

OLD GROWTH TREE DIVERSITY AT 50 HOME SITES AT POWHATAN PARK, MONTVALE, NEW JERSEY, USA

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ABSTRACT

The objective of the present study was to identify, map, determine tree dominance and frequency of occurrence of old trees and colonizing tree seedlings and saplings at 50 home sites at Powhatan Park, Montvale, New Jersey. Powhatan Park (41.05N, 74.05W) includes Waverly, Forest and Westmoreland Avenues and was developed as a summer resort complete with bungalows and a club house built in the 1920s. White oak (*Quercus alba*), red oak (*Quercus rubra*) and black oak (*Quercus velutina*) were the most frequently encountered old growth trees. The three trees with the highest relative dominance were *Q. velutina*, *Q. alba* and *Q. rubra*, with relative dominance values of 25.4, 18.9 and 17.4 respectively. Twenty-eight tree species have colonized the home sites. Transition to non-native taxa may be a very slow process because of the longevity of the dominant oaks.

Keywords: tree diversity, home sites, Montvale, New Jersey, USA.

1 INTRODUCTION

The objective of the present study is determining old growth urban tree diversity by mapping, identifying and measuring diameter at breast height (DBH) of trees at 50 homes at Powhatan Park, Montvale, New Jersey USA (41.04N, 74.03W). Powhatan Park was developed as a summer resort in the 1920s, almost a century ago with small bungalows and a spacious club house. A grammar school, Montvale School No. 2 at the southern end of Wavery Place, was built in 1907. This study is the second of its kind in the northeastern United States, and is significant as there are few urban tree studies in the northeastern United States.

2 METHODS

Every home within Powhatan Park was canvassed prior to the study. Home owners were given a pamphlet describing our project in detail when we sought permission to sample and map trees on their property. The 50 home sites selected for study July to October 2015, are located at Powhatan Park, Montvale New Jersey. Criteria used in selecting homes for study include the owners' permission and presence of mature trees when the homes were constructed, 1929 to 1953. Trees growing at the home sites were mapped, and the DBH (diameter at breast height 1.37 meter above the ground) of each tree was recorded. Only trees with a DBH greater than 7.6 cm were sampled. Tree DBH was converted to basal area, and relative dominance, percent basal area, was calculated (Table 1).

Density (average number of trees per quadrat), relative density (percent density), frequency (percent quadrats occupied by each species), relative frequency (percent frequency), relative dominance (percent basal area), and importance value (the sum of the relative density, relative frequency and relative dominance) were calculated for all trees found at the home sites (Table 2). Colonizing tree saplings and seedlings located at property boundaries were identified and recorded (Table 3). The ten most commonly encountered mature trees and colonizing trees is presented in Table 4. Trunk diameter of the largest tree species is presented in Table 5.

Native trees were classified according to Haines [1]. Exotic trees were classified according to Bailey [2].



3 RESULTS

Black oak (*Quercus velutina*) is the dominant tree at the home sites followed by white oak (*Quercus alba*) and red oak (*Quercus rubra*) (Table 1). Dogwood (*Cornus florida*) was the most frequently encountered tree found on 52% of the home sites followed by *Q. alba*, *Q. rubra*, *Q. velutina*, and black cherry (*Prunus serotina*) (Table 2). *Prunus serotina*, a successional species, is found almost exclusively at property borders where it has escaped extirpation.

The composition of seedling and sapling tree species differs from that of the dominant taxa with respect to frequency of occurrence. Seedlings and saplings of American ash (*Fraxinus americana*) were most frequently encountered, 42% followed by *Q. rubra*, white mulberry (*Morus alba*), yellow poplar (*Liriodendron tulipifera*), and American elm (*Ulmus americana*) (Table 3).

The eastern gray squirrel (*Sciurus carolinensis*) is responsible for the dissemination of oaks while the seeds of *Fraxinus americana*, *L. tulipifera*, and *U. americana* are dispersed by wind. *Cornus florida*, the most frequently encountered tree at the home sites demonstrated poor reproduction. Seedlings and saplings of *C. florida* were found on but 3 of the home sites (Table 4). Dogwood has showy white or pink bracts that surround small yellow flowers; it may be planted by home owners in the future. Mature dogwoods are small, rarely growing more than 10 meters and are no threat to homes if toppled during hurricanes, wind bursts, or ice storms. Dogwood is a native tree and its planting should be encouraged. Many of the tree seedlings and saplings found at property borders will never reach maturity as they are periodically cut by home owners.

Table 1: Relative dominance of the ten highest ranked tree species.

Tree species	Relative dominance
<i>Quercus velutina</i>	25.4
<i>Quercus alba</i>	18.9
<i>Quercus rubra</i>	17.4
<i>Liriodendron tulipifera</i>	10.2
<i>Quercus coccinea</i>	6.6
<i>Acer platanoides</i>	2.7
<i>Acer rubrum</i>	2.6
<i>Quercus bicolor</i>	2.1
<i>Betula lenta</i>	2.0
<i>Acer saccharinum</i>	1.7

Table 2: Frequency of the ten most common trees at the 50 home sites.

Species	Frequency
<i>Cornus florida</i>	52
<i>Quercus alba</i>	36
<i>Quercus rubra</i>	34
<i>Quercus velutina</i>	34
<i>Prunus serotina</i>	34
<i>Acer rubrum</i>	24
<i>Betula lenta</i>	22
* <i>Acer platanoides</i>	22
<i>Liriodendron tulipifera</i>	22
* <i>Morus alba</i>	18

*Non-native taxa.



