



CENTRAL PARK CONSERVANCY INSTITUTE FOR URBAN PARKS

TURF CARE HANDBOOK

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Central Park Conservancy Institute for Urban Parks—Turf Care Handbook



Foreword

The nationwide revival of city parks over the last few decades has underscored the need for effective long-term management and maintenance of public green spaces. With nearly every U.S. city investing in restoring existing parks or building new ones, often in partnership with citizens' groups and nonprofit organizations, a new field of urban park management has emerged. Central Park Conservancy has been in the forefront of this effort to foster best practices, knowledge exchange, and professional development for current and future park managers.

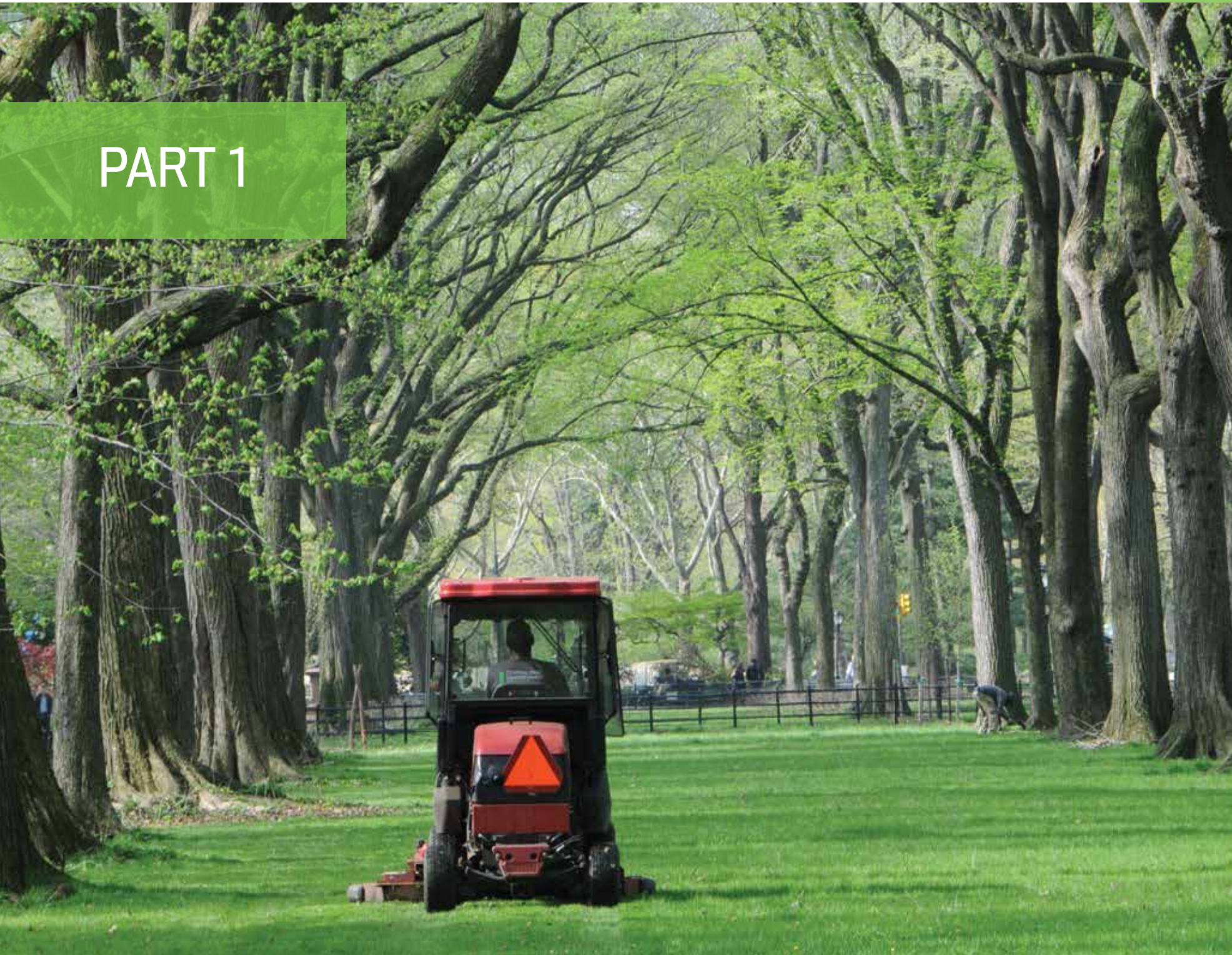
Founded in 1980 to break the “cycle of restore and decline” by bringing long-term planning and consistent management, supported by private fundraising and volunteer assistance, the Conservancy pioneered the model of the public-private park partnership. As part of our mission to restore, manage, and enhance Central Park in partnership with the public, we aim to set the standard for world-class urban park management. Over thirty-five years of experimentation and innovation – finding out what does and doesn't work – we have developed effective strategies for every aspect of park care.

