seems to be a sucession of smaller bands. Tips of needles often creamy white. Habit dense and somewhat congested, with about 4 to 9 cm of new growth each year.

Most similar to P. parviflora *'Janome' (actually, two distinct clones) and 'Ogon'. 'Janome' is distinguished by its strongly curved needles and green-tipped needles in both so-named selections. 'Ogon' is distinguished by its short, densely tufted needles, which are uniformly yellow except at the base.*

Illustrated on the cover of the Fall 1977 catalog of Kairyo En (nursery), Angyo, Japan, and described on the inside cover. Sold by Kairyo En and other nurseries.

Cultivar Update

In the Fall 1983 issue of *Arnoldia*, we assigned the name 'Sundance' to a cultivar of *Aucuba japonica* (Yinger Collection No. 267). We have since discovered a validly published name for this clone that is acceptable under the *Code*. Thus, we wish to nullify our name 'Sundance' in favor of the name 'Meigetsu' [the Japanese spring and autumn equinox], which is illustrated and described on page 9 of Catalog 62 (Fall 1978–Spring 1979) of Asahi Shokubutsuen (nursery), Okazaki, Aichi Prefecture, Japan.

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Five years of experience yield the formula for success

Replacing the Understory Plantings of Central Park

Geraldine Weinstein

A century after Central Park was created, few vestiges of its original understory of shrubs and trees remained, despite a major replanting that was done in the 1930s. Depleted financial resources, misguided attempts at landscape management, inadequate maintenance, and the impact of millions of visitors were the major culprits. Recognizing the importance of shrubs and understory trees in the Park's design and ecology, the Central Park Conservancy and the New York City Department of Parks and Recreation began to replant the understory in the spring of 1980.

Basing their approach on the Park's history, on growing conditions in the Park, and on the desires of parkgoers, the Park's managers and landscape architects have been focusing on the ability of specific understory plantings to accomplish aesthetic and ecological objectives. They have found that the key steps in successfully reestablishing the understory are analysis of the site, the selection of plants, appropriate maintenance practices, and continual evaluation of each plant's performance.

Construction of Central Park began in 1858, during an era of intense botanical exploration. The idea of bringing plants from abroad greatly appealed to Frederick Law Olmsted and Calvert Vaux, the Park's designers, since an expanded choice of plants would make it easier for them to carry out their design intentions. Combining exotic and native species, they provided a multitude of contrasts in plant texture, color, and form, offering visitors to the Park a continual and fascinating change in scenery. *Leucothoë fontanesiana* (*L. catesbaei*), *Mahonia aquifolium*, and a myriad of *Rhododendron* species brought bold texture and deep color to the landscape, while *Caragana arborescens*, *Cytisus scoparius*, and other fine-textured plants provided a counterpoint.

Fruits of the many species of *Cotoneaster*, *Lonicera*, and *Viburnum* also wove color through the landscape. In autumn, the diversity of color was heightened by the foliage of *Rhus typhina*, *Euonymus alatus*, and *Hydrangea quercifolia* and, in winter, by the twigs of *Kerria japonica*, *Cornus sericea*, and *Vaccinium angustifolium*.

Through the widespread planting of roses, spireas, lilacs, azaleas, and rhododendrons, floral displays became part of the Park's landscape. But in choosing from a wide array of plant species, the Park's designers did not always give horticultural considerations the attention they deserved.

First and foremost, Olmsted and Vaux used plants—especially shrub and understory species—to give specific aesthetic character to a site or to complement such existing features of the landscape as lakes, streams, and meadows. Although Olmsted and Vaux planned the understory with a flawless eye, conditions at a site were not always favorable to the species they planted there. Some of the species probably found the Park's environment as inhospitable in the nineteenth century as they would find it now. Of the plants listed on the 1873 survey of the Park, *Aucuba japonica*, *Kalmia angustifolia*, *Andromeda polifolia*, and *Myrica cerifera* could not have found conditions particularly favorable.

The 1873 survey indicates that the species planted in the Park came from a wide range of habitats. Shrubs familiar in garden settings—*Potentilla* spp., *Buxus* spp., *Hydrangea macro-*

The Fifth Avenue border planting of *Berberis thunbergii* and *Rhodotypos scandens*. Photographs by the author.

phylla, *Cotoneaster* spp., *Hypericum perforatum*—were used, as were shrubs more often seen in their native habitats—*Lindera benzoin*, *Viburnum dentatum*, *Clethra alnifolia*, for example.