Property borders are occasionally planted with arborvitae (*Thuja occidentalis*), Canadian hemlock (*Tsuga canadensis*), white pine (*Pinus strobus*), and Leland cypress (*Cupressus lelandii*). Canadian hemlock, a border hedge species, has been blighted with the wooley adelgid and is gradually been replaced by planting of arborvitae and Leland cypress.

Several tree species have large trunks with a DBH greater than one meter: *Q. rubra*, scarlet oak (*Q. coccinia*), *Q. velutina*, *L. tulipifera*, and *Q. alba* (Table 3). Annual ring counts of black oak (159 years), and red oak (161 years) cut at the Fisher property on Forest Avenue, and a white oak (153 years) at old Montvale Grammar School No. 2 suggest that a majority of the large oaks on the properties are over a century old.

Table 3: Frequency values of the ten most common invasive seedlings and saplings.

Species	Frequency
<i>Fraxinus americana</i>	42
<i>Quercus rubra</i>	30
* <i>Morus alba</i>	28
<i>Liriodendron tulipifera</i>	28
<i>Ulmus americana</i>	28
<i>Prunus serotina</i>	26
<i>Quercus alba</i>	24
<i>Sassafras albidum</i>	16
* <i>Catalpa speciosa</i>	16
* <i>Acer platanoides</i>	14

*Non-native taxa.

Table 4: Comparison of tree frequency and seedling and sapling frequency.

Species	Tree frequency	Seedling and sapling frequency
<i>Cornus florida</i>	52	6
<i>Quercus alba</i>	36	24
<i>Quercus rubra</i>	34	30
<i>Quercus velutina</i>	34	6
<i>Prunus serotina</i>	34	26
<i>Acer rubrum</i>	24	12
<i>Betula lenta</i>	22	12
* <i>Acer platanoides</i>	22	14
<i>Liriodendron tulipifera</i>	22	28
* <i>Morus alba</i>	18	28
<i>Fraxinus americana</i>	12	42
<i>Ulmus americana</i>	10	26
<i>Sassafras albidum</i>	2	16
* <i>Catalpa speciosa</i>	0	16

*Non-native taxa.

Table 5: Trunk diameter of the ten largest (girth) tree species. Values are in cm.

Species	Diameter (cm)
<i>Quercus rubra</i>	124
<i>Quercus coccinea</i>	124
<i>Quercus velutina</i>	109
<i>Liriodendron tulipifera</i>	109
<i>Quercus alba</i>	107
<i>Quercus bicolor</i>	99
<i>Acer saccharinum</i>	91
<i>Ulmus americana</i>	89
<i>Fagus gandifolia</i>	84
<i>Carya spp.</i>	76

4 COMPARISON WITH OTHER URBAN AREAS

In an earlier study, Stalter [3] examined non-native and native tree species at 40 home sites, New York City, New York. In the aforementioned study, he cited a number of papers dealing with urban arborescent vegetation [4]–[6]. Two of these studies follow. Lawson et al. [7] examined 65 lots in Nakoma Woods, an urban neighborhood in Madison Wisconsin. *Ulmus americana*, *Quercus alba*, and *Q. velutina* ranked 1, 2, and 3 in relative dominance; all were present at the home sites at Powhatan Park. Schmid [8] compared the vegetation in five urban Chicago Illinois neighborhoods that differed in socioeconomic status. He observed that older, wealthier neighborhoods tended to have dense plantings of trees and shrubs while the more urban neighborhoods were more open.

The species composition of the dominant trees at wealthy Jamaica Estates, New York City, New York [3] and Powhatan Park are remarkably similar. *Quercus velutina*, *Q. rubra* and *Q. alba* ranked 1–3 in relative dominance at Jamaica Estates while *Q. velutina*, *Q. alba* and *Q. rubra* ranked 1–3 in relative dominance at Powhatan Park.

In a more comprehensive study of a comparative flora of large urban parks of the northeastern United States, Loeb [5] found black, red, and white oaks in the parks of Washington, Philadelphia, New York City, and Boston. Scarlet oak, Washington DC's "city tree" was not reported in Philadelphia, a possible omission given Philadelphia's close proximity to Washington DC. The aforementioned 4 cities have 498 taxa in common [5]. Plantings may increase taxa diversity in some city parks [4], but if these vascular plant species are not watered during their first two years after planting, they may not survive.

Loeb's [5] comparative, but somewhat flawed, study of ten urban New York City parks was based on 3 studies with no vouchers and 5 studies with incomplete vouchers. Three of the incomplete vouchered studies were based on the work of two untrained botanists on the floras of Breezy Point, Jamaica Bay Wildlife Refuge, all units of Gateway National Recreation Area, USA. The Venezia and Cook study at Breezy Point listed 225 taxa of which only 25 taxa were vouchered [6]. Taxa listed for Breezy Point included native bittersweet, *Celastrus scandens*, but not the ubiquitous invasive *C. orbiculatus*. Loeb [5] lists the following taxa at Breezy Point *Platanus occidentalis*, *Asimina triloba*, and *Morus rubra* though none of these taxa are found there.

5 CONCLUSIONS

Oaks, notably *Q. velutina*, *Q. alba*, and *Q. rubra* were the dominant trees at Powhatan Park ranking 1-3 in relative dominance (Table 1). Their combined relative dominance value, 70%, was comparable to a sister site at Jamaica Estates, New York City, New York where the relative dominance of these same taxa was 80%. Tree loss at the Powhatan Park home sites was due primarily by selective cutting to protect homes from tree fall during infrequent hurricanes, wind microbursts and ice storms. Tree replacement by owners was primarily by non-native trees and native *Cornus florida*. Oaks may maintain their dominance at Powhatan Park during the 21st century because of their large size and longevity.

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