males doing the larger percentage of the cooing that happens during breeding and nesting season. Pigeons mate monogamously but are a gregarious species so they will congregate in groups that can number in the hundreds. They eat grass, seeds, insects, spiders, and scavenge from trash cans as well as take advantage of people feeding them bird seed and stale bread. Labeled an invasive species by the USDA, attempts to control their populations ranges from setting up spikes and other deterrents on buildings that do nothing to shrink the population but instead only keeps some pigeons away so that the amount of droppings in front of buildings is limited, to spreading poison, and trapping them. They are considered vermin in NYC, sometimes referred to as “rats with wings.”
People mistakenly think they spread disease. The best means of controlling their population is restricting access to food, much as in the case of rats. They are preyed upon by falcons and hawks. With a growing population of red-tailed hawks in NYC, hawks have been helped by this rich source of food in their spread around the city.

**Scissor-Tailed Flycatcher** (*Tyrannus forficatus*): An elegant bird with a stunningly long forked tail that gives these birds their common name, they have grey heads and salmon-pink undersides with brown wings. Their tails assist them in catching insects like crickets, beetles, and grasshoppers allowing them to make sharp turns while in midair. They also consume berries. Females build the nests and tend to use a lot of human material like cigarette butts, string, etc., but also non-human produced materials like plant stems, flowers, and leaves, bark, as well as animal material like caterpillars, and sheep’s wool, among others. Males and females travel together to find nesting sites ranging from gardens, to pastures, roadsides, and salt marshes. Males and females defend their territory with extravagant aerial displays that mostly take place in the mornings when invaders tend to encroach. Their range in the eastern U.S. includes Florida and Georgia though there was one instance of a vagrant bird seen near Freshkills Park.

**Eastern Screech Owl** (*Megascops asio*): Of a rusty to dark grey color, with a streaked underside, these owls weigh only between a little over four to over eight ounces. Their heads are round and large, on stocky, broad-winged bodies with short tails. They have identifiable ear tufts and make a distinct call that sounds like an eerie cry or whine. The screech owl is strictly nocturnal, nesting in cavities in tree trunks, known for their cries at night. They inhabit deciduous forests, mixed deciduous woodlands, parkland, wetlands, fields and meadows. They use their hearing and vision for hunting from dusk to dawn, consuming mainly insects and invertebrates for the better part of the year. Spiders, scorpions, centipedes, crayfish, and snails are also eaten, as are worms, and insects like grasshoppers, crickets, moths, and cicadas, as well as others. Small mammals are also part of their diet, including rabbits and shrews. Snakes, salamanders, and others are also sometimes opportunistically consumed. These owls do not build nests and instead use the cavities made by woodpeckers, laying their eggs on top of the fur and feathers left behind from the animals they consume. They will reuse the same nests throughout the course of different nesting seasons, laying eggs only once unless their clutch is lost. Incubation lasts 26 days, with offspring fledging at 31 days. Females do most of the incubating, with some help from males though males are mainly responsible for providing most of the food. These owls suffer from parasites. Their introduction to Central Park did not work out though one screech owl remains from the group that was released. They are, however, rather common around Staten Island.

**Tree Swallow** (*Tachycineta bicolor*): With a dark blue-green iridescent back, pointed wings, and short and slightly-notched tails, these small songbirds are common around northern wetlands and fields in summer. They have white undersides and a black eye mask. Females are duller in colors, as are juveniles, both being mainly brown. These birds consume insects they hunt with acrobatic turns in midair. They nest in tree cavities and nest boxes which makes them additionally accessible to scientists studying their
breeding patterns and behaviors. They breed in open habitats adjacent to water. Foraging birds are commonly seen in wetlands and agricultural fields.

