

The Oak Dominated Forest and Successional Communities in the Vicinity of New York City, New York

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Abstract

We present descriptions of two plant communities within 50 miles of New York City, the Oak dominated climax forest and successional community based on 50 years of Stalter's observations and research on plant communities in the vicinity of New York City, New York. We also include a short list of important invasive vascular plant species as many invasive species out-compete our native vascular plants. The Oak Forest community occupies undisturbed land in New York City parks. Red Oak (*Quercus rubra*) and Black Oak (*Quercus velutina*) are the dominant trees. Succession or Community development occurs in gardens, fields, and long undisturbed portions of City Parks. A subsection Primary Succession on wet (hydric) and dry (xeric) sites is also included in this section. The short tables in the paper provide lists of the common plants in each community. The tables are incomplete as there are hundreds of vascular plant species within 50 miles of New York City.

Keywords: Plant communities, Community Development, Secondary Succession, Primary Succession, Oak Forest Community, Invasive Species, New York City, New York

Introduction

New York City and its nearby environs is host to several unique habitats ranging from successional fields, salt marshes, coastal dunes, and mature woodlands. We describe the plant communities, dominant vegetation and environmental factors and forces responsible for the unique assemblage of vascular plant species in oak dominated climax forest and successional communities. New York State boasts a population of 3,524 vascular plant species of which 1,490, 43% are not native to the region [1]. Most are familiar with the injurious effect non-native species have on native taxa. American Chestnut, *Castanea dentata* was one of the most common trees in our eastern forests in the 19th century. The accidental introduction of blight infected Chinese Chestnut at the Bronx Zoo in the early 1900's introduced deadly chestnut blight, *Endotheca parasitica* to this country. Chestnut blight rapidly spread throughout the range of our native chestnuts resulting in the near eradication of one of our most valuable trees. Several alien plants and animals were deliberately introduced to this country. These include the Carp Game Fish (*Cyprinus carpio*), Fur bearing animal Nutria (*Myocastor coypus*), while others such as Zebra Mussel was accidentally transported to the United States in ballast of foreign ships. Non-native plants that have gained foothold in this country include the Water Hyacinth, attractive flowers (*Eichhornia crassipes*), Poplar Hedge Plant (*Rosa multiflora*), Kudzu (*Pueraria lobata*) (erosion stabilizer), and attractive fruit, Porcelain Berry (*Ampelopsis*

brevipedunculata). Many of these invasive plants are now well established in our lawns, gardens, waste areas, fields, and forests. We list several problems with non-native vascular plant species in Table 1. These are less than .01 percent of the non-native vascular plant species in New York State [1].

The objective of this short paper was to present descriptions of 2 plant communities, the Oak dominated climax forest present in New York City Parks and succession communities within 50 miles of New York City. A second objective was to present some but not all of vascular plant species common to the above communities.

Methods

The descriptions of the Oak dominated forest and successional plant communities are based on Stalter's observations on field trips to Alley Pond Park, New York, Cunningham Park, New York and botanical and ecological publications over a 50-year period. The plant lists in this paper are somewhat arbitrary as plants can be common in one location in one year, scarce the following year and absent the next. Indian Pipe, *Monotropa uniflora* was observed by Stalter only 5 times in 52 years at Alley Pond Park, New York 3 miles from St. John's University where Stalter teaches. One year it was abundant, common the second year and scarce the following 3 years. We include growth form for each plant listed in each table, fern, herb, rush, sedge, shrub, tree and vine.



Table 1: A list of important invasive plant species within 50 miles of New York City. Letters following the species indicate: g= grass, h= herb, s= shrub, t= tree, v= vine. This is a short but not definitive list.

