International Oaks

The Journal of the International Oak Society

…old-growth Quercus faginea, *the ecological significance of delayed fertilization, a tale of two oaks, the oaks of New York City…*

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Photos. Cover: Roderick Cameron (Central Park, New York City, USA). Page 7: The Morton Arboretum; Béatrice Chassé (*Quercus acerifolia*). Page 8: Béatrice Chassé. Page 9: Ryan Russell. Pages 10-11: Dirk Giseburt. Page 13: Roderick Cameron (*Q. coccinea*, Brooklyn Botanic Garden, NYC, USA).

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The Oaks of New York City

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Introduction

You are never far from an oak in New York City: you can find them in the streets, in the squares, in the smaller parks, in the grand landscaped parks, in the nature reserves, in the wild forests, along the riverfronts and beaches. Some grow spontaneously, the others have been planted for reasons ornamental, environmental, or monumental: enhancing the beauty of streets and parks, improving the quality of urban life, or serving as memorials to key events and persons in the City's past. During a couple of short sojourns in the Big Apple, I dedicated some time to studying their diversity, history, and performance in the various locations where they are found. Then I looked for a way to tell their story. Garden designer Piet Oudolf once said, "Plants are characters I compose with and I put them on the stage" (Bradshaw 2019). Given New York's rich theatrical tradition, perhaps we could take his cue and consider the oaks as actors interpreting characters in a play. So let us pretend for a moment that all New York's a stage and all the oak trees in it merely players. You, reader, can be a producer putting together a theater company, and I will be the casting director proposing who might best play the different roles called for in a Broadway show.

Enter the King

There would be little doubt as to who should play the lead: *Quercus palustris* (pin oak) in New York is king of the hill, top of the heap. It is the species of oak that has most often been planted as a street tree and even makes it into the top five of any tree species planted in New York City's streets: only the urban tree superstars *Platanus ×acerifolia* (London planetree), *Gleditsia triacanthos* (honey locust), and *Pyrus calleryana* (Callery pear) have higher billing. New York's streets are a hostile environment for trees – you might say, if a tree can make it there, it would make it anywhere – but (king)pin oak's backstory of adaptation to swamp conditions means it is able to withstand occasional flooding and low oxygen levels found in urban soils; it is also tolerant to drought and is easy to transplant due to its shallow root system (Barnard 2002). It seems to thrive in New York despite the cement and the exhaust fumes and the winter salt, presumably thanks to the acid soil that this species craves and is found in most of the City. I saw very few pin oaks showing signs of chlorosis – a typical fault of this species when soil is alkaline – and the majority seemed very healthy. Though another dozen oak species are recorded in the 2015–2016 Street Tree Census (see Table 1), *Q. palustris* clearly has the best agent: over 53,000 specimens recorded, versus 8,400 for the second most-planted oak, *Q. rubra* (northern red oak). It is worth noting that at a genus level, oaks are second only to maples as the most planted on the streets of New York.

Quercus palustris puts in outstanding performances as a specimen tree in the City's parks and gardens: perhaps the best I have seen is in the Brooklyn Botanic Garden, dominating the lawn next to Magnolia Plaza; a massive *Q. palustris* in nearby Green-Wood Cemetery offers stiff competition, its huge straight trunk standing guard over Cedar Dell, a circle of old gravestones dating back to the 1700s and moved from the Dutch Reformed Church's churchyard in the mid-19th century (Richman 2011). In Central Park it is one of the most common trees, ranking second behind top-billed *Prunus serotina* (black cherry), of which there are close to 3,800 (Chaya and Barnard 2013). Like a versatile lead actor, it is not above forming up in a chorus line when

Photo 1/ *Quercus palustris* (Brooklyn Botanic Garden).

the script calls for it: a magnificent planting runs along Central Park West. This must surely be one of the longest plantings of a straight line of a single species: c. 4.2 km is planted almost entirely with large *Q. palustris*. Some seem to have succumbed to age and have been removed or replaced by younger understudies, but the grandeur withstands, balanced by a corresponding line of *Ulmus americana* on the east side of the Park along 5th Avenue. The species is also a smash hit on Broadway, particularly in the Broadway Malls, a series of fenced gardens that occupy the median of the Big White Way from Columbus Circle (60th Street) to Mitchell Square (168th Street). The malls were originally 10-meter-wide landscaped medians incorporated into the new design in 1869 of what was then Bloomingdale Road, renamed as the "Boulevard" and modeled after the Champs Elysées in Paris. They were redesigned in 1904 after the construction of the subway line, relandscaped in 1935, and then renovated by the Broadway Mall Association between 1980 and 1993. Most of the trees now in the malls date to this reconstruction, although some still date to the 1930s. Though many of the oak trees were replaced with other species such as *Platanus* ×*acerifolia*, *Q. palustris* is still the dominant tree, in many cases providing the main structure of the design of the landscaped gardens. As you walk up Broadway from Columbus Circle to Columbia University, *Q. palustris* will show you the way, save for a few interruptions. The oaks are mostly medium to large trees, which grow well there due to the large amount of soil available, usually 40 cm above street level and 10 cm below (NYC Parks 2022a). The species plays a similar role in the median strip of 12th Avenue between 42nd and 34th Street, which runs along the Hudson River and past the Hudson Yards. This takes the form of an allée of medium-sized *Q. palustris* with trunk diameters up to 30 cm (NYC Street Tree Map 2022).

Photos 2/ *Quercus palustris* roots spilling over (a) in Gramercy Park, E. 20th St. in Manhattan; and (b) on Henry St. in Brooklyn.

Quercus palustris grows well on city sidewalks, achieving significant size. Trees with diameters above 75 cm can be found all over the outer boroughs (Queens, Brooklyn, The Bronx, and Staten Island)[1] and to a lesser extent in northern Manhattan. Over 40 specimens with diameters exceeding 130 cm are recorded in the Street Tree Census, some of them double or triple stemmed. A fine planting of large specimens can be found on Slosson Avenue in Staten Island, between Victory Boulevard and Martling Avenue, including over 60 trees forming an allée lining either side of the Avenue, with average trunk diameter of 75 cm, the largest reaching 110 cm. The largest single-stem tree in the Census grows on the curb alongside Pelham Parkway in The Bronx, its diameter

1. New York City includes the following five boroughs: Manhattan, Brooklyn, Queens, The Bronx, and Staten Island; the latter four are referred to as the outer boroughs.

recorded as 145 cm. *Quercus palustris* don't seem to object to being hemmed in by the tree pits where they grow, though the roots often spill out or push through the low fences surrounding them. In Henry Street in Brooklyn I came across one that had stretched out a large root along the curb, reaching out some 2 meters before sliding into the crack between the sidewalk and the curb edging.

Quercus palustris also appears under the stage name GREEN PILLAR®, in the guise of a tightly fastigiate cultivar ideally suited to street planting (but which on New York stages has opened to mixed reviews). Its proper nom de guerre is *Q. palustris* 'Pringreen' and it is marketed under the trademark GREEN PILLAR®, patented by William Flemer III in 1995. However, it is often found in trade literature as simply 'Green Pillar', and it is under this name that it figures in NYC Parks' List of Approved Species (see Table 1). The cultivar was discovered in a mass planting of *Q. palustris* 'Crownright', a selection of upright habit, with secondary branches at a 30 to 60° angle to the central leader (Dirr and Warren 2019). 'Green Pillar' is an upright, very narrow, columnar tree with nearly vertical branches and a strong central leader (Missouri Botanical Garden 2022). Its form can be best appreciated in winter, when its wavy upright branches seem to rise like frozen flames reaching for the sky. Though it often appears in this svelte form, I came across several specimens in New York that like headstrong actors are not able to take direction, suffering from what Jim Barborinas calls "lazy laterals". These are branches that because of excessive growth and weight droop out of the columnar crown, hanging to the side. According to Barborinas, this is mostly seen in young trees under perfect growing conditions; once reduced, these wayward branches will stiffen up and toe the line (Barborinas 2022). The tree apparently reaches 15 m when mature, with a crown around 5 m wide, but I only saw younger, smaller trees in New York City, many in diverse degrees of disarray. One planted in the median at the intersection of Broadway and 56th Street would be best described as a flop, the "lazy lateral" problem compounded by the fact that branches sprouting from the root stock have not been removed and now spread out horizontally around the central column. It has been used more successfully in the section of Central Park West facing the entrance to the American Museum of Natural History, where a line of four specimens creates an interesting break in the majestic line of mature oaks, while maintaining species consistency (inexplicably, a fastigiate *Q. bicolor* (swamp white oak), or hybrid thereof has been included in the line, perhaps a result of mistaken identity when planting in winter, when the trees would be harder to distinguish?).

Photo 3/ A flop on Broadway: *Q. palustris* 'Green Pillar'.

Swamp Thing

In drama as in fiction, a character that is intended to highlight attributes in another character through opposing traits is known as a foil. And as a foil to our protagonist, I would cast *Q. bicolor*, a section *Quercus* oak, with as much street smarts as *Q. palustris*,

from section *Lobatae*, and a better record in begetting columnar cultivars. *Quercus bicolor* also benefits from a swampy background that allows it to adapt to adverse urban conditions, tolerating heavy clay-based soils, heat and drought. Dirr and Warren (2019) commend the ease with which it can be transplanted and qualify it as a "superb" street tree. It prefers acid soils and so is at home in New York City's pH range: I found none displaying chlorosis, which can occur in alkaline soils. It is widely planted in the City, ranking third among oaks in the Street Tree Census with almost 6,600 trees counted, below second-billed *Q. rubra* but comfortably above the rest of the oaks. It has been widely planted in Central Park (65 specimens) and in Brooklyn's Prospect Park (c. 100), and it was also chosen by Piet Oudolf as one of the key tree species in his redesign of The Battery. It is widely planted as a street tree all over the five boroughs, and large specimens can be found in the outer boroughs. The largest I was able to verify grows in The Bronx near Eastchester Bay, with a trunk diameter of over 1 m according to the New York City Street Tree Map (see Table 1).

