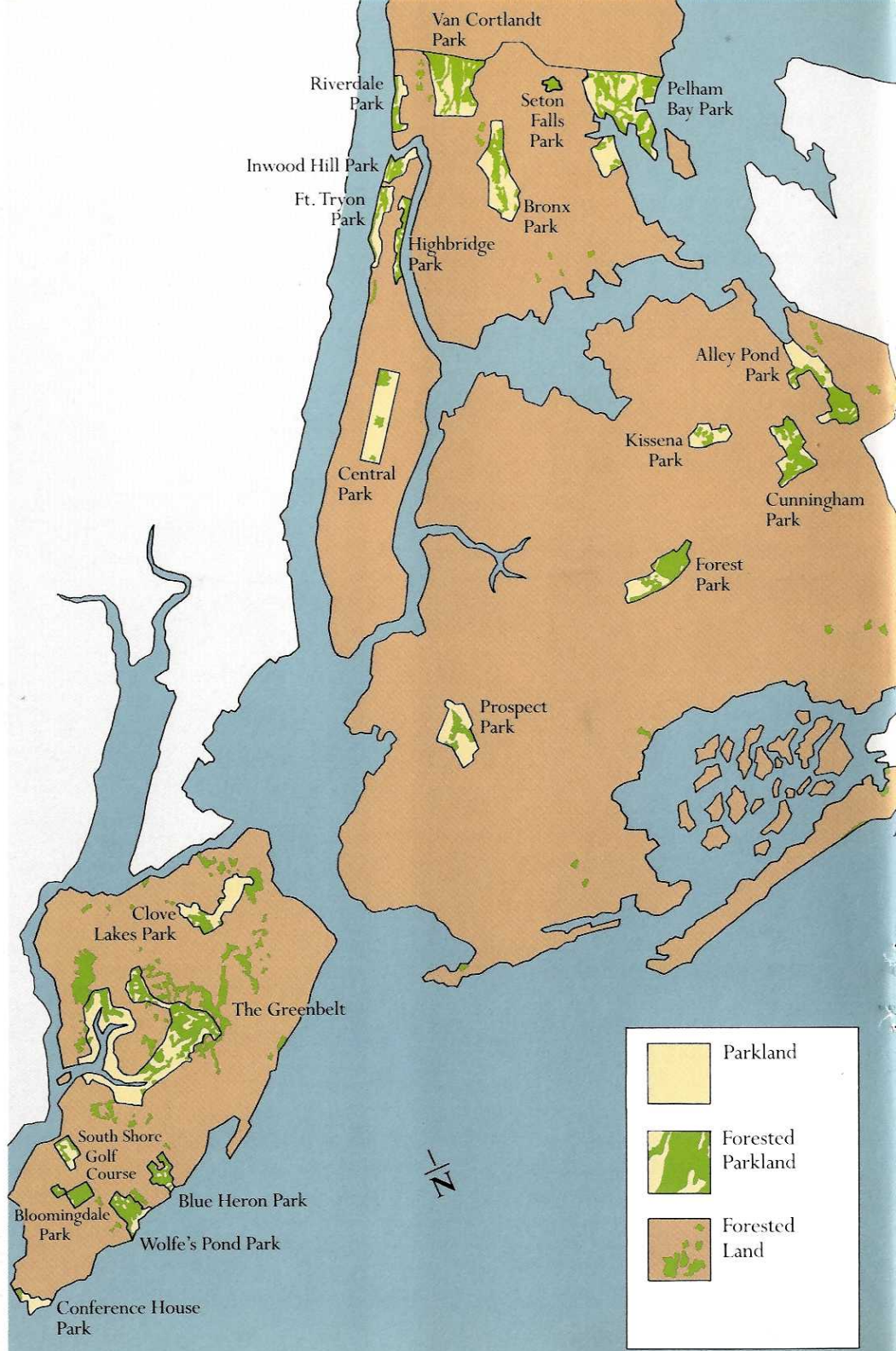
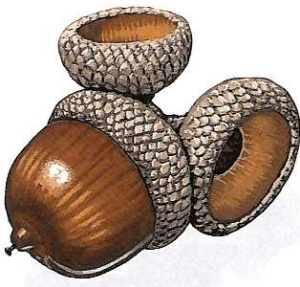


FORESTS  
OF NEW  
YORK CITY







Three steps onto one of the city's woodland paths is as transporting as an hour drive to a park upstate. In any borough we can slip into the woods where footfalls rebound off springy forest floors. In summer, the woods are often as many as ten degrees cooler than on the street.

In winter, the windchill factor is greatly reduced. And throughout the year, the city's forests are full of soothing sights, sounds, and scents.

From spring through fall, a constant display of woodland wildflowers explodes with color. On a winter stroll, one oftens sees a red-tailed hawk wheeling above the trees, sunlight illuminating its brick-colored tail feathers. In any season, the woods smell refreshing: perfumed in summer; earthy, with a hint of spice and mushrooms in the spring and fall; and simply fresh in winter.

Daily urban life confronts us with many insults: noise; exhaust from cars, trucks, and buses; crowds careering through concrete corridors. New Yorkers are fortunate to have nearly 5,000 acres of forested parkland to which we can retreat. The forests are the city's lungs. They scrub the atmosphere, removing air pollution, absorbing carbon dioxide, and returning oxygen. As a refuge from the stress of big city life, they are unmatched. Use this guide as an introduction to your city's forests.