1	Norway Maple (<i>Acer platanoides</i>)	t
2	Garlic Mustard (<i>Alliaria petiolata</i>)	h
3	Porcelain Berry (<i>Ampelopsis brevipedunculata</i>)	v
4	Japanese Barberry (<i>Berberis thunbergii</i>)	s
5	Oriental Bittersweet (<i>Celastrus orbiculatus</i>)	s
6	Russian Olive (<i>Elaeagnus angustifolia</i>)	s
7	Autumn Olive (<i>Elaeagnus umbellata</i>)	s
8	Japanese Honeysuckle (<i>Lonicera japonica</i>)	v
9	Japanese Stilt Grass (<i>Microstegium vimineum</i>)	g
10	Common Reed Grass (<i>Phragmites australis</i>)	g
11	Japanese Knotweed (<i>Reynoutria japonica</i>)	h
12	Multiflora Rose (<i>Rosa multiflora</i>)	s

Community Development

Secondary Succession

When a cultivated field is allowed to lie fallow, it produces a crop of annual plants the first year, numerous perennials the second year, and a community of perennials thereafter [2]. In areas where forests are the climax vegetation, perennial herbs and grasses are soon replaced by woody plants culminating in arborescent vegetation which soon become dominant. After any disturbance of natural vegetation such as cultivation, lumbering or fire, a similar sequence of plant communities occurs with several changes in the dominant vegetation through the years. The change in plant communities is accompanied by a concomitant change in animal species. Climate and soil also change as plant communities change through time.

A classic study of secondary succession in the metropolitan region was published by Bard [3] on the piedmont plateau of New Jersey. Bard reported that Ragweed (*Ambrosia artemisiifolia*) was dominant on one year old cultivated fields that were allowed to lie fallow. Evening Primrose (*Oenothera biennis*) was also common followed by Goldenrod (*Solidago nemoralis*) which assumed dominance by the second year. Aster (*Symphyotrichum pilosum*) increased to dominance by the 5th year, while Little Bluestem (*Schyzacharium scoparium*) was dominant by the 15th year. Red Cedar (*Juniperus virginiana*) invaded fields soon after abandonment, was the most common tree species after 15years and remained the dominant arborescent species at 60years at adjacent Hutcheson Memorial Forest, New Jersey. Common shrubs observed by Bard on abandoned fields were Dewberry (*Rubus flagellaris*), and Poison Ivy (*Toxicodendron radicans*). Shade tolerant Oaks, (*Quercus spp.*), replaced Red Cedar (*Juniperus virginiana*) and

assumed dominance at 100years. Oaks were the dominant taxa at Hutcheson Memorial Forest, Rutgers University's ecological research forest, an uncut forest where some mature Oaks were over 300 years old [4].

Additional papers on secondary succession in nearby southern New England and the mid-Atlantic states are by Bromely [5], Stalter [6], Stalter and Rachlin [7] for New England, Bard [3], Stalter and Howarth [4] for New Jersey, Clements [8], Keever [9] for North Carolina.

Primary Succession

Primary succession is initiated on a bare area where no vegetation has grown before. If the habitat is extremely dry it is described as xeric, if wet, hydric, if intermediate, mesic. Whatever the condition of the initial habitat, the reaction of vegetation tends to make it favorable to more plants by reduction of extremes which is reflected in improved moisture condition. Secondary succession occurs on sites that have been previously covered by vegetation. Since conditions on these sites (*e.g.*, an abandoned cornfield) are not as extreme as those on sites where no vegetation has grown before, secondary succession is usually more rapid.

Hydrarch Succession

Hydrarch succession begins in open water wherever vegetation can become established (Figure 1). The pioneer plants are submerged aquatics; next water lilies and other floating plants may exclude the submerged plants by shading them. In still shallow water emergent species predominate. These species tend to hold sediment. Gradually the bog or pond is filled in as plants grow and die and organic material accumulates.



Figure 1: Turtle Pond, Alley Pond Park, New York a kettle pond, was formed when the Wisconsin Glacier retreated from this site around 18,000years ago. Duck Weed, (*Lemna minor*) a vascular plant species is on the pond's surface.



Xerarch Succession

Xerarch succession on a rock follows a definite pattern whose progress is controlled by the rate at which soil forms and accumulates. Pioneers are either lichens or mosses capable of growing during the brief periods when water is available to them. The pioneer lichens are crustose and foliose types; they contribute by causing erosion of the rock surface and thus provide some anchorage for the other invading species. Mosses catch dust and mineral matter, and thus more organic matter and mineral matter may accumulate.