Like *Q. palustris*, *Q. bicolor* has made its mark under a stage name – and in this guise would fare much better with the critics than the leading man. Fastigiate cultivars with *Q. bicolor* genes cut fine figures on New York's street scene. Based on the List of Approved Species, they are most likely to be 'Long' and 'Nadler', both cultivars of the hybrid *Q.* ×*warei* (*Q. bicolor* × *robur*), selected by Earl Cully from seed collected in 1974 from a *Q. robur* 'Fastigiata' in Illinois, apparently pollinated by nearby *Q. bicolor*. Two seedlings were selected from about 1,000 that Cully raised and evaluated, chosen for their narrow upright form, their winter hardiness, and their resistance to mildew (often a problem with columnar *Q. robur* selections). They have also proven resistant to wind and ice. Their leaves are similar and so the cultivars are difficult to distinguish, but according to Dirr and Warren (2019), 'Nadler' has foliage that is less glossy than that of 'Long', has a slightly tighter growth habit, and stays smaller and narrower. 'Long' has a narrow columnar form when young, but widens and opens a bit with age. The authors note that in Oregon it has been known to fall completely open due to the weight of fast growth, but that in the Midwest and East the growth rate is slower and it tends to maintain a narrower form. The trees I saw in New York followed this rule: their form was tightly fastigiate and in general outperformed *Q. palustris* 'Pringreen' in that regard. 'Long' and 'Nadler' are often referred to by their trademarks, REGAL PRINCE® and KINDRED SPIRIT®. They can be encountered in many places in New York, in Manhattan especially, both on sidewalks and in parks. They feature prominently in Waterline Square, a recently landscaped park at 59th to 61st Street, between Freedom Place South and 12th Avenue on the Upper West Side overlooking the Hudson River. I was not able to determine which of the two cultivars they might be, but they make a powerful statement, their columnar forms echoing the many water fountains that are featured in the park's design.

But surely *Q. bicolor*'s most memorable role is played at the 911 Memorial in Lower Manhattan, where 408 trees (I counted them) form serried ranks surrounding the gaping square wells that mark the former foundations of the World Trade Center towers. It was chosen as the species to be used in the Memorial due to its ability to tolerate hostile urban conditions, but also because it is native to all three spots affected by the September 11, 2001 attacks (New York City, Arlington County in Virginia, and Shanksville, Pennsylvania) and to the regions of the US where most of the victims came from. The trees have been described as "the world's most cared for trees." They were sourced from several nurseries across the species range and then grown for over four years in an above-ground nursery

Photo 4/ *Quercus bicolor*'s most memorable role at the 911 Memorial in Lower Manhattan.

in New Jersey, under the supervision of Bartlett Tree Experts. Growing them in large wooden boxes sitting on the ground meant that transplanting stress was minimized, as none of the roots were lost when they were moved and planted at the Memorial. They grew under constant human supervision, and electronic probes monitored soil conditions in a large sample of the trees. In order to create a uniform effect, the oaks were pruned to obtain a similar structure throughout the plantation (Cameron 2016). The trees are growing vigorously and are on track to create the desired effect of a single canopy shading the area around the black pools where the towers stood. Despite the homogeneity of the plantation, it is interesting to note variations in autumn when leaves turn color at different times, or during winter when some lose their leaves entirely while others still retain marcescent crowns. The result is impressive and delivers a powerful emotional clout. In terms of mise-en-scène, it is reminiscent of the pivotal moment in Shakespeare's *Macbeth*, when the oaks of Birnam Wood advance towards Dunsinane to do away with the tyrant: a regiment of *Q. bicolor* marching against the hellkite that downed the towers in one fell swoop.[2]

Waterside willow oaks

As leading lady to play opposite *Q. palustris* I would cast *Q. phellos* (willow oak). Its elegant figure and delicate foliage graces many a New York City street and park. The species is at the very limit of its range but is apparently native along the coast of Staten Island and western Long Island (New York Metropolitan Flora 2022) – though currently listed as critically imperiled in New York State. I only came across one apparently spontaneous seedling in Van Cortlandt Park in The Bronx. But even if it is barely native

2. *Macbeth*, 4.3.217–219 and 5.5.34–5 (Shakespeare {1623} 1998). References are to act, scene, and line.

Photo 5/ *Quercus phellos* and a bronze replica of Luciano Garbati's clay sculpture representing Medusa holding the head of Perseus (Collect Pond Park, Manhattan).

to NYC, it gives all the appearance of being to the manner born: it is the fourth most-planted oak species in the City's streets and also has high billing in Central Park and in many of the smaller parks and squares. Recent plantings include the cultivar 'QPSTA', marketed under the trademark HIGHTOWER®, as recommended in the List of Approved Species (the selection is praised by Dirr and Warren (2019) for its pyramidal habit, central leader, and fast growth). A couple of *Q. phellos* performances stand out in Lower Manhattan: River Terrace and Battery Place are both lined on either side with medium-sized trees. The landscaping effect on River Terrace is enhanced by the street's ample curve as it follows the Hudson, a design that echoes the species behavior in nature, where it is often found growing along streams. Piet Oudolf selected it as one of the main tree species to provide structure in his design of The Battery, where it plays a two-hander with *Q. bicolor*. Mature *Q. phellos* stand in the Woodland there, and young trees have been planted lining the curved paths, offering views of the Statue of Liberty under their boughs. *Quercus phellos* is also the headliner at Collect Pond Park, a charming square on Leonard Street just west of Chinatown. The Park occupies the site of what in the eighteenth century was a large, 20-meter-deep pond fed by an underground spring. The historical connection to flowing water is in sync with this oak´s affinity to streams and ponds, and several large trees surround the park, cooling its air in summer and shielding it from the high, harsh concrete on every side. When I visited in July 2021, the stately trees were being upstaged by the oldest trick in the theatrical book: a stunning seven-foot bronze nude statue of Medusa, the head of Perseus in her hand and the serpents of her hair slithering onto her shoulder, drew any audience's attention with her inverted narrative of the myth. The statue was originally sculpted in clay by Argentine-Italian sculptor Luciano Garbati in 2008, and a bronze replica was placed among the oaks in Collect Pond Park, facing the New York City Criminal Court

building, apparently in connection with the #MeToo movement (several high profile abuse cases have been tried in that building, including that of Harvey Weinstein) (Jacobs 2020). Needless to say, the oaks cause less controversy than the statue did.

In Central Park *Q. phellos* abound, and a striking line of mature trees can be seen next to the Loeb Boathouse, again resonating with the species' predisposition to grow by bodies of water. Similarly, a notable specimen grows next to Clove Lake in Staten Island, 25.7 m tall × 13 m average canopy spread and 105 cm DBH (NYC Parks 2022b). Huge trees can be found on New York's sidewalks: I was stopped in my tracks by one on Hudson Street and Clarkson Street in Tribeca, its buttressed 84-cm diameter trunk straining, it seemed, to burst out onto the street. On another sidewalk next to Gramercy Park, an old fenced-in private park just north of Union Square, an even stouter tree dominates the sidewalk with its 91-cm-across trunk, its buttress bases spilling over the low fence that lines the tree pit. Specimen *Q. phellos* grow unimpeded in Broekelen Ballfields (named after the Dutch village that gave Brooklyn its name), a few meters from the inlet of Fresh Creek Nature Preserve. It has also been used in the new plantation on Governors Island, the small, historically fortified island a few hundred yards off the southern tip of Manhattan, where the Hudson and East Rivers meet. Lining the curvilinear paths prominent in the recent renovation of the southern cone of the island, once again the trees are never far from water.

Quercus rubra *and* Q. alba *to lend support*

Aside from actors who play the lead, theater companies need others to play supporting roles, and for that position my first choice would be *Q. rubra* (northern red oak). Though not as omnipresent as *Q. palustris* in New York, it is ranked second and in some places even steals the limelight. As a street tree it is the most planted oak after pin oak, and it can be found all over New York City, though less frequently in Midtown Manhattan[3] and below. Many of these are large specimens: over 500 recorded in the Street Tree Census with trunk diameters exceeding 75 cm. Some are double or triple stemmed, but I was able to verify a single-trunked specimen with a diameter of 150 cm growing on a sidewalk at the eastern edge of Queens in Little Neck. (This is apparently the largest single-stemmed oak in New York City's streets according to the Census, after discarding obvious errors, multi-stemmed trees, and those that no longer exist). *Quercus rubra* has been planted profusely on Eastern Parkway, a large boulevard in Brooklyn conceived by Frederick Law Olmsted and Calvert Vaux as a scenic access to Prospect Park, also of their design. It is found mainly in the eastern section between Brooklyn Avenue and Ralph Avenue. But its best performances can be appreciated in the city's outer parks, particularly those with second-growth forest. There it takes it lands on its mark center stage and together with *Q. velutina* steals the show from *Q. palustris*. It is the dominant species in Van Cortlandt Park, where its trunk grows tall and straight, supporting a rounded crown reaching 20 to 30 m above the ground (Barnard 2002). It also commands the stage in Inwood Park and Fort Tryon Park across the East River in the norther top of Manhattan, in Alley Pond Park and Forest Park in Queens, and in The Greenbelt in Staten Island. Though pin oak is unassailable in Central Park, in Brooklyn's Prospect Park it plays second fiddle to northern red oak: the Prospect Park Tree Keeper Map (see Table 1) records over 940 *Q. rubra* versus barely 420 *Q. palustris*.