Take a hike.

*The hackberry emperor butterfly larvae (caterpillars) eat only hackberry leaves.*

*The hackberry forest at Conference House Park, Staten Island, is one of the best localities in the region to observe them.*



## Pleistocene Park

There were no forests 15,000 years ago in New York City. Vegetation was scarce. A towering wall of ice that loomed more than 2000 feet high dominated the landscape. Areas free of ice revealed a boulder-strewn landscape of bare bedrock, gravel, and sand.

Four times during the Pleistocene Period — between one million and 10,000 years ago — the earth's climate grew much colder than it is today. Over the course of those cold periods — each one lasting thousands of years — snow and ice accumulated, forming a tremendous glacier that covered about one third of the Northern Hemisphere.

About 15,000 years ago, the global climate warmed, and the glacier receded.

Torrents of meltwater carried boulders, gravel, and sand which were deposited in a high ridge that marked the southern limit of the glacier's advance called a terminal moraine. The hills of Long Island's north shore are part of this terminal moraine which stretches from Nantucket Island and Cape Cod in the east, through Long Island and Staten Island, to the Pacific Ocean near Seattle, Washington.

Tremendous winds scoured the ice-free southern edge of the glacier. The sun warmed the bare ground and the air near the earth's surface. As the warm air rose, cold air from the top of the glacier sank rapidly and rushed down the southern face of the ice to take its place. These winds, sometimes blowing in excess of 150 miles per hour, whipped up gravel into horrendous sand and mud storms. Dunes and drifts deposited by these winds were early sites of soil formation and provided an opportunity for plant growth.

Colonizing the post-glacial landscape were grasses, sedges, mosses, lichens, and dwarf willow and birch shrubs, similar to plant communities found on present arctic tundra. Plant roots held sand in place. Successive generations of dead plant material added organic matter and nutrients to the developing soil.

The accumulation of soil, with continued warming trends, allowed for the growth of more trees. Pine, spruce, fir, and birch flourished. But this was not a forest. The trees were widely spaced and grasses and sedges remained a major component of the vegetation. In addition, extensive wetlands of cattail, knotweed, and sedges rimmed large lakes of glacial meltwater. Kettle ponds formed when huge chunks of ice that had been submerged under soil finally melted and left deep depressions filled with water. Forests of spruce, fir, and

birch did not prevail until about 8,000 years ago.

During the 7,000 years of warming and vegetation development, droves of animals began to move from the south into areas left ice-free by the receding glacier. Many of the animals were familiar residents still found in the Northeast, including white-tailed deer, cottontail rabbit, beaver, muskrat, and eastern chipmunk. Others would startle visitors if encountered today.

The ice age fossil record for New York City is scant. We know for certain that mastodons roamed what is now Inwood Hill Park; a skeleton was discovered during excavations of the Harlem River Ship Canal. Fossil remains of saber-toothed tiger, giant beaver, and dire wolf have been found within 100 miles of the city. Other fossilized pleistocene fauna

*A view  
from Deere Park,  
Staten Island.*





found within our region include woolly mammoth, ground sloth, tapir, and flat-headed peccary.

By 7,000 years ago, the gradually warming climate ushered in a dramatically different flora and fauna. The range of spruce, fir, and birch forest became restricted to more northern latitudes. Bog lemming, pine marten, moose, caribou, and porcupine, followed the evergreen forest's slow retreat. Others, like the woolly mammoth, saber-toothed tiger, flat-headed peccary, ground sloth, dire wolf, and giant beaver, became extinct. Oaks, hickories, maples, sweet gum, and hemlock expanded their ranges from the southern Appalachian mountains, Florida, and the Mississippi delta, and moved north into our area. White-tailed deer, eastern chipmunk, and great-horned owl were among the ice age animals that stayed in our area through the transition between forest types. Raccoon, opossum, eastern gray squirrel, southern flying squirrel, and others migrated north to live in the oak-hickory forest currently typical of our region.

*The tree canopy is active with consumers.*

*Primary consumers like the leaf hopper feed on tree leaves.*

*The spring peeper and Baltimore oriole — both secondary consumers — eat insects.*

## Forest Fundamentals

The term “ecosystem” describes the complex exchange of energy between plants and animals, and their interactions with one another in the context of a physical environment. In all ecosystems, energy is supplied by the sun. Primary producers — green plants — use solar energy to convert water and carbon dioxide into starches, sugars, and other organic material.

This process of photosynthesis provides energy for sustaining the life of consumers; animals. A by-product of photosynthesis is oxygen, also essential to the life of all animals. Consumers are either primary consumers that eat plants, or secondary consumers that eat other animals. Decomposers are the bacteria and fungi that digest and recycle animal waste, and dead animals and plants.

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### THE CANOPY LAYER

Trees — the chief forest primary producers — are among the largest and longest lived organisms. Their growth habit of dense, leafy canopies atop tall trunks makes it difficult for other plants to co-exist. A fully developed forest tree canopy may allow as little as one percent of ambient sunlight to reach the forest floor. This is not much light for the energy needs of other plants. So, forest



Errol Wright



*An abundance of organisms — fungi, bacteria, and insects, worms, and other invertebrates — inhabit the forest floor. The eastern chipmunk and red-backed salamander burrow into the soil. The ovenbird builds its nest on the ground.*

plants have adapted to form an intricate vertical structure and finely-tuned timing of leaf emergence and flowering. Lower layers leaf-out earliest each year, enabling them to gather sunlight before the next layer's leaves emerge.