**Wild Turkey** (*Meleagris gallopavo*): Easily identifiable for the fleshy growths on their heads, the loose skin that wattles on their throats and necks, their dark fan-shaped tail feathers, as well as the red skin around their necks, or the typical features of male turkeys. Their snoods (or hooded skin over the beak) are another easily identifiable feature. Toms, or male turkeys, have heads that turn red when angry and when birds are ready to fight, and turn blue when excited. They have strong sexual dimorphism, with hens being smaller, and of duller feather colors ranging from grayish-tan to brown rather than the iridescent and colorful feathers of males that can include purple, green, red, bronze, copper, and gold. Despite being the heaviest *Galliformes*, wild turkeys can fly (unlike their domestic counterparts). They live in wooded grassland and woodland habitats, as well as seasonal marshes. Wild turkeys are omnivores, foraging on the ground and in trees, consuming chestnuts and acorns, berries, insects, and occasionally also amphibians and small reptiles like snakes. They feed well in cow pastures and even backyard bird feeders, making them a problem in suburban settings where they make for hazards in roads. Their flexible diets also make them prolific breeders. Males are polygamous, strutting for females and mating with as many as they can. Females lay their eggs in shallow dirt depressions in clutches of up to 14 eggs laid one day at a time and incubated for 28 days. Various animals prey on their eggs as well as on the turkeys themselves, like opossums, skunks, foxes, coyotes, dogs, and owls. The turkey has special significance to Native Americans particularly in the northeast where it was a symbol for one of the three Lenape clans. Turkey populations have grown in parts of Staten Island. See Sterba (2012) on suburbanites’ struggles with growing turkey populations.

**Mammals**

**Eastern Gray Squirrels** (*Sciurus carolinensis*): A highly adaptable species, it is a native to the eastern U.S., west to parts of Texas, as far south as Florida and north to parts of southern Canada. It has so successfully adapted to areas as an introduced species that it is threatening native squirrel species in countries in Europe, in one instance. They are larger and better able to store fat than the native European red squirrel, and these are thought to have given the grey squirrel an advantage. The few predators they have in the introduced regions gives them an additional advantage. They are crepuscular, avoiding the heat during the day by being most active early and late in the day. Their fur is primarily gray, as its common name suggests, but often has brown fur mixed in with a light underside. Weighing only about 14-20 oz and measuring between 9-12 inches, with a tail up to about nine inches, these squirrels have become adapted to urban environments. Black and white squirrels are quite common in cities where the threat of predation is low. In NYC, there are parks with significantly high populations of black squirrels. Eating a range of foods, like acorns, walnuts, other types of nuts, tree bark, berries, and fungi. They can sometimes hurt trees by biting through the bark to access the cambial tissue and compromising the tree. They have been known to also eat other animals, like frogs, and even smaller squirrels. Squirrels are hoarders, stashing food in
numerous small caches, some temporary others more permanent. They will bury food near the site of an abundance of foodstuffs, to be retrieved shortly thereafter and reburied in more secure locations. They have a very good spatial memory, remembering where they have hidden food and using their olfactory sense only when in close range of their caches. When they know they are being watched, they will sometimes mime burying their food while actually holding it in their mouths. Gray squirrels have a range of vocalizations, including squeaks that sound like those made by mice, as well as chatter sounds and others. They also use their tails to flick as part of their communication repertoire. Noise levels where they live affect their level of vocal communication. They breed twice a year, having between two to six young, following a gestation period of about 44 days. Though they can breed before the age of one, they do not normally do so until after their first year. And while they can live up to 20 years in captivity, they live an average of 12 years in the wild. They are consumed by raccoons, hawks, feral cats, and depending on place, are also preyed upon by dogs and consumed by humans. They are one of the few climbing animals that can descend a tree head first. They are able to do this by turning their hind legs backwards and using their claws for anchoring. They nest atop of trees using twigs and leaves, with males and females sharing a nest during breeding season or when the temperatures are especially low to help build heat. They sometimes nest in the sides of houses or in attics, making them pests especially for people living in more suburban areas.