3. Midtown refers to the central portion of Manhattan, between 14th Street and 59th Street.

The Playbills		
Ressource	**Comments**	**URL**
2015–2016 Street Tree Census	A census of New York City's street trees, carried out by NYC Parks staff and volunteers. The focus was more on getting accurate tree position data than on species, so the species data is of variable quality, depending on who surveyed the tree, but in general terms it gives a good idea of the species planted and their location and size. Includes 683,788 trees, including 82,867 oaks (13 species listed). Each data entry includes accurate coordinates, which makes it easy to look up a tree in Google Street View. Only trees planted next to a street or in a median are included: trees planted in parks, squares, etc., are not. Referred to in this article also as "the Census".	https://data.cityofnewyork.us/Environment/2015-Street-Tree-Census-Tree-Data/uvpi-gqnh
New York City Street Tree Map	An online map showing the location, species, and trunk diameter of New York City's street trees. It was based originally on the data gathered in the 2015–2016 Street Tree Census, but it has been modified as trees have been planted and removed since then. As of January 2022, there are 689,227 trees on the map, including 87,413 oaks (26 species listed + "Hybrid Oak"). Referred to in this article as "the Tree Map".	https://tree-map.nycgovparks.org/
New York Metropolitan Flora	A multi-year project by the Brooklyn Botanic Garden to document the flora in all counties within an 80-km radius of New York City, including all of Long Island, southeastern New York State, northern New Jersey, and Fairfield County, Connecticut.	https://www.bbg.org/collections/nymf
Central Park Entire	A poster map of Central Park showing the precise location of over 19,600 trees, identifying every major tree species in the Park, using over 170 different species icons in the legend. Lists 2,855 oaks (12 species + one hybrid). See Cameron 2014 for more details.	http://www.centralparknature.com/
Prospect Park Alliance's TreeKeeper Database	An online database that maps the trees in Prospect Park, the result of a survey that claims to cover more than half of the park's 30,000 trees.	https://prospectparkny.treekeepersoftware.com/
New York City Approved Street Trees	An undated document stored on the NYC Parks website under the title "New York City Approved Street Trees". Includes 17 oak species, including three "preferred cultivars." Some unusual choices: *Q. dentata*, *Q. frainetto*, *Q. texana*.	https://www.nycgovparks.org/pagefiles/52/Street-Trees-List-For-Permits.pdf
List of Approved Species	A list that figures as Appendix A in the 2016 Street Tree Planting Standards for New York City. Includes 22 oak species, seven cultivars, and one hybrid (*Q. ×comptoniae*)	https://www.nycgovparks.org/trees/street-tree-planting/species-list
iNaturalist - New York City EcoFlora	A community science project on iNaturalist led by the New York Botanical Garden to document and conserve the biodiversity of New York City. As of January 29, 2022, it included 5,936 observations of oaks.	https://www.inaturalist.org/observations?project_id=10230
New York City Trees	Field guide to trees of New York City and surrounding area. Written by Edward Sibley Barnard (2002) and produced in consultation with the City's Department of Parks and Recreation. Covers 125 tree species including 12 oaks. Includes overview of best places to see trees, a list of NYC's Great Trees, and 10 tree walks.	N.A.

Table 1/ Some publicly available resources that allow us to learn who's who and what's where in NYC's oak scene.

Quercus rubra also stands out as a soloist at Madison Square Park, in the form of a historical tree known as the James Madison Tree. It was transplanted from the garden of James Madison, fourth President of the US, after whom the Square is named. The tree was dug up in 1936 in Montpelier, the former President's estate in Virginia, and replanted in the Midtown square to commemorate the 100th anniversary of Madison Avenue, which begins at the Square's southeast corner. *Quercus rubra* is known to transplant easily, due to its relatively shallow roots, and the tree clearly took this change of scene in its stride. The oak has been relieved of its lower limbs and strikes an imposing figure with its long, straight bole and high, vase-shaped canopy (Madison Square Park Conservancy 2022).

I imagine *Q. alba* (white oak) would be the respected character actor in the repertory company that specializes in playing aged characters like Lear and Falstaff. It is as a venerable, ancient tree that this oak displays its grandeur, usually out in the open where it can spread its waist and stretch its limbs and endure, safe from urban banes, but we can find fine examples even within New York City. An aging giant stands in a forest north of Manhattan in Riverdale Park, The Bronx. The tree has two-fold diplomatic connections: the forest it stands in is named after Raoul Wallenberg (1912-1947), a Swedish diplomat who is credited with saving tens of thousands of Hungarian Jews from likely extermination by the Nazis during World War II, and the oak itself was a favorite of General U Thant, the Burmese diplomat who lived in Riverdale during his tenure as Secretary General of the United Nations from 1961 to 1971. It is now known as the U Thant Oak. It did not really have the space to spread out, but its dimensions attest to a long life: 26.7 m tall, 138 cm DBH, and 19.4 m average canopy spread (NYC Parks 2022c; Barnard 2002). A larger specimen, known as the White Oak of Mosholu, grows just south of Van Cortlandt Park, near Mosholu Parkway at the intersection with Gun Hill Road. It likely began life as a field tree in the early period of New York City's colonization, but it now stands on a border between an area of parkland and a dense residential area. In 2017 it was 32 m tall, with a 147-cm DBH, 26 m average crown spread and 32 m maximum crown spread (Danielsen 2016). My own measurement of DBH in 2022 was 160 cm. But the unchallenged champion, and one of the City's greatest trees, is the *Q. alba* at Woodlawn Cemetery. Woodlawn is arguably the City's finest arboretum, as well as a 160-hectare resting place for the deceased, containing a wide variety of impressive trees: 392 taxa including 11 specimens of notable size, with trunks over 1.5 m in diameter. The *Q. alba* guards the north edge of the Cemetery and has been able to grow unimpeded, spreading its limbs over the gravestones around it to achieve an average canopy spread of 40 m. It is 27.5 m tall and the massive trunk is 167 cm across (Kelley 2021).

Photo 6/ One of New York City's greatest oaks, *Quercus alba* in Woodlawn Cemetery (The Bronx).

The type of actor I envision *Q. alba* to be might also play the iconic role of the ghost of Hamlet's father, often heard but not seen on stage, and indeed two of the City's most famous oaks are no longer of this world. The Dongan Oak in Prospect Park is documented by a plaque that tells of its heroic demise during the Battle of Long Island in 1776 during the American Revolutionary War. Once a prominent landmark mentioned in the patent of Governor Dongan in 1685 as a marker between Flatbush and Brooklyn, it was cut down by the Americans to obstruct the pass of the British troops, and though the battle was eventually lost, the Americans were able to retire in good order and bring off their artillery, partly due to the obstacle of the downed *Q. alba*. Another famed tree stood by the 18th green of the Split Rock Golf Course in Pelham Bay Park, estimated by Barnard (2002) to be over two centuries old in 2002 and boasting a 37-meter crown spread. Hurricane Sandy called curtains on this tree in 2012, a fact I did not learn till I spoke to the barman at the golf club, having made the considerable and fruitless trek to admire it.

Quercus alba is not as ubiquitous as a street tree as its section *Lobatae* cousins, but it is still found on many a New York street, though less so in Manhattan. It also achieves impressive dimensions: the largest I could verify was 116 cm in diameter and growing in the Westerleigh neighborhood of Staten Island (NYC Street Tree Map 2022). An interesting plantation is to be found on the median of West Street between 12th Street and Morton Street, along the Hudson, where it dances an intersectional pas de deux with *Q. imbricaria* (section *Lobatae*). Some of the trees there suggest there's been some ancestral hanky-panky with *Q. macrocarpa*, resulting in telltale pinched waists in the leaves and fringed cups on the acorn caps.

Scarlet blush

In the imaginary theater production I am casting I would pick *Q. coccinea* (scarlet oak) to play the part of the ingénue, the archetypical naïve girl or endearingly innocent young woman. Shall we compare the crimson hues of this oak's leaves, both on emergence in spring and in senescence in autumn, to the blushing rosy cheeks of the young lady? It is present in the City's main parks, though not in particularly high numbers. Specimens can be admired in Central Park, but only 16 of them, according to Barnard (2002). A couple of notable ones grow by the Conservatory Garden next to the 5th Avenue wall, at 103rd and 105th Street. More (53) can be found in Prospect Park, and there is an attractive row of some ten medium-sized trees that run along the East Drive, between Prospect Park Lake and Parkside Avenue on the south end of the Park. Our demure ingénue is not the sort of species to be out on the street alone after dark, and indeed few street trees of this species are recorded on the Tree Map (this may be an identification issue, as many more are listed in the Census). However, the species is native to the New York metropolitan area[4] and grows in natural areas such as the post oak-blackjack oak barrens[5] of Staten Island, sections of which can still be found in Clay Pit Ponds State Park Reserve. *Quercus coccinea*'s most notable New York role is in a double chorus line at Brooklyn Botanic Garden, in a long allée known as the Liberty Oaks.[6] The species was chosen to replace

4. The New York metropolitan area includes all counties within an 80-km radius of New York City, including all of Long Island, southeastern New York State, northern New Jersey and Fairfield County, Connecticut.

5. *Quercus stellata* and *Q. marilandica*.