When soil is built up sufficiently, hardy annual herbs appear followed by biennials and perennials, of which the grasses are most common. Later, a shrub stage becomes dominant. By this time, the mats may be several inches or even a foot thick; trees may make their appearance. Succession on disturbed sites may be influenced by many factors.

Stabilization and Climax

In successive communities the dominants become more exclusive. Eventually succession terminates in communities whose complex of species is well adjusted to each other. This self-perpetuating community in harmony with the environment and climate is the climax community.

The Oak Forest Community

Cunningham Park, a New York City Park in western Long Island, includes 132 hectares. Approximately two thirds of Cunningham

Park is forested. The vegetation of this forest has been studied by Harper [10] and Greller [11,12]. The dominant trees of this forest are Red Oak (*Quercus rubra*) and Black Oak (*Quercus velutina*). Other important trees include American Beech (*Fagus grandifolia*) Hickory (*Carya spp.*) Sweet Gum (*Liquidambar styraciflua*) Yellow Poplar (*Liriodendron tulipifera*) Sweet Birch (*Betula lenta*) and White Oak (*Quercus alba*). Dogwood (*Cornus florida*) a sub-canopy species was the dominant understory tree until ravaged by blight, Dogwood anthracnose. Red Maple (*Acer rubrum*) Tupelo (*Nyssa sylvatica*) and Pin Oak (*Quercus palustris*) occupy wet sites and may be common at kettle pond borders.

Much of Cunningham Park is on a terminal moraine formed during the last Wisconsin ice age. As the glacier retreated between 15 and 18 thousand years ago, a unique topography consisting of moraines and kettle holes was formed at Alley and Cunningham Parks and through most of the central part of Long Island. Alley Pond Park, like Cunningham Park, is situated on a portion of a terminal moraine and its topography and rich variety of species is similar to Cunningham Park [7]. Listed below are some of the herbaceous, shrub and arborescent species of forests in southeastern New York, adjacent southern New England, and New Jersey (Figure 2, Table 2).



Figure 2: Oaks (*Quercus spp.*) are the dominant trees in NYS parks. Black Oak, (*Quercus velutina*) is in the center of the photo taken at Alley Pond Park, September 29, 2023 by Eva Aguilar.

Conclusions

In summary, we describe community development, succession and list the plants that are common on disturbed sites, lawns, gardens, fields, and roadside right-of-way in the vicinity of New York City, New York, USA. We also included very brief descriptions of the 2 general kinds of primary succession. Hydric succession is common in city parks where the Wisconsin Glacier retreated around 18,000 years ago. Figure 1, a kettle pond, Alley Pond Park, New York is an example of a glacial pond undergoing primary succession.

We describe the common plants found at a mature oak dominated forest at Alley Pond Park, Queens County, Long Island, New York. Our data was based on 52 years of botany and ecology class field trips

and papers in peer reviewed papers by Stalter. The 79 species listed in Table 1 and 89 species listed in Table 2 are but a few of the common vascular plant species in these 2 communities as over 1,800 vascular plant species have been identified on Long Island, New York.

Finally, we include the growth form of each species listed in the tables. The tables do not and cannot list all the vascular plant species present in the vicinity of New York City and Long Island, New York as the flora of these combined regions is in excess of 2000 vascular plant species. Our primary objective is to provide general lists of some of the common successional and mature forest species of New York City and Long Island. People seeking more information on community development and oak dominated forests can read Stalter's numerous peer reviewed papers in the region.



Table 2: The following vascular species are found on disturbed sites in New York City parks and roadside right-of-ways, successional fields in southeastern New York, southeastern Connecticut, and the piedmont of New Jersey. Herbs are common on frequently disturbed sites or when a field is allowed to lie fallow. Successional shrubs and trees follow the herbs and grasses. The following list is incomplete as time and space limit the number of vascular plants in the table. f= fern, g = grass, h=herb, sedge, rush, s= shrub, t= tree, v= vine.