Northern Flying Squirrels (*Glaucomys sabrinus*): One of the two species of flying squirrels found in the U.S. (the other being a southern variety *G. volans*). There are also two subspecies of flying squirrels around the southern Appalachian area. Flying squirrels are not true fliers, with their flight consisting of gliding between trees made possible by a flap of skin that extends from their limbs called a patagium. Unlike most of the other members of their family, flying squirrels are nocturnal, and found in coniferous and mixed forests. They have thick light brown to cinnamon colored fur with a light underside. Being nocturnal, they have large eyes and long whiskers. Being gliders, they are light, weighing between 110-230 grams. They have a flat tail that helps them direct their course when gliding; by raising it they can shift directions. Their grace in the air is not paralleled on the ground. They therefore opt to hide from predators than try to escape. They are preyed upon by the spotted owl, other owls, hawks, lynxes, red foxes, and others. Flying squirrels consume fungi of various species, spreading their spores as they glide. Mushrooms, lichens, sap, insects, bird eggs and nestlings, flowers and bulbs are other sources of food. Seeds and lichens are cached, especially when food supplies are low. They nest in holes of trees, preferring dead trees for nests, but also building dreys (or the nests built by other squirrels atop trees), sometimes also nesting underground. They will shift nests frequently, sometimes aggregating during cold winter months and sharing nests as other types of squirrels also do for body heat. It was believed that they bred only once a year but more recently reports of two litters have come from parts of Canada. Some hybridization with the southern flying squirrel has also more recently been reported. Flying squirrels have not been seen around Staten Island in over a century.
Muskrats (*Ondatra zibethicus*): A middle-sized semi-aquatic rodent with a flattened tail, the muskrat is a native to North America with important effects on wetland ecosystems, their native habitat. It is an introduced species in other parts of the world and other habitats. When found in large numbers in any one area, they have been known to eliminate vegetation, especially that in prairie wetlands. Cat tails and yellow water lilies are their favorite species. Though wetlands have been destroyed, muskrats have been able to thrive thanks to the construction of canals and irrigation channels. Related to voles and lemmings, and other species, it is referred to as a “rat” in its common name because of its adaptable lifestyle, omnivorous diet, and on them being rodents though they are not true rats. The etymology of its name indicates that it got its name from its coloring and from its musky odor; the word “rat” was added because of their resemblance to rats. Sharing a habitat with beavers, they also spend much of their time in water. Their hind feet are semi-webbed but they rely primarily on their tails for propulsion and can shut their ears to prevent water from going in. Their fur is medium-to-dark in color, and thick given its dual layers that protect them from the cold. They live in groups mainly consisting of parents and their young. They compete with other muskrats for potential mates as well as territory, some dying in the process. They are primarily crepuscular, feeding on small animals like frogs, mussels, and other aquatic animals, but mostly feeding on aquatic plant species. They have been known to cooperate with beavers, appearing to steal beavers’ food in the winter given they do not store resources for the winter. Hawks, large owls, minks, coyotes, and a number of other animals feast on muskrats, including snapping turtles, large fish, and other animals preying specifically on the muskrat’s young. Their numbers rebound thanks to their prolific reproduction, following a cycle of radical reduction followed by population booms resembling the cycles of lemmings. Muskrats have been important to Native Americans for their fur as well as indicators of future weather patterns (i.e., the intensity of a winter season based on the size of the lodgings constructed). They are featured in some Native American myths, and have meant a source of meat for various groups of people. Their burrowing, facilitated by sharp claws, is damaging to infrastructure making them pests in different parts of the world.