6. For some, this name is problematic: in an article published in *The New Republic*, columnist Rochelle Gurstein (2011) referred to "the dreadfully politicized name, 'Liberty Oaks.'" Administrators at the Brooklyn Botanic Garden apparently considered the alternative 'Remembrance Oaks' which would have encompassed both the September 11 attacks and the WWI armistice, but 'Liberty Oaks' seems to have prevailed (Miscione 2001).

the *Acer platanoides* (Norway maples) that had been planted on November 11, 1918 to mark Armistice Day at the end of World War I, in memory of those fallen during that war. Unfortunately the maples proved not to be marble nor the gilded monuments of princes (let alone Shakespeare's powerful rhyme)[7] and at the end of their 80-year lifespan started to decline. The replacement had already begun when the September 11 attacks took place and it was decided to dedicate the oak allée in remembrance of those events and its victims. A total of 40 *Q. coccinea* in strict formation and uniform size and shape, their canopies raised to about 4 meters, make an impressive feature in the Garden – upstaged every spring by the blossoms of the famous cherry collection that grows alongside them. *Quercus coccinea* was also cast in another arboreal monument, the Memorial Grove in Van Cortlandt Park in The Bronx, at Broadway and 242nd Street. The grove was designed in 1949 and planted to honor local servicemen who lost their lives fighting in World War II. At the foot of each tree there is a bronze plaque dedicated to each of 21 soldiers who died in that war; additional plaques were dedicated to local soldiers who lost their lives in the Korean War, and in 2018 another plaque honored those from the community who served in the Vietnam War. The site had been neglected and had fallen into disarray but since 2006 has been restored in large part due to the efforts of Herb Barret, a local resident and Korea War veteran (Cohen 2020). In addition to *Q, coccinea*, the grove includes *Q. rubra* and *Q. palustris*.

Photo 7/ A double chorus line of *Quercus coccinea* (Brooklyn Botanic Garden).

Stalwart natives

Other good candidates to play supporting roles in our production would be *Q. velutina* (black oak) and *Q. montana* (chestnut oak). They are both native to the New York City

7. See *Sonnet 55* (Shakespeare and Barnet, 1989)

Photo 8/ *Quercus velutina* (Trinity Church Cemetery, Manhattan).

area, but only *Q. velutina* seems to be widely planted as a street tree all over the five boroughs (over 1,200 according to Tree Map), mostly as single trees, occasionally as small groups, particularly in the Jackson Heights and Astoria neighborhoods of Queens. Many have attained great size; the largest single-trunked *Q. velutina* growing on a New York City street that I was able to verify as still standing is in The Bronx and has a DBH of 145 cm according to Tree Map, only slightly smaller than the *Q. rubra* champ mentioned previously. There is a legendary tree in the New York Botanical Garden, designated a Heritage Tree and billed as "one of the grandest trees" in the Garden. It is estimated to be over 200 years old, which means it would have been a century-old tree when the Botanical Garden was founded. In 2015 it was 31.7 m tall with a DBH of 149.6 cm and a canopy spread of 25.6 m. (New York Botanical Garden 2022). It stands on its own triangle of turf on an intersection of garden paths, its flared base stamping its presence on the small clearing that has been made to honor it. There is another massive *Q, velutina* at Woodlawn Cemetery, with a whopping 190-cm-wide trunk, exceeding even the great white oak there.

Quercus velutina has a modest presence in the City's principal landscaped parks, making up about 4% of the oaks in Central Park and Prospect Park (Chaya and Barnard 2013; TreeKeeper Database 2022), but in the wilder parks of the outer boroughs it takes its place next to northern red oak and is able to hold its own as one of the dominant *Quercus* species. Fine spontaneous specimens can be seen in Pelham Bay Park and Van Cortlandt Park in The Bronx, in Inwood Hill Park in northern Manhattan, Alley Pond Park in Queens, and Conference House Park on Staten Island. It shares the stage with *Q. montana*, which also has a significant presence in these forests. In contrast with *Q, velutina*, however, *Q. montana* is quite rare in New York City: according to Tree Map there are no trees of this species planted on the City's streets and it is not included in the NYC Parks' List of Approved Species. A modest number grow in Central Park (29) and Prospect Park (15) (Chaya and Barnard 2013; TreeKeeper Database 2022), but in order to

see the fissured and ridged bark on mature *Q. montana* you need to move away from the City center, to Off-Broadway venues like Hunter Island in Pelham Bay Park, Riverdale Park and Inwood Hill Park overlooking the Hudson, or Clay Pit Ponds Reserve in Staten Island. Young trees have been planted in the recently landscaped Brooklyn Bridge Park, where it is reported to be the best performing oak species, less susceptible to *Melanaspis obscura* (obscure scale) than oaks of section *Lobatae*, and displaying a strong straight form that rarely needs pruning (Brooklyn Bridge Park 2022a).

Cameos for rarer natives

We have so far cast the principal roles in our company of oak species, using the more frequently found oaks native to the New York City area (with the exception of *Q. phellos*, which is rare in nature but popular in cultivation). Aside from this stable company, five other species are native to the area, but rare. Let's say they might make guest appearances or have the occasional cameo in our production. *Quercus macrocarpa* (bur oak) is head of this list. Though historically present in upstate New York, isolated specimens of these species are rarely found in the New York metropolitan area (New York Metropolitan Flora 2022). However, it appears to have been adopted by NYC Parks recently and many young trees can be found scattered around the five boroughs, with occasional group plantings, such as one of 14 young trees along Colgate Avenue in The Bronx, or others next to Tanahey Playground between Manhattan Bridge and Brooklyn Bridge in Lower Manhattan, or McCaffrey Playground a couple of blocks west of Times Square. Several have been planted in the streets surrounding The Battery, at the lower tip of Manhattan. It is little more than an extra in Central Park (11 trees) and fares only slightly better in Prospect Park, making up about 3% of the oaks planted there (Chaya and Barnard 2013; TreeKeeper Database 2022). But it has a starring role in the High Line Park, the elevated linear park created on a former New York Central Railroad spur on the west side of New York City. It is the only oak planted in the Park, and several small trees can be found at the south end, not far from the entrance on Gansevoort Street. Piet Oudolf, responsible for the garden design, mostly chose native species. His choice of *Q. macrocarpa* is thus unusual, there being other oaks more common in the New York area and perhaps more suited to the restricted space available in the elevated Park. Perhaps he was influenced by his time spent in the Mid-West, while designing the Lurie Garden in Chicago, when he incorporated into his palette many other plants native to that area.

Despite its epithet, *Q. stellata* (post oak) does not have a star status in New York: it makes only occasional appearances in Off-off-Broadway venues, a starlet at best. It is native along the coast of the New York metropolitan area, but to see it you have to travel to the City's northeastern limit, on Hunter Island in Pelham Bay Park – where it can be found dramatically clinging to the rocks by the water's edge – or south to Staten Island. Specimens can be found in the Island's Bloomingdale Park and New Dorp Beach, and in the post oak-blackjack barrens at Clay Pit Ponds Reserve. According to Barnard (2002), a post oak grew in Central Park, at East 67th Street, but it appears to have been removed.

Quercus marilandica (blackjack oak) is also encountered along the coast of the metropolitan area, but I only found it in New Dorp Beach and Clay Pit Ponds Reserve – here on very close terms with *Q. velutina*: many of the specimens showed signs of introgression, better named therefore as *Q.* ×*bushii*. *Quercus ilicifolia* (bear oak) is native throughout the metropolitan area but very rare in New York City. I saw some small trees

in the Brooklyn Botanic Garden's Native Flora Garden, where it has been planted with *Q. marilandica* in a recreation of New Jersey's pitch pine-scrub oak barrens.[8] There is also a small *Q. ilicifolia* shrub in a hidden corner of Central Park, behind the Andrew Haswell

8. *Pinus rigida*, *Q. ilicifolia*, and *Q. prinoides*.

Photo 9/ *Quercus ×bushii* on Governors Island, Manhattan.

Green Bench, off East Drive at the level of 105th Street. The species has been successfully used in a rehabilitation effort on the Fresh Kills Landfill on Staten Island. It was one of several species of trees and shrubs introduced as clusters to attract birds that would disperse

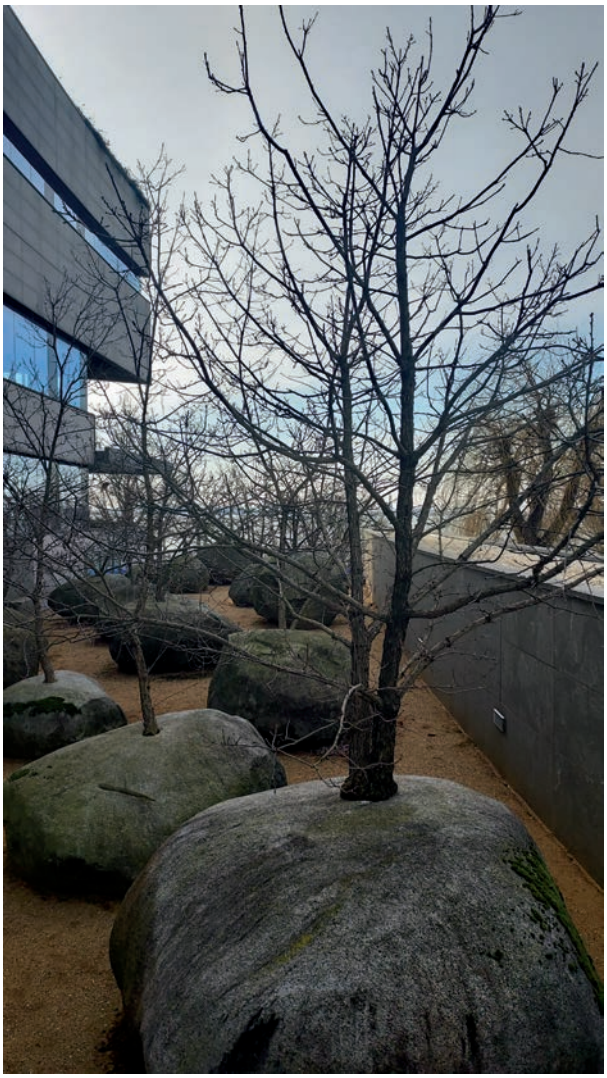

Photo 10/ Though absent from New York City's streets and parks, *Quercus prinoides* was chosen by artist Andy Goldsworthy to create a memorial, *A Garden of Stones*, to the victims of the Holocaust (Museum of Jewish Heritage, Manhattan).

their seeds. *Quercus ilicifolia* handsomely outperformed the competition, including some other native oaks: of 65 seedlings planted, 33 were reproductively mature by the first year following planting and 2 new seedlings emerged as spontaneous recruits (Robinson and Handel 1993).