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#### THE GROUND LAYER

The ground layer is composed of the lowest growing forest plants, the wildflowers and ferns. These are the first plants to emerge. Some of the spring ephemerals — so called because they sprout, flower, and die back to an underground bulb in a matter of weeks — push up through frozen ground and snow. The cone-shaped leaf buds of skunk cabbage are one of the first harbingers of spring, emerging in swamp forests through snow and ice as early as February. Most spring ephemerals, including bloodroot, mayapple, trout lily, and spring beauty emerge and flower in May. Ground layer plants vary in height from Canada mayflower which carpets the ground, to Joe Pye weed and woodland sunflower, which can be six feet tall.

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#### THE SHRUB LAYER

As ground layer plant leaves unfurl, shrub layer plant buds burgeon. This layer is made up of woodland shrubs, most of which, including spicebush, pinxter azalea, and mapleleaf viburnum flower first, then leaf-out. Shrubs range in height from the knee-high lowbush blueberry, chest-high arrowwood, to spicebush which reaches up ten feet or more into the understory.

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#### THE UNDERSTORY

The understory is composed of small trees like sassafras and flowering dogwood which flower and leaf-out about the same time as shrubs. Trees in the canopy layer generally flower first, often as early as shrub layer species, but their leaves open last.



## Wildlife

The vertical structure of forests provides diverse wildlife habitat. Comparisons have been made between forests and apartment buildings, where the amount of people living in a limited area is maximized by building multiple-story dwellings.

Animals living below the forest floor in the leaf litter and soil are the most numerous forest residents. Here we find the eastern chipmunk and eastern mole which burrow into the soil. The red-backed salamander lives under leaf litter,

and in and under rotting logs. But the bulk of forest floor animals are invertebrates — spiders, mites, insects, worms, and other arthropods. There can be thousands of invertebrates in as little soil as it takes to fill a coffee can. Millipedes, mites, springtails, and pseudoscorpions munch on dead leaves helping to recycle organic matter and nutrients. Hundreds of beetle species live in the forest floor. Some chew dead wood. Others, such as the carrion beetles, eat dead birds and mammals. Earthworms burrow through broken leaves and the waste of soil animals, digesting the debris and redistributing nutrients throughout the soil. The amount of leaves, branches, feathers, animal waste, carcasses, and other detritus that falls to the forest floor each year is more than one ton per acre. Invertebrate soil fauna play an essential role in breaking down this material enabling bacteria and fungi to recycle it back into the ecosystem.

The forest floor is the domain of the short-tailed shrew, a mouse-sized predator that is more fierce than its size suggests. Shrews eat their own weight in insects, mollusks, and small rodents every day. Other forest floor wildlife includes wood and box turtles, wood frog, white-footed mouse, and eastern cottontail rabbit. The ovenbird and American woodcock are among the few birds in our area that nest on the forest floor. The ovenbird builds a nest that looks like an old-fashioned clay beehive oven. The American woodcock nests at the base of dense shrubs.

The shrub layer and understory provide nesting habitat for some of the most

conspicuous forest birds including the northern cardinal, gray catbird, and wood thrush. It's hard to miss the red plumage of the cardinal as it flits through the understory. Gray catbirds are drably colored, but they often pop into view as one walks near. They utter their alarm call, which sounds like a cat's meow, and display a rusty patch under their tail. You are unlikely to encounter a wood thrush face-to-face, but once you have heard its song, you will not forget the flute-like, haunting melody.

Ascending the larger, older canopy trees, we find the luxury apartments, the rooms with views. Cavities serve as nests for raccoon, opossum, gray squirrel, southern flying squirrel, and great-horned owl where limbs have rotted and fallen. The yellow-shafted flicker, and red-bellied and downy woodpeckers excavate nest holes in tree trunks and limbs. Black-capped chickadee, tufted titmouse, and great crested flycatcher nest in these holes when they are vacated by the woodpeckers in subsequent years. As the cavities enlarge over time, bigger animals move in.

High in the canopy are the nests of the wood peewee, red-eyed vireo, scarlet tanager, and Baltimore oriole. Insects are active throughout the canopy. They are the chief forest primary consumers and the canopy is a popular place for insects to feast. Hundreds of species of moth caterpillar eat forest tree leaves. Inchworms, for example, traverse the canopy on silken threads eating leaves along the way. There are also leaf hoppers that suck sap from leaves and twigs. The leaf hopper's digestive tract concentrates



*The wood thrush is especially fond of spicebush fruits. In late summer and early fall spicebush, sassafras, flowering and grey-stemmed dogwoods, arrowwood, and tupelo produce large-seeded red fruits that are high in fats. The fruits supply forest songbirds with a high-energy food source at the beginning of their fall migration.*

nutrients from the sap and excretes copious amounts of sugary water. This honeydew is eaten by ants. The canopy-nesting songbirds spend most of their lives gleaning insects from leaves.