Each year, the Conservancy receives hundreds of requests from all over the world to share what we have learned. In 2013, the Conservancy launched the Institute for Urban Parks, our educational arm, in part to address this interest in our work. The Institute teaches park users and managers to care for urban parks everywhere.

As one of two centers that make up the Institute, the Center for Urban Park Management shares the Conservancy's expertise with current and aspiring park professionals to elevate the urban park management profession. The Conservancy has informally supported other parks in a variety of ways for more than three decades. The Center for Urban Park Management helps other parks by providing direct assistance and advice, formal training, and on-site support. This handbook is one of a number of resources the Center is producing to comprehensively document the Conservancy's best management practices.

In a high-profile park that is subject to enormously intensive use, the Conservancy seeks to maximize public enjoyment of Central Park while maintaining important historic, environmental, and aesthetic values. That challenge is vividly illustrated in the evolution and current practices of the Conservancy's turf care program, as detailed in this handbook. The Conservancy has learned a great deal from our experiences caring for Central Park. We are pleased to share this knowledge through the publication of this handbook and dissemination of additional resources available through the Center for Urban Park Management.

PART 1



Turf Care in Central Park

The *Central Park Conservancy Institute for Urban Parks—Turf Care Handbook* presents the successful turf care practices of Central Park Conservancy, how those practices have changed over time, and the underlying principles guiding the Conservancy's practices. Urban park managers can adapt these insights to their own parks, taking into account differences in size, program, budget, staff, and volunteer capacity.

Part One traces the evolution of turf care in Central Park and explains the basic principles and management systems that guide the Conservancy's turf care program. Part Two describes, in detail, the Conservancy's most effective strategies for maintaining healthy, attractive, and durable lawns and athletic fields in urban parks. Operations staff at the Conservancy developed these practices over 35 years of experimenting and innovating, adapting industry standards and academic research findings to meet the needs of an urban park that receives over 42 million visits each year. A reference guide at the end of the handbook provides additional technical resources.



CHAPTER 1

The History and Evolution of Turf Care in Central Park

The morning of July 12, 2014, dawned warm, humid, and overcast on the Great Lawn in Central Park. Less than six hours earlier, the New York Philharmonic played there before a crowd of 60,000 people. A rite of summer for many New Yorkers, the free classical concerts draw the biggest crowds of any Park event. More people squeezed onto the 12.1-acre swath of grass – about the size of two city blocks – than attend a sold-out game at Yankee Stadium. Decades ago, that many people walking, standing, and sitting on the Lawn at once, not to mention vehicles driving on grass to set up for the concert, would have compacted the soil and permanently harmed the Lawn. But that morning, when Central Park Conservancy staff checked to see how the Lawn had held up, they found that the damage was minimal and could be quickly remedied.

What made the difference? To begin with, the Conservancy completely rebuilt the Great Lawn in 1995, installing a highly efficient drainage and irrigation system, topped by layers of engineered soils and new sod. The new Lawn was designed to drain water quickly – foot traffic is most damaging when grass is wet – and allow the establishment of deeply rooted, dense turf that could sustain heavy public use.

Even the most soundly engineered lawn needs careful management to survive the more than five million visits the Great Lawn receives every year. To protect the Lawn well into the future, the Conservancy developed its Great Lawn Management Plan in 1997. The plan, which incorporated important organizational and turf management advances developed by the Conservancy over the years, was the first comprehensive strategy for managing a specific Park landscape and created a framework for managing turf throughout the Park.

Beginning months in advance of the concert and continuing up to the day of the event, Conservancy staff strictly adhered to the Great Lawn's management protocols. These protocols included frequent mowing, monitoring, irrigating, fertilizing, and aerating, as well as carrying out significant restoration work every fall, and closing the Lawn in winter. Conservancy staff used a system of red flags, signs, and barricades to notify visitors that the Lawn was closed. The Conservancy assisted in overseeing the concert setup, as it does for every event on the Park's lawns. Gardeners and Technicians who regularly work on the Great Lawn installed temporary fencing and signs while members of the Parkwide Turf Crew brought pedestrian barriers and production equipment onto the Lawn using vehicles fitted with turf tires designed to minimize soil compaction.