Despite their infrequency in New York, *Q. ilicifolia* and *Q. marilandica* have managed to land a gig on Broadway. Verdi Square is a charmingly restored and maintained small triangular park nestled between Broadway and Amsterdam Avenue at their slanted intersection between 72nd and 73rd Street. It is named after the statue of Giuseppe Verdi erected there in 1906 thanks to the efforts of Carlo Barsotti, an Italian-American newspaper and bank owner. It fell into neglect and in the 1960s and '70s became popular with drug users and even became known as "Needle Park", but in 1974 it was designated a Scenic Landmark, and in 2003 it was enlarged when the 72nd Street subway station was expanded. Maintenance faltered again in recent years and the Square was so overrun by rats that locals referred to it as "Vermin Square". Friends of Verdi Square, an all-volunteer nonprofit organization, working in collaboration with NYC Parks restored the square starting in 2019 and continues to maintain it in beautiful condition. The garden is designed to include indigenous New York City plant species that have been proven to thrive in urban development. In a section called The Meadow, on the Broadway side of the Square, you can find (if you look carefully) *Q. ilicifolia* and *Q. marilandica*, still small, growing slowly yet steadfastly. These are original and ideal selections for the location, revealing the expert advice the project has received from Daniel Atha of the New York Botanical Garden, who also happened to live in the neighborhood (Friends of Verdi Square 2022; McDowell 2020).

The final species in this group of rare native oaks is *Q. prinoides* (dwarf chinquapin oak). It is native throughout the New York metropolitan area, but especially abundant on Long Island. Though isolated sightings were recorded before 1990 in Manhattan and The

Bronx, since that date it has only been found in spots on the coast of Staten Island (New York Metropolitan Flora 2022). I was able to find it by New Dorp Beach in Staten Island, where it grows on sandy soil by the ocean's edge, recognizable by its flaky, papery bark and scrubby habit. It is absent from New York City's streets and parks, but it has secured what promises to be a long run at a venue in Lower Manhattan, the Museum of Jewish Heritage.[9] It landed the role thanks to the creative imagination of English sculptor and landscape artist Andy Goldsworthy, who was commissioned to create a memorial to the victims of the Holocaust. Aware perhaps of the shortcomings of trees as memorials, as evidenced by the short-lived Norway maples in the World War I memorial at the Brooklyn Botanic Garden mentioned above, Goldsworthy opted for firmer foundations. The piece consists of eighteen large granite boulders, each weighing between 3 and 15 tons, from which the *Q. prinoides* magically emerge and continue to grow. The huge boulders were hollowed out from below and a small circular opening made at the top. The space inside was filled with soil, and *Q. prinoides* seedlings were planted in the boulders by Holocaust survivors, their families, and the artist in 2003. They have all survived and grown to around 2 to 3 meters tall, in many cases multi-stemmed – I found one with five. It is not known what might happen when the trees press against their unyielding stone girdle, and it may be that the living cambium underneath the bark is crushed. The root system would then atrophy and the tree would die, but this prospect does not worry Goldsworthy, who tends to incorporate indeterminate outcomes of natural processes into his work (Schama 2003). *Quercus prinoides* is a perfect choice for the artwork, combining the concept of memory and endurance, traditionally associated with the genus, with the stunted stature necessary for the constraints of the project, and the species' native status in the area where the installation was erected. It merits several visits around the seasons to admire how its nature changes as foliage buds out, flourishes, browns and finally drops, exposing the stark skeletal scarecrows on the rocks, sometimes dusted with snow.

Up-and-coming out-of-towners

Just like would-be stars come from all around to try their luck in old New York, so do some oak species from out of town turn up in the city's trees and parks, eager to wake up in the city that doesn't sleep. Many only manage walk-on roles, but some have made promising débuts. Cream of this crop is *Q. imbricaria* (shingle oak) that has come in from the Mid-West and earned street cred in New York. It can be found in several extensive street plantings: as mentioned above, it partners with *Q. alba* on a median on West Street; there is also an extensive line of *Q. imbricaria* running up the middle of West Street between The Battery and the Robert R. Douglas Bridge at West Thames Street – part of the Hudson Greenway, a linear park, separated from traffic, running through a series of parks along the Hudson River and the west side of Manhattan. *Quercus imbricaria* make an attractive foreground in views of the Freedom Tower, which rises a few blocks north of them, and in winter their marcescent foliage sets them apart from their fully deciduous neighbors. Though it is difficult to say how many trees have been planted on the city's sidewalks (the Census lists just over 1,000, the Tree Map over double that figure, and in both cases many appear to be misidentified *Q. phellos*), it clearly has been widely

9. You don't usually expect to find living oaks on display in museums, but this was not the only case in New York: at the Museum of Modern Art's Design Store I found a *Quercus alba* seedling growing out of an "Acorn Vase," a bulbous glass vase designed by Ed Spurr and Amy Hall Browne. The vase has a small chamber at the top where you place an acorn; the vase is filled only with water, so you can watch the seedling grow and observe the beauty of its leaves and roots.

Photos 11/ (a) *Quercus imbricaria* (downtown Manhattan); (b) *Q. shumardii* (Central Park, Manhattan).

planted over the five boroughs. A mature specimen is firmly established in Central Park, in a planting of rarer species near Pilgrim Hill, and 32 other trees grow in the rest of the Park (Chaya 2003). On Governors Island it has been planted extensively in the Hammock Grove, and many of the specimens show interesting signs of hybridization.

Quercus muehlenbergii (chinquapin oak) is also primarily from the Mid-West but its native range extends as far as New York state, though not to the New York metropolitan area (New York Metropolitan Flora 2022). It nevertheless seems to be making a splash recently in the City, both as a street tree and in recently landscaped parks. The Tree Map lists 134 trees on sidewalks, and though the IDs in this database should always be taken with a hefty pinch of snow salt, in this case it appears reasonably accurate. Many young seedlings have been planted all over the City, including some small groupings, such as a row of four in front of Public School 45 on Sandford Street in Brooklyn, appropriately a Magnet School for Environmental Studies, perhaps interested in testing the viability of a near-native tree. I found an isolated specimen on Broadway in Washington Heights and another next to Green-Wood Cemetery. It was also included among 11 oak species featured in Brooklyn Bridge Park, a 34-hectare waterfront park running along the East River in Brooklyn and stretching 2.1 km from Atlantic Avenue to just north of the Manhattan Bridge. The land was formerly an industrial stretch consisting of warehouses and piers, and over the past 13 years has been transformed into a sustainable park (Brooklyn Bridge Park 2022c).

Quercus shumardii (Shumard oak) is native to the Southern and Central U.S., so it would be unusual for it to thrive in New York City. A mature specimen certainly is to be found in the Pilgrim Hill grouping of rarer oaks in Central Park, but it is difficult to say to what extent it grows on the city's sidewalks. Despite high counts in the Street Tree Census (1,487) and the Tree Map (1,606), I expect these figures should be revised down due to misidentifications. I did find the typical tufts of scant pubescence in the abaxial vein axils[10] of leaves on a young tree on Park Avenue on the Upper East Side, so some of the records may indeed correspond to this species, but many of the ones I checked turned out to be something else entirely. It is also found in Brooklyn

10. Sufficient reason, perhaps, to cast it in the role of the Juvenile?

Bridge Park, according to the plant list on their website (Brooklyn Bridge Park 2022b). Several distinctly southern species have longed to step around the heart of New York and some have indeed managed to get their foot in its door.

The most successful seems to be *Q. laurifolia* (laurel oak), which has been planted recently on sidewalks (no records in the Census, but 14 in the Tree Map, several of which I was able to confirm). It passed its audition for the small quercetum near Pilgrim Hill in Central Park: a mature specimen is well established there. This group of oaks also includes a healthy *Q. falcata* (southern red oak), likewise far from its southern home, though its range does extend up the coast to New Jersey. For some reason this species received good write-ups in both tree databases (80 in the Census and 120 in the Tree Map), but as far as I could tell, they were mostly – I would venture to say all – misidentified.

Quercus lyrata (overcup oak) makes its mark thanks to a formidable specimen at the Brooklyn Botanic Garden, presented by the Daughters of the American Revolution in 1932, but is absent in the City's streets and parks. Intriguingly, I found a young oak on the northern edge of Bloomingdale Park in Staten Island whose leaves had all the trappings of *Q. lyrata*, but it is difficult to be certain without acorns: it could have been an errant form of the notoriously variable *Q. stellata*.

Quercus nigra (water oak) makes a cameo appearance in a nook of Central Park, next to the 97th Street Traverse. The only other tree of this species I found in the city was at the New York Botanical Garden. In both cases they seemed to be in good health, though no doubt they pine for sunnier climes during New York's bleak midwinter.