A vexing question arises when we consider the enormous variety and abundance of leaf-eating insects in the forest: Why don't they eat all the leaves in the forest? In some years, within recent memory, gypsy moth caterpillars have almost done just that. But such wholesale defoliation is exceptional.

One reason for the continued health of forests, despite the existence of countless hordes of insects that would eat every leaf in sight if given the chance, is that plants fight back. Plants have evolved with a variety of structures, mostly an assortment of glandular hairs, on leaves and leaf stems that present a mini-obstacle course to marauding insect armies. Another line of defense is chemical weapons. Oaks

produce tannic acid. Willows contain salicylic acid — aspirin to you and me, a major pain to insects. Black cherries manufacture cyanide-related compounds. Black birch sap is rich in wintergreen oil. All these substances are present in concentrations that are toxic to insects. Of course some insects have evolved with, and continue to evolve, mechanisms for circumventing these plant defenses. But, for the most part, plant defenses keep insect feeding within tolerable limits.

Another factor that mitigates potential defoliation of forest trees by insects is predation. Waves of migrating songbirds descend on eastern forests every spring. These small birds — warblers, vireos, thrushes, and others — are enroute from their winter refuges in the tropics, to their summer breeding areas in the forests of upstate New York, New England, and Canada.

The arrival of these birds in our area — beginning in April, peaking in mid-May — is met with great excitement by local bird-watchers. During this period, almost any forested area in the city can be good for observing migrants, but the Ramble in Manhattan's Central Park and much of Brooklyn's Prospect Park are world-class birding hot spots. Hundreds of birders show up in these parks with the expectation of seeing as many as 30 or so species of migrant songbird. Some of the birds — the parula, bay-breasted, chestnut-sided, Canada, and black-throated green warblers, among others — are exquisite. Others, like the Philadelphia vireo and gray-checked thrush, are seldom seen by most bird-watchers except at this time.

The neotropical migrant songbirds are more than objects of bird-watchers' admiration. They constitute an ecological factor of global significance. The warblers and vireos are formidable predators of forest leaf eating insects. Western Hemisphere populations of these birds have been declining. Tropical rain forest destruction has been implicated as one possible cause of songbird decline. Another is heavy timber cutting in Canadian forests. Either way, the birds need forests to breed in, forests to winter in, and forests to feed in, while migrating. A reduction in forest in any one area will affect the other two areas as smaller bird populations will be available to help control forest insects.

## Forest Types & Distribution

The general vegetation patterns of the world are determined by temperature and moisture. In regions that are cold and wet, forests of evergreen trees dominate. Where cold, dry climates prevail, tundra — frozen treeless expanses of grasses and mosses — is the major vegetation type. Prairies and steppes occur where there is a warm, dry climate. Our region, the eastern United States, is a warm, wet climate. The dominant vegetation is deciduous forest; that is, a forest dominated by trees that lose their leaves every year.

Within the eastern deciduous forest there can be considerable variation. Not all eastern forests are the same. Particular sites have characteristics, related to soil nutrients, acidity, and moisture, that influence the distribution of plant and animal species that distinguish different types of forest. For example, in an oak forest, different oak species grow at different positions on the same slope: Red oak often grows at the bottom of the slope where moisture and fertility are greatest; black oak frequently grows on the mid-slope; and white oak usually grows on the top of the slope where soil moisture and fertility are lowest. Local weather conditions, such as length of frost-free growing season and total rainfall, play an important role in shaping the species composition of forests.

The great-horned owl nests in the forest canopy. A fierce predator with excellent sense of hearing and night vision, the great-horned owl hunts at night. The owl descends silently from its perch high in the canopy to take prey on the ground in its sharp, powerful talons. In our area, typical prey includes grey squirrel, Norway rat, and eastern cottontail rabbit.



New England maple and birch forests differ from southern Appalachian oak and hickory forests. And coastal plain forests are easily distinguished from the other two. Eastern forests contain many of the same species, but in each region and locale, particular species are more dominant than others. The following is a discussion of the major forest types recognized in New York State that occur in city parks.

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### FLOODPLAIN FORESTS

Floodplain forests grow on mineral soils in the lowlands of river floodplains and deltas. These sites are characterized by their flood regime; low areas are annually flooded in spring, and high areas are flooded irregularly. Typical floodplain forest tree species include red and silver maples, white and green ashes, sweet gum, tupelo, American sycamore, cottonwood, swamp white oak, pin oak, black willow, and American linden. Herbs and shrubs may include swamp sunflower, smooth nettle, marsh marigold, skunk cabbage, silky dogwood, and pussy willow. Wood duck, red-bellied woodpecker, blue-winged warbler, and tufted titmouse are common floodplain forest denizens.

*Examples of floodplain forests can be found along the Bronx River in Bronx Park; The Loch, Central Park, Manhattan; The Ambergill, Prospect Park, Brooklyn; The Ravine, Udalls Park Preserve, Queens; and Tibbetts Brook, Van Cortlandt Park, Bronx.*

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### RED MAPLE-HARDWOOD SWAMPS

Red maple-hardwood swamps occur in poorly drained depressions, usually on inorganic soils. They include a broad range of landscapes including permanently flooded forest, and apparent upland forests, flooded only a few weeks of the year. Varying mixes of red maple, sweet gum, pin oak, and tupelo dominate these sites.