At 11:30 pm, following the post-concert fireworks, staff entered the Lawn to remove trash and to dismantle barricades. Within a few days, they would return to aerate and seed spots where the turf was compacted and thinned, including the paths worn down that led to the four exits from the Lawn. If the damage had been more extensive, the Conservancy would have closed the Lawn temporarily to make more substantial repairs and lay down new sod. But because the damage was minimal, in several weeks, the grass was dense and full again and ready for picnickers and sunbathers to enjoy.

With over 42 million visits each year, Central Park receives an unparalleled intensity of use even for a New York City park. The statistics are staggering: according to a parkwide user survey

conducted in 2010, more than five million visits were made to the Great Lawn and more than three million to Sheep Meadow. Without a comprehensive approach to turf management, the lawns would quickly deteriorate. The condition of the Great Lawn that July morning confirmed the critical importance of high standards of stewardship, proper planning, effective organizational systems, and the use of best horticultural practices in caring for the Park's intensively used public spaces.

The History of Central Park's Turf

Designed by landscape architects Calvert Vaux and Frederick Law Olmsted in 1858 and largely completed by 1873, Central Park is a master work of art, an experiment in democracy, and an extraordinary feat of design, engineering, and management. Olmsted and Vaux designed the Park's spaces to promote the mid-19th-century ideal of "properly planned and managed public recreation grounds" (Beveridge, Schuyler, and McLaughlin, 1983, p. 84) that fostered civility and offered relaxation for a growing urban populace, regardless of social position. Olmsted and Vaux's design envisioned a naturalistic tapestry of meadows, open spaces, and woodlands organized around an extensive system of curving pedestrian paths, bridle paths, and carriage drives. Each space was designed to unfold into the next in a "series of passages of scenery" (Beveridge et al., 1983, p. 117). They called their plan "Greensward" (an English term for vast areas of lawn dotted with trees) after their preferred type of landscape for an urban park.



Sheep grazing on Sheep Meadow, early 1900s.



Boys' Playground, 1906.



Detail of the Greensward Plan of Central Park, Frederick Law Olmsted and Calvert Vaux, 1858. Originally, Sheep Meadow was called the Parade Ground.



The Tennis Courts, early 1900s.

Soon, however, the demand for active recreation areas began to alter the character of open spaces in the Park. Lawn tennis courts and athletic fields were built by 1863, although the athletic fields were meant only for school boys and their use was limited in order to preserve turf. Over the next few decades, however, unregulated activity started degrading Park lawns. Athletics for adults, massive public celebrations, and performances by public school children took over scenic meadows originally meant for quiet enjoyment. The City of New York began issuing permits to use open spaces for sports and special events. In 1915 alone, the City issued 20,000 tennis permits, requiring the hasty addition of nets on the Green – now known as Sheep Meadow – one of the most important scenic spaces in the southern part of the Park.

Municipal budgets for Park maintenance shrank throughout the 20th century while demand for recreational open space in the City continued to grow. The City installed Central Park's first underground sprinkler system in 1928, but persistent overuse and neglect eventually counteracted the benefits of automated irrigation. Maintenance budgets went up and down. Park managers found themselves able to invest in new turf one year, only to have to scale back maintenance efforts in the following season. Restored areas quickly eroded, beginning a "cycle of restore and decline" that would be repeated over the years to come.

By the 1960s, the City's masterpiece of landscape architecture had become a landscape of despair and disrepair. Lawns and meadows turned into dust bowls, with soils so severely compacted that water washed off the surface like rain falling on an asphalt parking lot. The Park became known for vandalism, graffiti, and litter. Municipal budgets barely covered the most basic Park services, leaving the New York City Department of Parks & Recreation (NYC Parks) unable to invest in a comprehensive and reliable approach to maintenance.