1	Red Maple (<i>Acer rubrum</i>)	t
2	Cinquefoil (<i>Achillea millefolium</i>)	h
3	Petticoat Climber (<i>Agrostis hyemalis</i>)	g
4	Wild Onion (<i>Allium vineale</i>)	h
5	Ragweed (<i>Ambrosia artemisiifolia</i>)	h
6	Pussytoes (<i>Antennaria plantaginifolia</i>)	h
7	Dogbane (<i>Apocynum cannabinum</i>)	h
8	Burdock (<i>Arcticum minus</i>)	h
9	Mugwort (<i>Artemisia vulgaris</i>)	h
10	Milkweed (<i>Asclepias syriaca</i>)	h
11	Old Field Birch (<i>Betula populifolia</i>)	t
12	Bur-Marigold (<i>Bidens coronata</i>)	h
13	Sensitive Plant (<i>Cassia nictitans</i>)	h
14	Corn Flower (<i>Centaurea spp.</i>)	h
15	Lamb's Quarters (<i>Chenopodium album</i>)	h
16	Chicory (<i>Chicorium intybus</i>)	h
17	Creeping Thistle (<i>Cirsium arvense</i>)	h
18	Bull Thistle (<i>Cirsium vulgare</i>)	h
19	Hedge Bindweed (<i>Convolvulus sepium</i>)	h
20	Horseweed (<i>Conzva canadensis</i>)	h
21	Orchard Grass (<i>Dactylus glomerata</i>)	g
22	Poverty Oatgrass (<i>Danthonia spicata</i>)	g
23	Wild Carrot (<i>Daucus carota</i>)	h
24	Deptford Pink (<i>Dianthus armeria</i>)	h
25	Crab Grass (<i>Digitaria sanguinalis, D. ischaemum</i>)	g
26	American Barnyard Grass (<i>Echinochloa muricata</i>)	g
27	Lovegrass (<i>Eragrostis spp.</i>)	g
28	American Burnweed, Fireweed (<i>Erechtites hieracifolia</i>)	h
29	Prairie Fleabane (<i>Erigeron strigosus</i>)	h
30	Grass-leaved Goldenrod (<i>Euthamia graminifolia</i>)	h
31	Bed Straw (<i>Galium spp.</i>)	h
32	Hawk Weed (<i>Hieracium paniculatum</i>)	h
33	Orange Grass (<i>Hypericum gentianoides</i>)	h
34	Spotted St. Johnswort (<i>Hypericum punctatum</i>)	h
35	Rush (<i>Juncus spp.</i>)	rush
36	Path Rush (<i>Juncus tenuis</i>)	rush
37	Canada Wild lettuce (<i>Lactuca canadensis</i>)	h
38	Prickly Lettuce (<i>Lactuca serriola</i>)	h
39	Virginia Pepperweed (<i>Lepidium virginianum</i>)	h
40	Bush Clover (<i>Lespedeza spp.</i>)	h
41	Oxeye Daisy (<i>Leucanthemum vulgare</i>)	h
42	Yellow Toadlax (<i>Linaria vulgaris</i>)	h
43	Japanese Honeysuckle (<i>Lonicera japonica</i>)	v
44	Medick (<i>Medicago sp.</i>)	h
45	Northern Bayberry (<i>Myrica pensylvanica</i>)	s
46	Common Evening Primrose (<i>Oenothera biennis</i>)	h
47	Common Yellow Woodsorrel (<i>Oxalis stricta</i>)	h