Norway Rat (*Rattus norvegicus*): The “common rat,” “brown rat,” “street rat,” “sewer rat” are some of the other names given to the species of rats that abound in NYC, one of the best known of rats. It is found just about everywhere in the world except the continent of Antarctica, making it the second most successful mammal after humans. Their success is related to the vast range occupied by humans, alongside whom they live, benefitting from their food as well as human-made environments that allow them to create suitable habitats. Rats prefer moist environments, for example, and sewer systems allow them to live as though along streams. Their fur is coarse, of dark grey color or brown, and up to 10 inches in size (25 cm) with tails as long as their bodies, weighing up to slightly more than 2 lbs in some cases. Being nocturnal, the brown rat relies on hearing and smell and has dichromatic vision. They use ultrasonic calls especially when communicating from offspring and mother. Because rats are social animals, they also use vocalizations during play and high pitched chirps are associated with feelings of pleasure. *R. norvegicus* are good swimmers and diggers, with females and young burrowing more than males and older rats. They are omnivorous, and foraging behaviors vary dependent
on population numbers as well as on food source availability. Rats are not seasonable breeders and can produce up to five litters with an average of seven offspring but up to 14 young, following a 21-day gestation period. Rat lifespan is short, most living only up to a year, with high predator pressures and interspecies competition. Living in hierarchical societies, rats form large groups with every individual having a place within the pack. Population pressures can lead to aggression and sometimes fatalities, lessening the population pressure. Rats are generally social, grooming each other and sleeping together. Eradication of rats has been possible in some places, including Alberta-Canada. The best means of managing their numbers is by taking preventive measures against them by plugging access points and controlling waste. However, NYC has tended to spread poison and use traps instead. See Robert Sullivan (2004) for a social history of rats and their almost unavoidable presence in cities, as well as on their habitats and metaphoric uses in popular culture, especially American culture.

**Raccoon** (*Procyon lotor*): Also referred to as the “common raccoon” and colloquially as “coon,” raccoons are medium-sized mammals, recognizable by the “mask” pattern made by their darkly colored fur around the eyes bordered by light fur that further highlights their mask-like feature. Native to North America, raccoons are nevertheless considered a pest in urban centers where they have successfully moved in, beyond the mixed and deciduous forests they are native to, and the coastal marshes and mountainous areas they have also adapted to beyond their natural range. They are highly intelligent animals as well as adaptive, as their movement into new habitats illustrates. Previously believed to be solitary animals, more recent findings suggest they have gender-specific social behaviors, with related females following a fission-fusion model of sharing common areas, and unrelated males living in groups to protect fertile females from outsider males during mating season. Their ranges vary depending on whether they are found in prairies where their territories are larger, or smaller hectares in cities. They mate between late January and mid-March, after males relentlessly roam their territories, courting females prior to the 3-4 days when they are fertile. Females gestate for 65 days and give birth to an average of two to five kits in the spring that live with their mothers until they disperse in late autumn. In captivity they have been found to live up to 20 years, but on average in the wild, they live almost two years to a little over three years. Hunting and cars are their most common causes of death. Named in various languages after its dousing behavior, where they use their hands in a motion resembling “washing,” the word “raccoon” is an adaptation of the native names given to them by native groups. Thought related to different animals including badgers, bears, dogs and cats, the evolution of the raccoon likely has tropical origins, probably from Central America after their arrival over the Bering Straits, according to fossil records and genetic studies showing four subspecies unique to that region.

Some of their unique features are being able to both sweat and pant to regulate their body temperature, swimming as well as climbing, running and leaping, and having a horny top layer to their ultra-sensitive front paws that becomes pliable when wet. Their paws are their primary sense for information about their world, getting information from objects before touching them via vibrissae, or hairs above their non-retractable claws. Their sense of smell is also important as is their auditory skill, more important than their vision which is limited for long-distance viewing, adapted for seeing in the dark given the
presence of tapedum lucidum. They use glandular secretions usually from their anus as well as their urine and feces to scent mark.

Raccoons are introduced species in places like Japan and Russia, introduced as pets in the former country, and as pools for game in the latter. They were killed off in islands in the Caribbean, and outside of North America, they have strong population numbers in Germany as well. Raccoons can carry rabies so they are managed for that reason, especially in urban settings. Since females forage during the day, this is not a reliable means of telling if raccoons are rabid. They carry other pathogens not necessarily lethal to humans. Raccoons appear in different myths, associated with features like intelligence and mystical powers. See Sterba (2012) for more on raccoon behavior and presence in cities, suburbs, and exurbs.