As much as diversity, scale characterized the shrub and understory plantings. For Olmsted and Vaux, understory planting had to be of considerable scale and depth, allowing the eye to wander, uninterrupted, over large areas of the landscape, evoking a sense of space and dimension. A powerful contrast was to exist between the Park and the surrounding city, where cement and concrete loomed before one's eyes, continually cutting off views of what might lie beyond. Shrub plantings of considerable depth and length would add another dimension to its environment, as well as another texture to the Park's landscape. Installed throughout woodlands, at the edges of meadows, and on the banks of streams and ponds, extensive shrub and understory plantings created environments rich in botanical and ecological diversity. Wildlife found varied sources of food and excellent protective cover. Visitors to the Park saw before themselves the same degree of harmony and contrast among plants that characterizes natural landscapes.

Design and Management Considerations

The objectives of the current replanting echo those of Olmsted and Vaux but have been expanded to meet additional management needs.

Growth habit, foliage texture, and times of flowering and fruiting are still part of the design and plant-selection process. However, management issues pertaining to the Park's appearance as a well maintained and thriving urban green space receive no less emphasis. As in early Park plantings, shrubs and understory trees are currently used to provide soft, undulating edges to wooded areas of the Park. The understory created between canopy trees and the ground surface is particularly important at entrances and along the Park's perimeter, where visitors get their first impression of Central Park as a naturalistic landscape.

Reiterating an important concept of Olmsted and Vaux's, landscape architects at the Conservancy are planning large-scale plantings of shrubs for selected sites along the edges of lawns. Throughout much of the Park, lawns are defined by pavement. The hard visual impact of asphalt paths is offset by lush and vigorous understory plantings, which also define the edges of meadows. Thus the lawns are set off and highlighted as more irregular and undulating spaces than before.

In addition, naturalistic edges of shrubs and understory trees are being planted on the banks of lakes, ponds, and streams in the Park to halt siltation. This process begins with an assessment of the total watershed area to determine whether and, if they will, where understory plantings will minimize erosion of surrounding slopes and adjacent areas. The process ends with an effective waterside planting that will stabilize the banks and shoreline. The waterside planting must have additional merit as a wildlife habitat, providing both food and cover.

Soil erosion in Central Park adversely affects not only its bodies of water. Throughout the Park, the growth and establishment of plants, especially of trees and ground covers, are threatened by the continual loss of topsoil. Erosion undoubtedly became a problem in Central Park soon after the first half million cubic yards of topsoil were brought to the Park during its construction. Other factors related to the erosion problem have been with the Park since its beginning. At any given site, at least one of the following factors is involved: design, soil texture, environmental factors, and use of the Park. Understory planting in Central Park is intended to compensate for the erosion-prone soil, intense use of the Park, difficult-to-manage or -design areas, and harsh microclimate.

Intensity of use in particular is a problem, as the feet of 14,000,000 visitors leave their imprints each year. The problem is most obvious in the dusty and constantly eroding cow paths that crisscross areas in the Park, and on steep slopes, where any major amount of foot traffic results in considerable loss of topsoil. Understory planting is used to manage the circulation patterns of visitors. Such "barrier plantings" protect easily eroded areas, newly restored landscapes, and lawn areas. The species of shrubs chosen are not necessarily thorny, but by their mass and visual impact they effectively deter foot traffic.

In summary, design intentions and management concerns have resulted in specific planting objectives for the restored understory, namely, to control erosion, supply food and cover for wildlife, provide a naturalistic understory in the Park's woodlands, stabilize banks and shorelines, lend spatial definition to landscape sites, and assure the integrity of Central Park as a naturalistic landscape, even at its entrances and on its periphery.

Site Considerations

In any restoration project, if the plant species chosen deal successfully with the existing use and environmental problems, then the design intent will be clearly conveyed; otherwise, it will crumble. After the site has been analyzed, plant material must be chosen with as much knowledge and information as are available to the horticulturist and the landscape architects. Strong emphasis is placed on the use of native species whenever possible, and on integrating broadleaf evergreens into the planting. Existing plant lists can indicate which species are tolerant of shade, salt, or flooding, and which will help prevent ero-

sion. However, existing lists usually do not take into account the many adverse environmental conditions of an urban site.

Central Park is a built landscape. Even its soil, which must support plants, is built. The characteristics of urban soil differ sharply from those of natural soils. Structural and textural inconsistencies in the profile of an urban soil create barriers to the movement of air and water into the soil. In addition, compaction of the surface and subsurface layers of soil decreases the amount of air and water that are available to plants, a common problem in soils that are affected more by people and machines than by natural processes. Both periodic flooding and drought can occur within soil layers.