Perhaps the most surprising oak to find surviving in New York is *Q. virginiana* (southern live oak), whose vagabond shoes seem to have been longing to stray as far as Brooklyn. Five trees are making a stand in Green-Wood Cemetery, as part of a trial to prepare for the changes that may come about due to global warming. According to Joseph Charap, Director of Horticulture and Curator, the Cemetery's arboretum is diversifying its collection in order to maintain it, adding species to create a more resilient collection and looking towards southern species that are more adaptable to Green-Wood's growing environment than they have been in the past (Charap 2022). These *Q. virginiana* seedlings were propagated from a population in Virginia,[11] at the northern edge of the species' traditional range, and seem to be finding their feet in Brooklyn: planted out in 2016, four of them are around 3 m tall, while one has resprouted vigorously after dying back. Form further afield, *Q. lobata* (valley oak) was apparently present in Central Park and included in a plant list as late as 1982. Loeb (1993) hypothesized that the heat island effect, which has increased average temperature and reduced snowfall in the city, would help *Q. lobata* survive there, but just like Hollywood film stars sometimes falter on New York stages, it seems the Californian species failed to make a brand new start of it in the City.

Guest stars from overseas

Foreign actors sometimes do well in New York, especially British ones. And so it is with oaks. Let us imagine, then, that we would cast a few foreign guest stars in our fanciful production. *Quercus robur* (English oak) can be found in Central Park (7 trees) and is widely planted around the city (some 1,600 trees recorded in Census and Tree Map, probably less after accounting for misidentifications). Perhaps the largest specimen in the

11. See Aiello 2016 for more detail. Green-Wood Cemetery has also planted other *Quercus virginiana* seedlings obtained from the US National Arboretum Woody Plant Germplasm Repository (Green-Wood Cemetery 2022).

Photo 12/ An uneven and declining hodgepodge of what was supposed to be fastigiate cultivars of *Quercus robur* (Battery Park City Esplanade, Manhattan).

Photo 13/ *Quercus cerris* (Long Meadow, Prospect Park, Brooklyn).

city grows on 149th Street in Murray Hill, Queens, with a DBH of 123 cm and a wide-spreading canopy. Its leaves are shallowly lobed, but the long peduncles and auricular leaf bases suggest it is *Q. robur* and not *Q. alba*, as recorded in NYC Parks' databases. However, it is in fastigiate form that *Q. robur* has made its greatest impression in Manhattan's street scene. Large columnar cultivars (probably SKYROCKET® or another selection in the Fastigiata Group) make a bold statement in a row along West Street in the West Village, between 12th Street and Jane Street, rising to some 15 meters in height and maintaining their figures. Further down West Street, between Vesey Street and Murray Street, the median is graced by another double line of fastigiate *Q. robur*, though these appear more dissolute and their branches in slight disarray. They look orderly, however, next to a group of 6 lined up nearby along Battery Park City Esplanade on the north side of South Cove, an uneven, unhealthy, and declining hodgepodge of different shapes and sizes. To return to our theatrical comparison, if these were British actors making it big in New York, they would be the likes of Richard Harris and Peter O'Toole after a wild night on the town, a sad lot of mildewed roués staring out into the marina, their hangovers melting away. (They are put to shame by a close relation: a shapely, 19-meter tall, tightly columnar *Q.* ×*warei* that stands further along the Esplanade, looking across the Hudson to New Jersey.) One of the best Fastigiata Group trees I saw stands in Greenwich Village, at the end of a median in Hudson Street, a few yards from its intersection with Bleecker Street. As I walked by, I was struck by its elegant shape and dense, healthy foliage. Then a glint of metal at its base caught my eye. Crouching beside it I parted the lower branches to read the inscription on the bracelet-sized metal tag fastened around the stem: "In Memory of David H. Rice - Happy, Joyous, and Free - 2/22/1969 – 9/11/2001." David was a fixed income analyst at Sandler O'Neill & Partners on the 104th floor of the south tower of the World Trade Center (Aspinwall 2011).

Another foreign guest star is *Q. cerris* (Turkey oak) that has excelled in the City's large parks. In Central Park it is the third most-planted oak behind *Q. palustris* and *Q. rubra*, with 356 trees – and counting: juvenile, apparently adventive, specimens have been found in the vicinity of planted trees, indicating that it is becoming an invasive species there (New York Metropolitan Flora 2022; DeCandido et al. 2007). In Prospect Park a group of three majestic trees stands out at the edge of the Long Meadow by the Picnic House; and in Hermon A. MacNeil Park on College Point, Queens, a peninsula jutting out into the East River, an impressive specimen stands 18 meters tall with a trunk 137 cm across (Barnard 2002), perched on top of one of two small hills in this well-kept woodland park. Another European species has crept in under the radar, undetected in any of the databases: on Park Avenue and 94th Street, on the sidewalk in front of Hunter College Campus Schools, grows a mature *Q. frainetto* (Hungarian oak), begging the question of how it came to be planted there. Let's pretend its Zsa Zsa Gabor making a guest appearance!

Our final foreign oak is *Q. acutissima* (sawtooth oak), an East Asian species that has already received a warm welcome stateside – perhaps too warm: it has become naturalized and invasive in the Eastern US. Though scarce in parks, it is the fifth most-planted oak on New York's streets, with over 3,000 trees recorded in Tree Map. A couple of group plantings merit mention: a line of 15 trees on Houston Street in Tribeca (perhaps in recognition of the proximity of Chinatown?), and an extensive planting in tandem with *Q. rubra* on Eastern Parkway in Brooklyn (a fit location for an Eastern species?). Its standout performance, however, is in the form of a soliloquy on Sheep Meadow in Central Park,

where in summer it spreads welcome shade and in winter stands in leafless, beautifully structured isolation against the backdrop of the new skyscrapers on Billionaire's Row.[12]

Sometimes whole productions transfer to Broadway from abroad, with only the actors replaced by local talent. There is a parallel for this in New York's oak world too. *7000 Eichen* (7000 Oaks) is a project created by German landscape artist Joseph Beuys. It began in 1982 and called for the planting of 7,000 oak trees throughout the city of Kassel, Germany. Each tree was paired with a short basalt column about 1.2 m high standing in the ground beside it. Beuys intended the Kassel project to be the first stage in a scheme of tree planting that would extend through the world as part of a global mission to spark environmental and social change. The Dia Art Foundation extended the project to New York, planting trees and stone columns on West 22nd Street between 10th and 11th Avenues in 1988 and in 1996. Beuys' original project emphasized the importance of planting oaks. "I think the tree is an element of regeneration which in itself is a concept of time," he said. "The oak is especially so because it is a slow growing tree with a very solid heartwood. It has always been a form of sculpture, a symbol for this planet ever since the druids" (Public Delivery 2021). Dia Art Foundation saw fit to add some other common street trees into the mix (no comment!), but several *Q. palustris* are included in the 37 trees planted as part of the installation. Unfortunately, many of these oaks are currently stifled by scaffolding, a fate suffered by many of the City's street-side trees at some stage in their lives.

Hybrid stars

In the theater business, actors who are able to both act and sing are referred to as a "double threat", because they have an advantage when auditioning for musicals or plays that include songs. We would certainly want some of those in our NYC Quercus Repertory Company, and I propose the positions would be best filled by hybrid oaks, which combine the skills of two species, plus the added bonus of hybrid vigor. There would be no shortage of candidates in New York City for these positions, some of them notable trees. I have already mentioned the street savvy of the steadfastly fastigiate *Q.* ×*warei* cultivars, planted liberally all over town. In Central Park, near the Delacorte Theater, where every summer open-air performances of Shakespeare in the Park are staged, stands a large *Q.* ×*leana* (*Q. imbricaria* × *velutina*). I found no record of how it came to be there, so it could be a spontaneous seedling, as both species are native to the area. The hybrid was described by Thomas Nuttall based on information and specimens provided by Thomas Lea (hence the epithet), from a tree near Cincinnati, Ohio. The tree is identified as such on Ken Chaya's *Central Park Entire* map (Chaya and Barnard 2013), and based on leaf shape the identification certainly seems plausible. It stands guard over the Shakespeare Garden, which holds plants mentioned in the Bard's plays and verses, each with its plaque naming the plant and quoting the passage where it is mentioned. Might a small flight of fancy transform Lea's oak into Lear's oak, perhaps in reference to the mention of "oak-cleaving thunderbolts" in Lear's diatribe against the storm while out on the heath?[13]

Another standout hybrid grows next to the Staten Island Museum at the northern tip of the island facing Manhattan. It was planted in the 1930s by William T. Davis, founder of

12. A set of ultra-luxury residential skyscrapers, constructed or in development, that are arrayed roughly along the southern end of Central Park.

13. *King Lear* 3.2.5 (Shakespeare {1608} 1998).

Photo 14/ *Quercus* ×*warei* (South Cove, Manhattan).

the museum and accomplished hybrid-oak hunter, who determined it to be a cross of *Q. phellos* and *Q. velutina* (*Q.* ×*filialis*) (Carse 2008). The epithet, chosen by Elbert Little in 1943, refers rather generically to the hybrid´s origin as the filial generation or offspring of a cross between parents of different species. It replaced the former epithet, *inaequalis*, designated in 1935 by Palmer and Steyemark but rejected because there was already a fossil with this name (Little 1943). The tree now dwarfs the Museum, reaching taller and spreading wider. The leaves display an intriguing range of wavy- to shallowly and asymmetrically lobed margins, with the leaf base also asymmetric and sometimes almost auricular. Staten Island has historically been rich in hybrids, including *Q.* ×*heterophylla* (*phellos* × *rubra*) (Scientific American 1888; MacDougal 1907; Davis 1929), *Q.* ×*rudkinii* (*marilandica* × *phellos*) (Hollick 1888; MacDougal 1907), *Q.* ×*giffordii* (*ilicifolia* × *phellos*) (New York Metropolitan Flora 2022), *Q.* ×*robbinsii* (*coccinea* × *ilicifolia*) (New York Metropolitan Flora 2022), *Q.* ×*fernowii* (*alba* × *stellata*) (Weldy et al. 2022) and *Q.* ×*brittonii* (*ilicifolia* × *marilandica*) – described by William Davis from a specimen found at Watchogue, Staten Island, and named after his mentor and fellow hybrid-oak hound Nathaniel Britton (Davis 1892). As mentioned above I was able to compare parents and their hybrid in the case of *Q.* ×*bushii* (*marilandica* × *velutina*) at Clay Pit Ponds Reserve in the southwestern wedge of the island. This 107-hectare State Park was the site of white kaolin clay mines in the 19th century; after the mines were abandoned, rainwater and natural springs filled the pits, whence the name. It has a rich oak diversity: in an afternoon's walk I came across eight oak species, in addition to several potential hybrids. You can also find a *Q.* ×*bushii* planted on the top of the heap of rubble that makes Discovery Hill, one the highest point of The Hills, a series of artificial mounds created on the southern tip of Governors Island using the remains from military buildings demolished there. The leaves have the typical trident-shaped top of *Q. marilandica*, but the well-developed proximal leaf lobes and the thin texture of the leaves suggest it is crossed with black oak (D. Goldman, pers. comm.).