Skunk cabbage may be prominent among the ground cover. Other ground cover and shrubs include cinnamon and sensitive ferns, tussock sedge, turtlehead, swamp azalea, and spicebush. Blue-winged warbler, wood duck, spotted salamander, and bull, green, and wood frogs are some of the typical wildlife.

*Examples of red maple-hardwood swamps are found in The Great Swamp, Staten Island Greenbelt; Wolfe's Pond Park, Staten Island; Van Cortlandt Park, Bronx; and Lily Pond, Alley Pond Park, Queens.*

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### OAK-HICKORY FOREST

Oak-hickory forest is represented by most of the city's mature forests. It occurs on well-drained sites, often on ridge tops, upper slopes, or south- and west-facing slopes. The soils are usually loams, or sandy loams.

Red, black, and white oaks (or their hybrids) are dominant. Red oak commonly grows on moister soils at the bottom of slopes, black oak on mid-slopes, and white oak on drier ridge tops. American beech may be co-dominant on moist sites. Shagbark, bitternut, and mockernut hickories are often prominent



The red-tailed hawk is often thought of as the day-time counterpart of the great-horned owl. Both nest in the canopy and prey on small mammals. Although neither hawk nor owl would tolerate the other nesting in its own territory, their hunting ranges frequently coincide. Conflicts are avoided because the red-tailed hawk works the day shift, the great-horned owl the night shift.

canopy trees. Mapleleaf viburnum, pinxter azalea, lowbush blueberry, and flowering dogwood are often conspicuous in the shrub layer.

Ground layer herbs include blue-stemmed goldenrod, wild sarsaparilla, black snakeroot, bloodroot, tall meadow rue, rattlesnake root, toothworts, and trout lily. Where sufficient forest interior exists, typical breeding birds may include great crested flycatcher, red-eyed vireo, American redstart, ovenbird, and wood thrush. Eastern gray squirrel is a conspicuous mammal; southern flying squirrel and white-footed mouse may be present, but much less conspicuous. *Examples of oak-hickory forest are present in Forest Park, Queens; Inwood Hill Park, Manhattan; The Ravine, Prospect Park, Brooklyn; High Rock Park, Staten Island Greenbelt; and Seton Falls Park, Bronx.*

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### **RICH FOREST**

Rich forest occurs on fertile, moist, well-drained soils which are favorable for the dominance of a wide variety of tree species. There are a number of variations of this community in which only a few species co-dominate. Oak-tulip stands are dominated by tulip tree, red maple, and red and black oaks. Beech-maple stands are dominated by sugar maple and American beech, and tend to occur on acid soils.

Canada mayflower often carpets the forest floor. Other herbs include lady and New York ferns, wild geranium, bloodroot, mayapple, Solomon's seal and many others. Shrubs include spicebush,

shadblow, arrowwood, and blackhaw viburnum.

Wildlife is essentially the same here as in the oak-hickory forest. Red-backed salamander thrives in the more uniformly moist forest floor. *Examples are found in The Clove, Inwood Hill Park, Manhattan; Northwest Forest, Van Cortlandt Park, Bronx; Blue Heron Park, Staten Island; and The Midwood, Prospect Park, Brooklyn.*

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### **SUCCESSIONAL FOREST**

Successional forest occurs on sites that have been cleared or otherwise disturbed. A characteristic feature of successional forests is the lack of reproduction of the canopy species. Most of the tree seedlings and saplings in a successional forest are species that are more shade-tolerant than the canopy species. Shrub and ground layer dominants may include many species characteristic of successional old fields, like little bluestem grass and smooth sumac. Or they may include species that occurred on or near the site prior to disturbance such as mapleleaf viburnum and white wood aster.

Successional forests — or discrete patches of successional forests — are often dominated by particular species on a first-come, first-served basis. There may be a patchwork pattern of even-aged sapling stands of different species occurring side-by-side: a stand of black cherry next to one of black locust; a sassafras stand abutting poplar and sweet gum stands. Often, successional forests occur in highly dissected landscapes. Species typical of adjacent meadow and shrubland may also be present.



Wildlife in early successional forests includes eastern cottontail rabbit, white-footed mouse, gray catbird, northern mockingbird, northern cardinal, willow flycatcher, rufous-sided towhee, and warbling vireo. *Examples are found in Blue Heron Park, Staten Island; southern Hunter Island, Pelham Bay Park, Bronx; northern Cunningham Park, Queens.*

## Places to Visit

There are forests in each of the five boroughs worth visiting. Here are a few suggestions.

### BROOKLYN

Of all five boroughs, Brooklyn has the least amount of forest. Some small successional forests dot open space in the vicinity of Jamaica Bay, but the bulk of the forest in the borough of Kings — less than 100 acres — is in **Prospect Park**. When Frederick Law Olmsted and Calvert Vaux designed Prospect Park, they incorporated two areas of existing forest into the plan. One area, the Midwood, was left largely untouched. It is essentially a tulip tree-dominated rich forest situated below the terminal moraine. Above the Midwood, on the moraine, is the Ravine, a series of knobs and kettles with a small stream entrenched in a steep valley. Olmsted and Vaux planted various evergreen trees in an attempt to mimic an Adirondack-

like landscape. But, over time, most of the evergreens died and native oaks, and non-native Norway and sycamore maples, have filled in the gaps.