White-Footed Mice (*Peromyscus leucopus*): Also known as the “woodmouse” in Texas, this type of mouse is a rodent native to North America, ranging from Ontario to Quebec, Labrador and the Maritime Provinces in Canada, to the Southwest U.S. and Mexico. There is a known disjunct population in Nova Scotia as well. While the maximum life span of these mice can be up to 96 months, they typically have a mean life expectancy of 45.5 months for females and 47.5 for males; northern climates further cut their life expectancy on average to 12-24 months. Similar to *Peromyscus maniculatus*, or the Deer Mouse, it can carry the hanta virus, dangerous to humans. Additionally, it is a competent reservoir for the tick causing Lyme disease. For additional information on white-footed mouse genetics, behaviors, distributions across NYC, and more, see Munshi-South’s research (2012) and Munshi-South and Kharchenko (2010).

White-Tailed Deer (*Odocoileus virginianus*): Also commonly called “whitetail” or “Virginia deer” as their Latin name indicates, *O. virginianus* are medium-sized ungulates native to the United States, Canada, Central and South America. It is an introduced species in places like New Zealand and parts of Europe. Their genetic variation and the fact that they are generalists makes them well adapted to a variety of environments and the most widespread species. Replacement populations where deer were killed off are descendants from *O. virgianus virginianus*. Their coats are a reddish brown in the spring that turns a grayish-brown in the fall with bright white fur on the underside of their tails that flairs when alarmed. Their fur is hollow, providing enhanced insulation. They can weigh up to almost 300 lbs (about 130 kg), largest the farther away they are from the equator, following Bergmann’s Rule. Males grow antlers every year beginning in the spring, with their length and branching dependent upon genetics and nutrition. Age is better reflected in the length of snout than it is in antler length. Older deer have longer snouts and greyer fur. Antlers are shed once all females have been bred. Sparring for females follows a dominance hierarchy, with bucks mating with as many females as possible and becoming depleted in the process since they eat or rest little during mating season. Temperature affects the deer’s ability to travel looking for females as they can overheat or become dehydrated in the process. Females enter estrus in late October/early November, as early as their first year depending on number of females in any given area as well as on food availability. They can reproduce six months after they have reached maturity, at one or two years of age. Females have one to three young around May or June. Copulation consists of a brief jump, short in duration. Offspring are weaned after
8-10 weeks, losing their spots by the first winter. Male fawns tend to be larger than female ones and leave their mothers after their first year while female fawns will move away after two years.

They communicate through sound, scent, marking, and body language. Mother and offspring especially communicate through a series of grunts, snorts, and high-pitched sounds from bedded fawns. Aggression is also shown through a grunt-snort-wheeze pattern and danger is communicated through sounds as well. They have scent glands between the antlers that they use to rub on branches, and they “rub urinate” which involves squatting while urinating so the urine will run down their legs. Females also release pheromones when in estrus. Deer are an example of the success of conservation: they were brought back from small populations through protective regulatory policies. They have since become a nuisance species in some places, including the northeast. As carriers of the ticks bearing the Lyme disease parasite, they have facilitated the spread of that disease. They pose hazards to drivers and their browsing changes the composition of forests. White-tailed deer eat plants, shoots, grasses, leaves, cacti, acorns, and fruit, varying with each season. In certain areas, despite hunting their population remains large, limiting the spread of native plants due to over-browsing and compacting of ground that depletes woodlands and affects plant succession by changing the amount of light that enters the forest floor based on what deer eat. In addition to changing the light composition which affects plant growth, they tend to prefer native species as food, promoting the advancement of invasives, effects that are magnified in conjunction with canopy disturbance. Their ruminant stomach allows them to also eat organisms like poison ivy and mushrooms not consumable by humans, as well as foodstuffs particular to farms like corn and hay, also opportunistically feeding on field mice and songbirds even though they are herbivores. The four-chambered stomach also allows them to process food once they have reached safety and the bacteria in their guts changes seasonally based on their diets. Without their natural predators, wolves, alligators, jaguars, cougars, bobcats, coyotes, and others, their numbers have expanded significantly, currently making them a threat to car traffic as well as to plants in city parks. Also refer to Sterba (2012) and Haskell (2012) for additional details on habitat and ecology of white-tailed deer in suburban and forest contexts, respectively.
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