A famous hybrid oak grows in the Brooklyn Botanic Garden, a venerable tree occupying pride of place at the edge of the Plant Family Collection. Of uncertain origin, it was determined to be a cross between *Q. rubra* and *Q. velutina* (*Q.* ×*hawkinsiae*) and has attained an impressive size (28.6 m tall with a 36.2 m canopy spread in 2019), its branches reaching out across the wide walking path that runs below it. This hybrid is often misspelled "*hawkinsii*" (even on the brass plaque that stands at its base – and in the original publication!), the masculine ending implying it was named after a Mr. Eugene Hawkins, but the record is quite clear that the person honored in the epithet was **Mrs**. Hawkins, who discovered it in 1912. The tree was damaged by a storm in August 2019, when the trunk cracked at the junction where the leaders branch off. Steel rods were inserted to pull the trunk together, the leaders cabled, and the canopy pruned to lighten their load (Schmidt 2019). The tree seemed to have pulled itself together quite well when I visited in July 2020.

Another hybrid oak worthy of mention in New York is *Q.* ×*schuettei* (*Q. bicolor* × *macrocarpa*). A large tree, planted in 1961, stands opposite the Leony Levy Visitor Center in the New York Botanical Garden (New York Botanic Garden 2022). It has *Q. bicolor*'s two-tone leaves (dark green above, light green below), but deeply lobed margins, the sinuses often reaching more than half way to the mid rib; the acorns have a burry fringe. Another specimen, growing on the edge of the Garden by Bronx Park Road has leaves with *Q. macrocarpa*'s distinctive oversized middle sinus, while the acorns are born on *Q.*

bicolor's long stalks. A complete list of the natural hybrids recorded in New York City can be found in Table 2. A host of unusual putative hybrids grow in Green-Wood Cemetery, fruit of the research and experimentation carried out by Dr. Nina Bassuk and colleagues at Cornell University (Bassuk et al. 2016). You can find oddities listed as unlikely crossings, many of which beggar belief as to their hybrid nature, for in appearance they are similar to one of the putative parents. Some, however, are clearly hybrids and show an intriguing combination of features, though not necessarily recognizable as belonging to one of the supposed parents. For example, a *Q. macrocarpa* × *prinoides* with triangular lobes, and a *Q. bicolor* × *polymorpha* whose leaves have regular, shallow lobes, save for a deeper sinus in the lower half.

Casting for the future

This brings to a close our brief survey of the oaks of New York City, and I trust, reader, that as a producer you now have enough oaks with which to build your company, one with sufficient oak talent to take on the most demanding scripts. As we have seen, New York City is blessed with a large number of native species ready to take their place on the City's many and diverse stages (see Table 3); it has also welcomed out-of-town oaks from other parts of the US that have flourished in the City's streets and parks, and it has taken in immigrants from overseas. The City is also blessed with an organization that has done an impressive job in establishing, maintaining, and cataloguing its urban forest, oaks included. The New York City Department of Parks and Recreation (better known as NYC Parks) has taken on the daunting, mammoth task of caring for all the trees growing on the City's sidewalks and in its parks, in some cases in association with organizations that are responsible for individual parks. (One might even forgive NYC Parks for choosing a maple leaf rather than an oak leaf for its logo.) In the case of oaks it is exciting to see that new plantations are pushing the envelope and trying out more unusual species, including rising stars like *Q. imbricaria*, *Q. muehlenbergii*, and *Q. macrocarpa*, thereby increasing the diversity of the City's oaks and challenging the dominant positions held by the old guard (*Q. palustris*, *Q. rubra*, *Q. bicolor*, and *Q. phellos*), which according to the Tree Map account for 84% of street oaks in NYC – *Q. palustris* alone making up over 60%. Allowing rarer species to come through and be a part of it in New York should increase the resilience of the urban oak forest in the face of future challenges posed by new diseases and climate change.

Photo 15/ *Quercus robur* Fastigiata Group, West Street between W 12th St. and Jane St.

The Players (in alphabetical order)		
Taxon	**Bio**	**Where to see**
Q. acutissima	East Asian	Houston Street; Eastern Parkway
Q. alba	Native	Orchard Beach, Pelham Bay Park; Inwood Hill Park; Hermon A. MacNeil Park.
Q. bicolor	Native	911 Memorial; Woodlawn Cemetery
Q. ×brittonii	*ilicifolia* × *marilandica*	Seen in Staten Island and Queens according to New York Metropolitan Flora
Q. ×bushii	*marilandica* × *velutina*	Clay Pit Ponds Reserve, Discovery Hill, Governor's Island
Q. cerris	European	Prospect Park; Central Park; Hermon A. MacNeil Park
Q. coccinea	Native	Prospect Park (East Drive), Central Park (Conservatory Garden), Brooklyn Botanic Garden (Liberty Oaks)
Q. falcata	Out of town, US	Pilgrim Hill, Central Park
Q. ×filialis	*phellos* × *velutina*	Wall St., next to Staten Island Museum.
Q. ×fernowii	*alba* × *stellata*	One record from Staten Island (Weldy et al. 2022)
Q. frainetto	European	Park Avenue and E. 98th St.
Q. ×giffordii	*ilicifolia* × *phellos*	Seen on Staten Island (New York Metropolitan Flora)
Q. ×hawkinsiae	*rubra* × *velutina*	Brooklyn Botanic Garden
Q. ×heterophylla	*phellos* × *rubra*	Seen before 1990 in Queens (New York Metropolitan Flora)
Q. ilicifolia	Native	Verdi Square; Central Park (behind Andrew Haswell Green Bench)
Q. imbricaria	Out of town, US	Pilgrim Hill, Central Park; Governor's Island; Brooklyn Bridge Park
Q. laurifolia	Out of town, US	Pilgrim Hill, Central Park; Governor's Island
Q. ×leana	*imbricaria* × *velutina*	Delacorte Theater, Central Park
Q. lyrata	Out of town, US	Brooklyn Botanic Garden
Q. macrocarpa	Native	Brooklyn Bridge Park; Governors Island
Q. marilandica	Native	Clay Pit Ponds Reserve; Verdi Square
Q. montana	Native	Riverdale Park; Twin Island, Pelham Bay Park; Inwood Hill Park; Alley Pond Park; Brooklyn Bridge Park
Q. muehlenbergii	Out of town, US	Brooklyn Bridge Park
Q. nigra	Out of town, US	Central Park; New York Botanical Garden
Q. palustris	Native	Brooklyn Botanic Garden; Green-Wood Cemetery; Central Park West; Forest Park; Staten Island (Slosson Ave. from Victory Blvd. to Martling Ave.)
Q. phellos	Native	Breukelen Park; Loeb Boathouse, Central Park; Woodlawn Cemetery
Q. prinoides	Native	New Dorp Beach
Q. ×robbinsii	*coccinea* × *ilicifolia*	One record from Staten Island (New York Metropolitan Flora)
Q. robur	European	38-03 149th St., Murray Hill, Queens. Fastigiata Group: Wave Hill, the Bronx; West Street, Manhattan
Q. rubra	Native	Van Cortland Park; Eastern Parkway; Fort Tryon Park
Q. ×rudkinii	*marilandica* × *phellos*	Seen in Staten Island (Hollick 1888, MacDougal 1907)
Q. ×runcinata	*imbricaria* × *rubra*	New York Botanical Garden
Q. ×saulii	*alba* × *montana*	Seen in outer boroughs (New York Metropolitan Flora)
Q. ×schochiana	*palustris* × *phellos*	New York Botanical Garden
Q. ×schuettei	*bicolor* × *macrocarpa*	New York Botanical Garden
Q. shumardii	Out of town, US	Pilgrim Hill, Central Park
Q. stellata	Native	Hunter Island and Twin Island, Pelham Bay Park; Clay Pit Ponds Reserve
Q. velutina	Native	Hunter Island, Pelham Bay, Inwood Hill, and Alley Pond Parks; Greenbelt, Staten Island.
Q. virginiana	Out of town, US	Green-Wood Cemetery
Q. ×warei	*bicolor* × *robur*	Waterline Square Park; Woodlawn Cemetery; Green-Wood Cemetery

Table 2/ Selected oak taxa that can be seen in New York City. Not all of the oaks held in botanical gardens have been included; also excluded: *Quercus lobata*, seen only in the history books.