The climate of Central Park, like the climates of other "green islands" in cities, is strongly modified by the areas around it. Winds tunnel between tall buildings, and heat radiates long into the evening, having been trapped in masses of asphalt and concrete during the day.

It is significant, too, how the characteristics of urban soils and microclimates intensify the effects of seasonal changes in temperature. Unlike actual islands, which are protected from climatic extremes by the water around them, urban "islands" have very few ameliorating influences. Temperatures in the soil and air are often extreme, especially in shallow and compacted soils.

Perhaps the most important site consideration is the effect wrought by people. "People-pressure diseases" of urban trees also affect the understory. While most actual islands are inaccessible to large numbers of people, urban islands are created for people. In fact, the intense use of Central Park, despite the damage it does to vegetation, is the Park's greatest attribute. Central Park was created to attract the citizens of New York; it provides them with relief from the city's steel and concrete.

The Border Planting

The restoration along Fifth Avenue between 72nd and 76th Streets was the first attempt to reestablish a border planting at the edge of the Park. The planting was gradually extended, creating a forest edge along the Park's perimeter, adjacent to Fifth Avenue.

This planting lies between two Park entrances. One, the entrance at 72nd Street, a major thoroughfare in the Park, leads to the Mall, Sheep Meadow, and Bethesda Terrace—all of which are major focal points in Central Park. Immediately north of this entrance is the path leading down to the Conservatory Water, which is a model-sailboat pond in spring and summer and an attractive site for ice-skating in winter.

While a proliferation of architectural styles and forms occupies the adjacent city streets, the forest edge just inside the Park is a coherent and free-flowing naturalistic landscape, reflecting harmony along its entire length. From the Park wall, the forest edge slopes either down toward the Conservatory Water or up a short rise toward the 72nd Street entrance. Understory plants weave through and around canopy trees. Unlike the city streets, which are spatially defined by blocks, the border planting conveys the feeling of a contiguous forest.

On sunny days, the lawn around the Conservatory Water is crowded with people. On weekdays, hundreds of people pass through the 72nd Street entrance, on weekends, thousands. During certain special events, hundreds of thousands of people pour into the Park. The spilling over of people from the entrance onto the border planting is a perennial problem, one that affects both the design of the planting and the plants used at the site. The entrance at the other end of the border planting is much smaller in scale—just a gap in the Park wall, and a pathway leading in—and is far less used by visitors. There is a very popular playground just to the north, making large numbers of school children a normal part of the landscape.

In terms of climate, the Park's perimeter along Fifth Avenue is colder by far in winter than all other sites in the Park. The wind coming off the East River increases in force as it whips around and through row upon row of skyscrapers before

Myrica pensylvanica growing on a rocky ledge on The Point.

striking the Park with enormous impact.

Because the perimeter planting faces east, parts of it receive more sunlight than other areas of the Park, particularly in winter. Unfortunately, the winter sun does more harm than good to plants because it can dry them out.

The most striking visual features of the site are the many large and magnificent canopy trees and the extensive steep slope that characterizes the entire planting. In this part of the Park's perimeter the slope extends down from the base of the Park wall, becoming a potentially scenic and dramatic backdrop to the lawn areas below.

Although the trees were for the most part in good condition, the slope was, with few exceptions, bare of understory planting. It was also bare of leaf litter, since the leaves from the canopy trees are swept off the slope by the wind and people onto the lawn areas below. During heavy rainstorms the Park wall adds to the erosion problem: Rain pours down the side of the stone wall and shoots down the slope, leaving rills and gullies behind. As this site is adjacent to the Park wall, we were not surprised to find fill and heavy subsurface layers within the soil profile. To provide a supportive soil environment, truckloads of leaf mold were brought to the site. Where feasible, the leaf mold was rototilled into the soil. Where a Rototiller could not be used, the leaf mold was worked in with grub axes and shovels.

To create a forest edge at the site, understory planting would have to stop erosion effectively. Shrubs and understory trees capable of doing this would be those species able to deal with the adverse effects of wind, heat, sun, and people, as

Cornus racemosa, placed to soften a planting of *Berberis julianae* used to define a path to The Point.

well as with the limitations of deep shade and intense competition from the roots of the many existing mature trees. Over two thousand shrubs and understory trees, consisting of twenty-two species, were used at the site. *Hamamelis virginiana*, *Euonymus alatus*, *Rhodotypos scandens*, and *Viburnum siedboldii* are the "anchors" of this landscape. They have proven themselves in other sites in the Park, and were used to give cohesiveness to the planting and to link this landscape to other sites in the Park. It was also hoped that they would uphold the planting and the design if any of the other plants chosen proved to be mistakes.