### BRONX

Of **Pelham Bay Park's** 2,764 acres, more than 782 acres are forest. Hunter Island (about 200 acres) is a convenient place to begin to become familiar with forests in this park. Successional forest occupies the southern portion of Hunter Island, just north of the Orchard Beach parking lot. (The area is no longer an island, so it is a quick walk from the parking lot or the beach.) Stands of white poplar, black cherry, black locust, and sassafras are dominant. These forests are growing on the site of the old Hunter estate gardens. Some ornamental species still persist: day lily, porcelain berry, hosta lily, and myrtle in the ground layer; and Tartarian honeysuckle and jet bead in the shrub layer.

A stand of pines — mostly white pine — and a stand of Norway spruce were planted near the middle of the island about 70 years ago. In winter, these evergreen trees provide owls with cozy roosts. Great-horned, long-eared, and saw-whet owls can often be found on Hunter Island in January.

Mature oak-hickory forest dominated by large, widely spaced white, red, and black oaks, some with trunks nearly three feet in diameter, occupy northern Hunter Island. A relatively sparse canopy allows ample light to reach the forest floor. A varied ground layer including wood

betony, early and tall meadow rues, and purple Joe Pye weed, thrives. The open character of the forest is typical of the habitat preferred by great-horned owls and red-tailed hawks. Both commonly nest here.

More than half of **Van Cortlandt Park's** 1,146 acres are forest. A varied topography of high rocky ridges alternating with valleys provides the base for diverse forest flora. The Northwest Forest is 188 acres. Oak-hickory forest grows on rocky heights overlooking valleys of tulip tree-dominated rich forest. Ground layer wildflowers are extraordinarily diverse in the Northwest Forest. There is bloodroot, trout lily, silver rod, rattlesnake root, and many asters, including heart-leaved aster. The forest contains one of the highest concentrations, among sites in the city, of plants recognized as rare in New York State, including giant yellow hyssop, golden seal, and wingstem. Red fox is sometimes observed in the Northwest Forest. In winter, white-tailed deer occasionally wander down from Yonkers and browse here.

In some of the lower, slower draining areas, within the rich forests, depressions are occupied by red maple-hardwood swamps. American woodcock nest here among sweet pepperbush and buttonbush shrubs. Lizard tail, a primitive looking plant of pristine wetlands, is a prominent part of one swamp.

The Old Croton Aqueduct Trail, which roughly bisects the park, provides a wonderful woodland walkway. Oak-

hickory and rich forests are dominant. The ground layer here is as impressive as in the Northwest Forest. However, the mix of canopy tree species is distinctive along the aqueduct. In the rich forest, planted stands of black walnut, American sycamore, and American elm are present. In the oak-hickory forest, sugar maple is prominent. Sugar maple is unusual in our area. It is more typical of New England forests. The relatively lower incidence of fire seems to hasten its reproduction in this part of the park.

**Bronx Park** is best known as the site of the Bronx Zoo and New York Botanical Garden. The park also contains the only natural streamside landscape remaining in the city, outside of Staten Island. The stream is the Bronx River, the borough's namesake. The Bronx River begins in North White Plains and flows into the East River at Soundview Park. The two-mile stretch of river in Bronx Park runs through a deep gorge. A combination of red maple-hardwood swamp and floodplain forest grow on the riverbank along slower flowing portions of the river. Wood duck and muskrat are two common river residents.

A 40-acre forest in the New York Botanical Garden is situated on the slopes above the river gorge. The forest, thought to be the only forest in New York City that was never cleared, is a mixture of eastern hemlock and hardwoods. The hemlock was once dominant. It has since been devastated by an insect pest — the woolly adelgid — that was inadvertently introduced from Asia. Hemlocks throughout the Northeast are

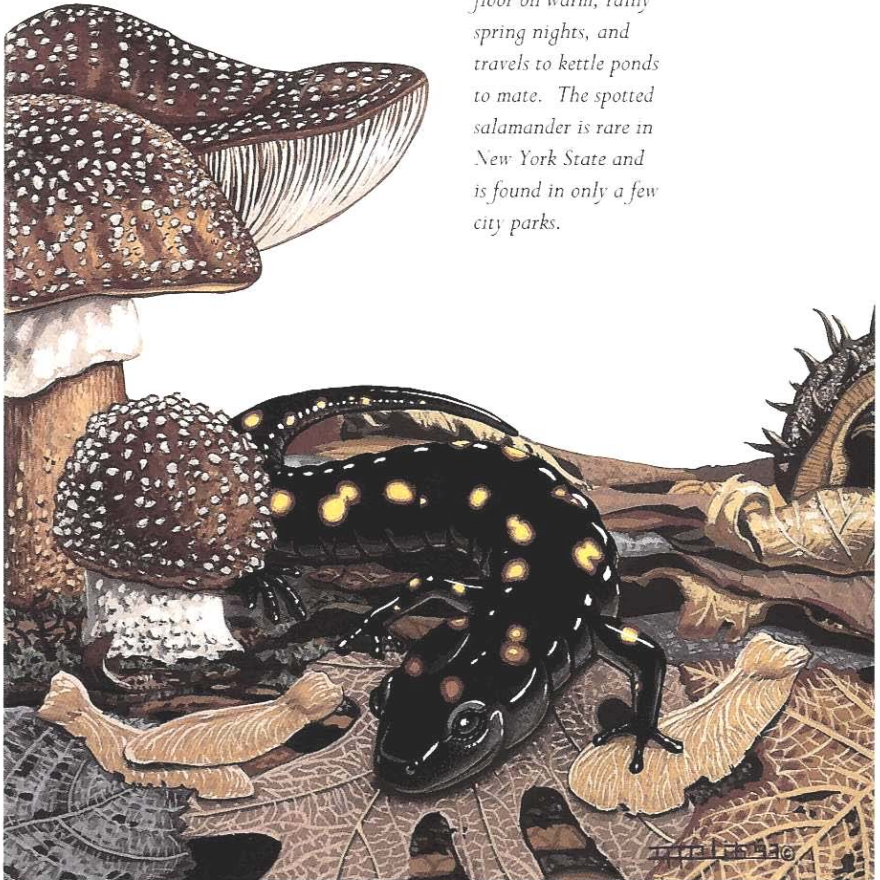
being ravaged by the woolly adelgid. In the Bronx River hemlock forest, black cherry and black birch are replacing dying hemlocks.