The Stages		
Venue	**Borough**	**Comments**
Alley Pond Park	Queens	Contains some of the most beautiful old-growth forest fragments in NYC. 257 ha includes large *Q. rubra*, *Q. velutina*, *Q. palustris*.
Bloomingdale Park	Staten Island	56 ha of land once cleared but now reverting to forest. Oak barrens contain stunted *Q. alba*, *Q. velutina*, *Q. marilandica*, *Q. stellata*, *Q. montana*.
Brooklyn Botanical Garden	Brooklyn	Relatively small (21 ha), but contains large variety of native and exotic trees. Mature oaks can be found in Plant Family Collection (including *Q. lyrata*, *Q.×schochiana*, *Q. ×hawkinsiae*); avenue of *Q. coccinea* ("Liberty Oaks") by Cherry Esplanade; the pitch pine-scrub oak barrens area of the Native Flora Garden includes *Q. marilandica* and *Q. ilicifolia*. Several oaks included in the Bonsai Collection. Online catalogue: www.bbg.org/collections/plant_collection
Brooklyn Bridge Park	Brooklyn	Spanning 2 km of Brooklyn's waterfront, recently developed park features continuous promenade along six piers and offers spectacular views of Lower Manhattan's skyline and New York Harbor. New plantings in landscaped areas feature native oaks (*Q. bicolor*, *Q. alba*, *Q. imbricaria*, *Q. montana*, *Q. macrocarpa*). Online plant list: www.brooklynbridgepark.org/plan-your-visit/plants-and-wildlife/horticulture/
Central Park	Manhattan	Largest park in Manhattan (340 ha), first landscaped park in the U.S., started 1858, designed by Frederick Law Olmsted and Calvert Vaux. Over 2,850 oaks, including 19 species and one hybrid. A small qurecetum established next to Pilgrim Hill at 72nd Street.
Clay Pit Ponds State Park	Staten Island	State-run natural area, includes ponds that formed where kaolin clay was mined in the 1800s. High diversity of native oaks, including hybrids; *Q. stellata* and *Q. marilandica* found in post oak-blackjack oak barrens.
Collect Pond Park	Manhattan	Small park occupies 18th century site of a 20-m deep pond fed by underground spring. Several large *Q. phellos*.
Eastern Parkway	Brooklyn	World's first parkway, designed by Olmsted and Vaux. Long sections planted with *Q. rubra* and *Q. acutissima*.
Forest Park	Queens	One of the largest and healthiest oak forests in NYC (218 ha). Contains *Q. rubra*, *Q. velutina*, *Q. coccinea*, *Q. alba*.
Fort Tryon Park	Manhattan	27-ha park perched on Washington Park. *Quercus rubra* dominates the wooded sections.
Governors Island	Manhattan	80-ha island only 800 yards from Lower Manhattan. Plantings in The Hills, built on the rubble of demolished buildings, and Hammock Grove feature native oaks (notably *Q. macrocarpa*, *Q. imbricaria*, *Q. phellos*, *Q. ×bushii*). Large oaks in older, historic section of the Island.
Gramercy Park	Manhattan	Small, fenced-in private park in Gramercy neighborhood. Some large oaks, notably *Q. phellos*.
Green-Wood Cemetery	Brooklyn	The other side of the argument concerning the best arboretum in NYC (cf. Woodlawn Cemetery). ArbNet Level III Arboretum: c. 8,000 specimens, 695 taxa representing 159 genera. Exemplary oaks include *Q. rubra*, *Q. velutina*, *Q. palustris*, *Q. phellos*, but many more oaks can be found here. Impressive collection of oak cultivars (e.g. *Q. robur* 'Filicifolia', 'Fennessyi', 'General Pulaski'; *Q. frainetto* 'Trump'; *Q. ×macdanielii* 'Clemons'; *Q. bicolor* 'Green Nova', 'JFS-KW12'; *Q. dentata* 'Pinnatifida'; *Q. ×warei* 'Long'; *Q. lyrata* 'Dahlonega', 'Howler' (these two not as yet registered in oaknames.org). Research projects involving oaks includes trials of *Q. virginiana* and a large number of "Cornell hybrid oaks" developed by Dr. Nina Bassuk and team at Cornell's Urban Horticulture Institute. Online catalogue shows precise location of every tree, allowing you to identify trees near you on a smartphone: www.green-wood.com/living-collection/
Hermon A. MacNeill Park	Queens	Located on the northeastern tip of College Point, across from La Guardia airport. Charming wooded park, many majestic trees, including *Q. alba* by the waterfront, *Q. imbricaria*, and a notable *Q. cerris*.
Highline Park	Manhattan	Elevated linear park, 2.3 km long, built on a historic freight rail line elevated above the streets on Mahattan's West Side. Garden design by Piet Oudolf. Includes several *Q. macrocarpa*.
Hudson River Park	Manhattan	220-ha riverfront park and estuarine sanctuary spanning 6 km along west side of Manhattan, from Battery Park City in Tribeca to W. 59th St. in Hell's Kitchen. Many oak species featured in the plantings (e.g., *Q. bicolor*, *Q. acutissima*, *Q. macrocarpa*). Habitat Garden (W. 26th St. to W. 29th St.) planted with native oaks.
Inwood Hill Park	Manhattan	Rugged 80-ha park at north tip of Manhattan, contains last vestiges of native forest that once covered most of the island. Includes large *Q. palustris*, *Q. rubra*, *Q. velutina*, *Q. montana*.
New Dorp Beach	Staten Island	Parkland along the shore of the neighborhood of New Dorp; *Q. bicolor*, *Q. stellata*, *Q. prinoides* found here. An interesting hybrid stands in Corporal Allan F. Kivelhan Park at north end: *Q. ×leana*? (ID based on lanceolate, irregularly lobed leaves and pubsecent buds)

The Stages		
Venue	**Borough**	**Comments**
New York Botanic Garden	Bronx	Over 100 ha, outstanding tree collection. Mature oaks planted all over the garden and also found in the Thain Family Forest, a 20-ha remnant of primeval forest that has never been cut. A quercetum includes native and imported species, including some rarer East Asian species (e.g. *Q. baronii*, *Q. wutaishanica*). Online catalogue: www.planttracker.nybg.org
Pelham Bay Park	Bronx	Largest and most varied park in NYC (1,118 ha). Many large oaks (*Q. rubra*, *Q. velutina*, *Q. alba*, *Q. bicolor*); high species diversity on Hunter Island and smaller Twin Island, including *Q. montana* and *Q. stellata*.
Prospect Park	Brooklyn	Considered by many to be the crowning achievement of designers Olmsted and Vaux; 213 ha, started 1866. Large wild oaks (*Q. rubra*, *Q. alba*, *Q. velutina*, *Q. coccinea*), also large *Q. cerris*.
Riverdale Park	Bronx	Ribbon of mostly forested land stretching c. 2.5 km along Hudson River (23 ha). *Quercus rubra* dominant; other oaks include *Q. montana*.
Riverside Park	Manhattan	Thin, 130-ha sliver of land extending over 6 km along the Hudson River, offers sweeping views, winding paths, and long tree-lined promenades on different levels. Contains *Q. rubra* and *Q. palustri*s.
The Battery	Manhattan	Formerly knows as Battery Park, 10-ha park at southern tip of Manhattan, facing New York Harbor. Several areas designed by Piet Oudolf feature *Q. bicolor* and *Q. phellos*.
Trinity Church Cemetery	Manhattan	Located in Hamilton Heights, Upper West Side. Large native oaks (*Q. rubra*, *Q. velutina*, *Q. coccinea*).
Van Cortlandt Park	Bronx	NYC's third largest green space (463 ha), includes many large *Q. rubra*, *Q. alba*, *Q. velutina*. Memorial Grove by Broadway at 242nd Street contains *Q. rubra*, *Q. palustris*, *Q. coccinea*.
Verdi Square	Manhattan	Small triangle on Upper West Side at Broadway and Amsterdam Avenue. Recently restored gardens feature native plantings including a *Q. ilicifolia* and a *Q marilandica*.
Wards Island Park	Manhattan	Landscaped area at southern end of Randalls and Wards Islands. Large oaks and younger trees including fastigiate oak cultivars, *Q. acutissima*, *Q. macrocarpa*.
Waterline Square	Manhattan	Public space in the middle of the Riverside Center development on Mahattan's Upper West Side, opened 2020. Over 200 trees, including fastigiate oaks (*Q. ×warei* and *Q. robur* cultivars), *Q. bicolor*, *Q. imbricaria*.
Wave Hill	Bronx	Originally a country home built in 1843, and donated in 1962 to NYC, which converted it into a 11-ha non-profit center for the study of nature and the arts. One of the most impressive arboreta in NYC, notable trees include a c. 170-year-old *Q. rubra* and fastigiate *Q. robur.*
Woodlawn Cemetery	Bronx	Arguably the best arboretum in NYC (cf. Green-Wood Cemetery). ArbNet Level II Arboretum, contains 392 tree species and cultivars, including 11 particularly large trees with trunks over 150 cm in diameter. Five of the 65 entries in NYC Parks' list of "Great Trees of New York City" are found here, one of which is a champion *Q. alba*. Notable oaks include a mammoth *Q. velutina* and large *Q. macrocarpa*, *Q. phellos*, *Q. bicolor*, *Q. imbricaria*, *Q. robur*, *Q. palustris*, *Q. rubra*, *Q. coccinea*, and *Q. acutissima*. Online resources feature a virtual tour of the significant trees in the collection, with a satellite-view map showing location and 360° Ground View of each tree: www.woodlawn.org/virtual-tours/

Table 3/ A selection of locations where oaks can be seen in NYC, ranging in scale from Grand Opera to Off-off-Broadway (street theater not included: NYC's streets would constitute its largest venue for oak trees).

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Photo 16/ Winter in Sheep Meadow, Central Park, with *Quercus acutissima*.