Hamamelis virginiana was the principal understory tree used. This species had already indicated its tolerance of severe exposure, drought, and flooding at other sites in the Park. Its wide-spreading habit provides an effective contrast to the many verticals of the major-story trees. Placed at the top of the slope, it breaks the force of the wind and rain and provides a buffer for less adaptable plants on the site. Even from outside the Park, the graceful form and yellow flowers are a welcome contrast to the traffic congestion on the avenue.

Although somewhat stiffer in habit, *Euonymus alatus* 'Compactus', with its dense and compact form, also protects the soil from the pounding of heavy rainfalls. When mass-planted, it provides an equally dense buffer against careless foot traffic. Its density deters visitors from ploughing through the planting. In the autumn, the broad spatial effect of its pink-rose foliage provides ad-

ditional depth and interest to the border planting.

While both *Viburnum dilatatum* and *Viburnum lantana* were used, *Viburnum sieboldii* has proved more successful. Its lustrous foliage is an especially welcome sight during the hottest part of the summer. It rarely indicates drought or heat stress, and it grows more vigorously than other species of *Viburnum*, with *Viburnum prunifolium* being the only exception.

Rhodotypos scandens is another park favorite, much admired because it tolerates almost anything. With maintenance, it is a very vigorous grower. Its graceful, wide-spreading habit contrasts effectively with the more upright *Euonymus alatus*. At this particular planting site, it flowers for nearly four weeks. The black, beadlike berries are as attractive to wildlife as to people.

Acanthopanax sieboldianus has proved very effective at stopping erosion because it deters foot traffic. It is easily established and is a very vigorous grower, so vigorous, in fact, that it often hinders the growth of less competitive plants growing nearby. Its very-fine-textured foliage lightens up an entire planting. It protects the soil because it virtually covers it with its moundlike and wide-spreading habit.

At the base of the slope, in a wet area, we were successful with a bare-root planting of *Cornus sericea*. While we had often been unsuccessful planting *Cornus* species balled and burlapped, we incurred no losses with the planting at this site.

As all of the above species flourish, they provide protection for rhododendrons and *Kalmia latifolia*. Though not widely used throughout the planting, the contrast between their bold, broadleaf foliage and the lighter texture of the deciduous material magnifies their impact. While it would be nice to use evergreens at the edge of a border planting, so that they could be seen from the street, it doesn't work that way. They are difficult to reestablish, are easily desiccated by the wind and sun, and are intolerant of the heat, urban soils, and disturbances in general. While an environment suitable for rhododendrons, laurels, and azaleas could be provided, site conditions proved totally unsuited for other species selected.

Amelanchier canadensis is a favorite understory tree, but it has not fared well on this site. Heat, surface campaction, and frequent disturbance by people set it back substantially. In Central Park it is slow to establish, even when maintenance is provided, and its stems are easily broken.

Along with *Amelanchier canadensis*, *Clethra alnifolia* and *Ilex verticillata* found the site far too dry for their liking. Even with irrigation and mulching, neither species thrived. Like *Amelanchier*, *Clethra* is particularly difficult to establish. While healthy examples of all three species can be found elsewhere in the Park, the fatality rate has been high, considering the numbers planted during the last two to three years (nearly one thousand *Clethra* plants). *Clethra* and *Amelanchier* are doing well at waterside plantings, even though the soil in which they were planted is not wet. The breezes from the water lower the temperature and provide a degree of air circulation missing from the border planting, where the winter winds are not replaced by any cool summer breezes. In addition, at the waterside sites, both species suffer far less disturbance.

Ilex verticillata was the great mistake in the border planting. This species was totally out of its habitat, and there was no way we could recreate the habitat. A planting of this species situated on a shaded slope leading down to an inlet is successful, however. *Ilex verticillata* is the perfect example of shrubs often recommended for wildlife plantings but that cannot benefit the wildlife in Central Park since they rarely survive in the Park's harsh environment.

There have been other planting successes and failures throughout the Park that are worth reporting. Central Park was built on rocky, barren land; therefore, shallow soil is a common problem. *Myrica pensylvanica* and *Elaeagnus umbellata* seem to take this limitation in stride, thriving on rocky, fully exposed sites and yet tolerant of light shade. Both species contribute to the success of the wildlife planting at The Point, a rocky peninsula jutting out into the 72nd Street lake. A