**Riverdale Park** contains about 50 forested acres, including mature oak-hickory forest. The rest is successional forest. Twenty seven species of birds — including screech owl — have been confirmed as breeding in the park.

**Seton Falls Park** is small, only 35 acres, and suffers from vandalism, and other

abuse. But it has a surprisingly vital forest. Floodplain forest is present, as is cattail marsh and sedge meadow, along Rattlesnake Creek at the bottom of a sheer, rocky ravine. Above the ravine, oak-hickory and successional forests are dominant.

*The spotted salamander spends most of its life underground. It emerges from the forest floor on warm, rainy spring nights, and travels to kettle ponds to mate. The spotted salamander is rare in New York State and is found in only a few city parks.*



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## MANHATTAN

Yes, there are forests in Manhattan.

**Inwood Hill Park** at the northern tip of Manhattan island is shaped like a mitten. The fingers and thumb are rock ridges rising high above Broadway and the Harlem River Ship Canal; a valley is tucked between the thumb and fingers. The top of the western ridge was the site of several estates and public institutions during the last century and the forest reflects this past land use. It is mostly successional forest with stands of Norway maple planted during park construction projects in the 1930s. For thousands of years rain has washed soil from the top of the hill and deposited it in the valley, an area called the Clove, and into the tidal flats and salt marsh beyond. Deep, rich soils in the Clove support a tulip tree-dominated rich forest. Some of the tulip trees reach 70 feet high. The ground layer in the Clove contains downy yellow violet, bloodroot, and large mats of Dutchmen's breeches, a wildflower with blossoms that look like upside down, inflated pants.

The Central Park Conservancy is studying and managing a 12-acre forested area in the north end of **Central Park**. The site includes a dramatic landscape of glacially polished rock outcrops with precipitous drops over oak-hickory forest intermingled with black cherry, oaks, and Norway maple.

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## QUEENS

There are roughly 1,000 acres of forest in Queens. They are divided almost evenly between Forest, Cunningham, and Alley

Pond parks. All three parks are perched on the terminal moraine, and share the knob and kettle topography — rounded hills (knobs) alternating with bowl-shaped depressions (kettles) — typical of terminal moraine landscapes. They also have in common forests typical of those growing on the terminal moraine: dry oak-hickory forests on the knobs; rich forests in the kettles; and often red maple-hardwood swamps when kettle ponds are present.

**Forest Park** is the driest of the three parks. Its soil drains so well that forests at the bottom of kettles are barely distinguishable from those on knobs. There is only one kettle here that holds water, and it remains wet only after rainy springs. When this occurs, the surrounding forest is one of the best places during spring migration to see such relative rarities as cerulean, yellow-throated, and mourning warblers.

**Alley Pond Park** forests run the gamut from dry white-oak dominated oak-hickory forests on top of knobs, to red maple-hardwood swamps in a series of kettle ponds. In between are moist oak-hickory forests with American beech and red oak as co-dominants and tulip tree-dominated rich forests. The park has what is probably the best local amphibian fauna outside of Staten Island. On spring and summer nights, the forest resounds with the high-pitched call of the spring peeper, a diminutive tree frog. There are also three species of salamander, including the rare spotted salamander, as well as wood and bull frogs, and Fowler's toad.

Most of the forest in **Cunningham Park** is successional, but the one area with mature forest is a beauty. The Southern Woods, along Francis Lewis Boulevard and Union Turnpike contains the oak-hickory and rich forest typical of knob and kettle terrain, but the forest is exceptionally undisturbed. There is not a lot of visitation to this small forest, so the ground cover is in terrific shape. Ferns are an especially prominent part of the ground layer. There are most of the common ones — lady, New York, wood, interrupted, and long beech wood ferns — as well as some rarer ones like rattlesnake and maidenhair ferns.

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#### STATEN ISLAND

Staten Island is the city's last frontier, its least developed borough. Some of the biggest, healthiest forests are in Staten Island parks. Also, some of the last opportunities for preserving privately owned forested areas through park acquisitions exist on Staten Island.