48	Timothy (<i>Phleum pratense</i>)	g
49	Pokeweed (<i>Phytolacca americana</i>)	h
50	Narrow-leaved Plantain (<i>Plantago lanceolata</i>)	h
51	Spear Grass (<i>Poa annua</i>)	g
52	Annual Bluegrass (<i>Poa pratensis</i>)	g
53	Prostate Knotweed (<i>Polygonum aviculare</i>)	h
54	Swamp Smartweed (<i>Polygonum hydropiperoides</i>)	h
55	Tear Thumb (<i>Polygonum persicaria</i>)	h
56	Knotweed (<i>Polygonum spp.</i>)	h
57	Heal-all (<i>Prunella vulgaris</i>)	h
58	Virginia Mountain Mint (<i>Pycnanthemum virginianum</i>)	h
59	Buttercups (<i>Ranunculus spp.</i>)	h
60	Winged Sumac (<i>Rhus copallina</i>)	s
61	Smooth Sumac (<i>Rhus glabra</i>)	s
62	Multiflora Rose (<i>Rosa multiflora</i>)	s
63	Blackberry (<i>Rubus allegheniensis</i>)	s
64	Black Raspberry (<i>Rubus occidentalis</i>)	s
65	Red Sorrel (<i>Rumex acetosella</i>)	h
66	Little Bluestem (<i>Schizachyrium scoparium</i>)	g
67	Green Foxtail (<i>Setaria glauca</i>)	g
68	Cat Greenbriar (<i>Smilax glauca</i>)	v
69	Bittersweet Nightshade (<i>Solanum dulcamara</i>)	v
70	Tall Goldenrod (<i>Solidago altissima</i>)	h
71	Early Goldenrod (<i>Solidago juncea</i>)	h
72	Gray Goldenrod (<i>Solidago nemoralis</i>)	h
73	Wrinkleleaf Goldenrod (<i>Solidago rugosa</i>)	h
74	Frost Aster (<i>Symphotrichum pilosum</i>)	h
75	Forked Bluecurls (<i>Trichostema dichotomum</i>)	h
76	Rabbitfoot Clover (<i>Trifolium arvense</i>)	h
77	Tall Red Top (<i>Triodia flava</i>)	g
78	Poison Ivy (<i>Toxicodendron radicans</i>)	v
79	Common Mullein (<i>Verbascum thapsus</i>)	h

Table 3: Common vascular plant species in the Oak Forest Community. The following list is incomplete as time and space limit the number of vascular plants in the table. f= fern, g = grass, h=herb, sedge, rush, s= shrub, t= tree, v= vine.

1	Black Snakeroot (<i>Actaea racemosa</i>)	h
2	White Snakeroot (<i>Agaratina altissima</i>)	h
3	Rue Anemone (<i>Anemonella thalictroides</i>)	h
4	American Spikenard (<i>Aralia racemosa</i>)	s
5	Wild Sarsaparilla (<i>Aralia nudicaulis</i>)	h
6	Southern Lady Fern (<i>Athyrium asplenoides</i>)	f
7	Cherry Birch, Sweet Birch (<i>Betula lenta</i>)	t
8	False Nettle (<i>Boehmeria cylindrica</i>)	h
9	Pennsylvania Sedge (<i>Carex pennsylvanica</i>) sedge	
10	Sedge (<i>Carex spp.</i>) sedge	
11	Hop Hornbeam (<i>Cornus caroliniana</i>)	t
12	Bitternut Hickory (<i>Carya cordiformis</i>)	t
13	Sweet Pignut Hickory (<i>Carya glabra</i>)	t
14	Mockernut Hickory (<i>Carya tomentosa</i>)	t
15	Oriental Bittersweet (<i>Celastrus orbiculatus</i>)	v
16	Hackberry (<i>Celtis occidentalis</i>)	t
17	Buttonbush (<i>Cephalanthus occidentalis</i>)	s