Staten Island is a complicated landform, and that is reflected in its forests. The terminal moraine runs down the length of the island parallel to its south shore. Forests on the moraine are similar to those in other boroughs, except they are generally in better condition. For example, in **High Rock Park**, in the Staten Island Greenbelt, and **Wolfe's Pond Park**, soils are deeper and richer, and American beech is more often co-dominant with oaks in the oak-hickory forest. Tree canopies are more dense with fewer gaps, and the ground and shrub layers are more diverse. In early

spring, the forest floor in Wolfe's Pond Park is blanketed by extensive patches of trout lily. The forest at High Rock is suffused with the color of pinxter azalea blossoms.

**Blue Heron Park** is a complex mosaic of terminal moraine knob and kettle oak-hickory forest, beech co-dominated oak-hickory forest, successional forest, and herbaceous meadow.

On the outwash plain south of the moraine and in the lowlands north of Staten Island's serpentine bedrock spine are glorious red maple-hardwood swamps. **Bloomington Park** contains a woodland stream that meanders through oak-hickory forest and during rainy springs, spills over into a red maple-hardwood swamp. Much of this swamp is dominated by sweet gums. Box turtles are relatively common here as they are throughout Staten Island. **The Great Swamp**, in the Staten Island Greenbelt, lives up to its name. It is among a few sites in the city where persimmon — a species rare in New York State — can be seen.

The very southern tip of Staten Island is the only part of New York City that was not glaciated. That little piece of the island has affinities with the piedmont and coastal plain of mid-Atlantic and southern states. At **Conference House Park** a hackberry forest sits on clay bluffs overlooking Raritan Bay. The hackberry forest is the northernmost forest of its kind. Its occurrence here is probably due to the enormous quantity of oyster shell in the soil. The shells represent hundreds

of years of prehistoric native American kitchen trash. The calcium in the shells buffers the soil acidity, creating conditions favorable for hackberry. Nearby, paw paw — introduced in the early part of this century from Louisiana — and Virginia magnolia grow. They are two other southern plants that are at the northernmost limit of their range.



## Management

The notion of natural succession has for the past century had a profound influence on how land managers have considered forests. It assumes that forests destroyed or disturbed by natural disasters or human land use, will, when left alone, revert in a series of stages to a climax forest — a stable self-perpetuating forest in which all tree, shrub, and herb species are able to reproduce in the shade of the canopy. If we accept this notion and want a forest to develop where one has previously been cleared, then all we need do is let nature take its course. Just be patient and a new climax forest will develop in a century or two.

Natural succession does take place. Weedy herbs and grasses colonize cleared land. The herbs are eventually crowded out by shrubs, which are, in turn, shaded out by pioneer tree species. There often develops a forest of shade tolerant species that is relatively stable over time. But then again, sometimes it is not the kind of

forest we expect or desire. In less than ideal situations — and that means in virtually all urban situations — there are factors that prevent the expected sequence of natural succession. Because of these factors, it is necessary to take a hands-on approach to forest management in New York City.

One of the most significant of these factors is the presence in the city of invasive non-native plants. Removed from their native ecological contexts where insects, fungi, or other natural forces kept them in check, some of these species wreak ecological havoc in our native ecosystems. Trees like Norway and sycamore maples, and vines such as porcelain berry, oriental bittersweet, and Japanese honeysuckle colonize sites where sufficient light allows them to grow. This appears to be natural succession; a small clearing exists and a tree or vine seeds-in and grows. However, these invasive species create so much shade that no native species can grow beneath them. Natural succession comes to an abrupt stop. Norway maple forests in our area contain barely any herb layer, shrub layer, or understory. Gone is the intricate vertical structure of the native forest and wildlife diversity is greatly diminished.

The City of New York Department of Parks and Recreation, through the combined efforts of the Natural Resources Group, the City Parks Foundation's Urban Forest & Education Program, and borough administrations, is actively involved in managing the city's forests. Native forest species are

being planted in areas where canopy gaps exist to preempt potential colonization by invasive plants. In some forests where invasive vines and trees have already taken over, they are being removed and replaced with native forest plants. Conditions that favor nuisance plant growth — arson, illegal dumping, and soil compaction and erosion — are being addressed before they gain an advantage.

Another important goal of forest management in New York City is to consolidate separated fragments of forest into a healthy whole. Five isolated ten-acre patches of forest do not provide the same kind of habitat as one fifty-acre forest patch. The healthiest forests that provide the best wildlife habitat are those which are biggest and most intact. We are reforesting abandoned lawns and disturbed, weedy sites, in order to maximize forest continuity.

Brochures and maps with travel direction for some of the parks mentioned in this guide are available, free of charge, from Parks Natural Resources Group (NRG) and the Urban Forest & Education Program (UFEP). Call (212) 360-2744 for further information.

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## THE NATURAL RESOURCES GROUP

A division of the New York City Park Department established in 1984, the Natural Resources Group (NRG) is dedicated to the preservation and restoration of natural areas throughout the city. NRG staff inventory flora and fauna, and develop management plans identifying fragile areas in parklands and areas that should be acquired for preservation.

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Parks and Recreation  
Natural Resources Group

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*Front cover:*

*Great-horned owl  
fledgling, Pelham Bay  
Park, Bronx. This  
bird was climbing  
back to its nest, using  
its talons and bill,  
after an unsuccessful  
attempt at flying.*



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