18	Greater Celandine (<i>Chelidonium majus</i>)	h
19	Spotted Wintergreen (<i>Chimaphila maculata</i>)	h
20	Wood Reed Grass (<i>Cinna arundinacea</i>)	g
21	Sweet Pepperbush (<i>Clethra alnifolia</i>)	s
22	Asiatic Dayflower (<i>Commelina communis</i>)	h
23	Flowering Dogwood (<i>Cornus florida</i>)	t
24	Hawthorne (<i>Crataegus spp.</i>)	t
25	False Nutsedge (<i>Cyperus strigosus</i>) sedge	
26	Water-willow (<i>Decodon verticillatus</i>)	s
27	Hay-scented Fern (<i>Dennstaedtia punctilobula</i>)	f
28	Wild Cucumber (<i>Echinocystis lobata</i>)	v
29	Beech-Drops (<i>Epifagus virginiana</i>)	h
30	Horsetail (<i>Equisetum arvense</i>)	h
31	Yellow Trout Lily, Dog-tooth Violet (<i>Erythronium americanum</i>)	h
32	Fetterbush (<i>Eubotrys racemosa</i>)	s
33	White Woodland Aster (<i>Eurybia divaricatum</i>)	h
34	Beech (<i>Fagus grandifolia</i>)	t
35	White Ash (<i>Fraxinus americana</i>)	t
36	Huckleberry (<i>Gaylussacia baccata</i>)	s
37	Cranesbill, Wild Geranium (<i>Geranium maculatum</i>)	h
38	Witch Hazel (<i>Hamamelis virginiana</i>)	s
39	Tapertip Rush (<i>Juncus acuminatus</i>) rush	
40	Path Rush (<i>Juncus tenuis</i>) rush	
41	Rush (<i>Juncus spp.</i>) rush	
42	Mountain Laurel (<i>Kalmia latifolia</i>)	s
43	Northern Spice Bush (<i>Lindera benzoin</i>)	s
44	Sweetgum (<i>Liquidambar styraciflua</i>)	t
45	Tulip Tree (<i>Liriodendron tulipifera</i>)	t
46	Japanese Honeysuckle (<i>Lonicera japonica</i>)	v
47	Netted Chain Fern (<i>Lorinseria areolata</i>)	f
48	Fetterbush (<i>Lyonia mariana</i>)	s
49	Crosswort, Swamp Candle (<i>Lysimachia terrestris</i>)	h
50	Canada Mayflower (<i>Maianthemum canadense</i>)	h
51	Indian Cucumber Root (<i>Medeola virginiana</i>)	h
52	Partridge-berry (<i>Mitchella repens</i>)	h
53	Indian Pipe (<i>Monotropa uniflora</i>)	h
54	White Mulberry (<i>Morus alba</i>)	t
55	Black Gum, Black Tupelo (<i>Nyssa sylvatica</i>)	t
56	Sensitive Fern (<i>Onoclea sensibilis</i>)	f
57	Garden Star of Bethlehem (<i>Ornithogalum umbellatum</i>)	h
58	Cinnamon Fern (<i>Osmundastrum cinnamomeum</i>)	f
59	American Hop-hornbeam (<i>Ostrya virginiana</i>)	t
60	Virginia Creeper (<i>Parthenocissus quinquefolia</i>)	v
61	Clearweed (<i>Pilea pumila</i>)	h
62	Sycamore (<i>Platanus occidentalis</i>)	t
63	Smooth Solomon's Seal (<i>Polygonatum biflorum</i>)	h
64	White Poplar (<i>Populus alba</i>)	t
65	Quaking Aspen (<i>Populus tremuloides</i>)	t
66	Self-heal (<i>Prunella vulgaris</i>)	h
67	White Oak (<i>Quercus alba</i>)	t
68	Scarlet Oak (<i>Quercus coccinea</i>)	t



69	Pink Oak (<i>Quercus palustris</i>)	t
70	Red Oak (<i>Quercus rubra</i>)	t
71	Black Oak (<i>Quercus velutina</i>)	t
72	Buckthorn (<i>Rhamnus sp.</i>)	s
73	Swamp Azalea (<i>Rhododendron viscosum</i>)	s
74	Black Locust (<i>Robinia pseudo-acacia</i>)	t
75	Multiflora Rose (<i>Rosa multiflora</i>)	s
76	Wineberry (<i>Rubus phoenicolasius</i>)	s
77	American Black Elderberry (<i>Sambucus canadensis</i>)	s
78	Canadian Black snakeroot (<i>Sanicula canadensis</i>)	h
79	Blue Skullcap (<i>Scutellaria lateriflora</i>)	h
80	Starry Campion (<i>Silene stellata</i>)	h
81	False Solomon's Seal (<i>Smilacina racemosa</i>)	h
82	New York Fern (<i>Thelypteris noveboracensis</i>)	f
83	Bellwort (<i>Uvularia sessilifolia</i>)	h
84	Highbush Blueberry (<i>Vaccinium corymbosum</i>)	s
85	Lowbush Blueberry (<i>Vaccinium pallidum</i>)	s
86	White Vervain (<i>Verbena urticifolia</i>)	h
87	Maple-leaved Viburnum (<i>Viburnum acerifolium</i>)	s
88	Arrow-wood Viburnum (<i>Viburnum dentatum</i>)	s
89	Blue Violet (<i>Viola sororia</i>)	h

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