In 1979, then-Park Commissioner Gordon Davis appointed Elizabeth Barlow Rogers as Central Park Administrator. To stop the seemingly endless cycle of restoration and decay, two of the most prominent Park advocacy groups merged in 1980 to form the Central Park Conservancy. Led by Rogers, the Conservancy brought long-term planning, consistent management, and reliable resources to the Park with financial help from private donors and hands-on stewardship from dedicated volunteers. In 1998, the Conservancy entered into a formal management contract with the City and assumed day-to-day responsibility for almost every aspect of the Park, including turf care. Over time, the Conservancy developed a comprehensive and consistently effective strategy for taking care of turf on lawns and athletic fields throughout the Park – a strategy outlined in the following section of this handbook.



Maypoles, early 1910s.



Children's Day, 1905.



Heckscher Ballfields and Sheep Meadow, late 1970s.



Park managers employed a variety of techniques to mow Sheep Meadow, 1869.

The Evolution of the Conservancy's Turf Care Program

The first full-time staff person hired to work for the Conservancy was a mechanic. Not a gardener or an arborist or even a turf specialist – a mechanic. Before the Conservancy, NYC Parks shipped broken mowers and other equipment to an off-site facility for repairs. Work was often delayed and some equipment simply never made its way back to the Park. Hiring a full-time mechanic allowed valuable equipment to be kept on-site so repairs could be made in a fraction of the time.

The Conservancy made small but significant improvements, like the immediate removal of graffiti and the repair of benches and playground equipment. The first lawn restored by the Conservancy was Sheep Meadow in 1981. The perimeter of the lawn was fenced for the duration of the renovation. When Sheep Meadow reopened for public use, the Conservancy kept the fence in place, which enabled a complete closure during the dormant winter months. This simple action demonstrated, for the first time, the value and feasibility of strategically limiting access to turf areas for maintenance and restoration.

The Conservancy's initial success spurred support for a more comprehensive approach to management and restoration. In 1985, the Conservancy released *Rebuilding Central Park: A Management and Restoration Plan*, a 15-year vision for the complete recovery of Central Park. Over the next decade, additional lawns were restored, including the Great Hill, the North Meadow, and Cedar Hill. During the renovation of Cedar Hill in 1994, the Conservancy

developed the Red Flag System, using temporary flags to communicate the opening and closing of lawns related to weather and maintenance. The Conservancy restructured the Park's traditional roving maintenance crews in 1995 with its Zone Management System, which assigned staff to 49 geographic zones in the Park. This system has led to increased accountability and consistency of maintenance as well as improved communication and familiarity with Park visitors. After the restoration of the Great Lawn, the Conservancy created a Parkwide Turf Crew trained in lawn and athletic field care to work with Zone staff on regular turf maintenance.

That same year, the Conservancy raised \$18 million to rebuild the Great Lawn as part of the renewal of the surrounding 55-acre landscape. The Lawn reopened in the fall of 1997, culminating one of the most ambitious projects in the history of Central Park.

The 1997 Great Lawn Management Plan was the Conservancy's first comprehensive management blueprint for a specific landscape. It incorporated all of the lessons learned up to that point and established the system used throughout the Park for turf care. The plan tied turf management to a new system of lawn categories, defined by type and amount of use. Turf with the most concentrated foot traffic, such as major lawns and athletic fields, received the most intensive care. Among its innovations, the plan regulated public use and activities to reduce turf damage, instituted scheduling protocols and guidelines for regular and seasonal turf maintenance, and limited the size and frequency of concerts and other events. Events on the Great Lawn, which require permits issued by NYC Parks in consultation with the Conservancy, were capped at six per year and attendance at each event was limited to 60,000 people.



Sheep Meadow, late 1970s.



The Great Lawn, 1980s.



The East Green, early 1980s.



The North Meadow, early 1980s.



The Great Hill, early 1980s.



Cedar Hill, early 1980s.



Restoring the Great Lawn, 1996.



The Great Lawn, 2009.



Aerial view of the Great Lawn.

The Conservancy's Turf Care Program Today

Like all urban parks, Central Park is a complex and ever-changing landscape. Patterns of visitor use vary with each season. Events come and go, weather patterns fluctuate, and the conditions of each landscape evolve as trees and plants are added and existing plant communities mature. Industry standards and products, as well as environmental regulations, are regularly updated. Despite this shifting landscape, a stable set of principles guides the Conservancy's turf care program.

The Conservancy's turf care management starts with a culture committed to high standards, accountability, teamwork, knowledge

sharing, and communication between staff, the City of New York, and the public. Organizational values – a long-term perspective, built-in flexibility, and attention to detail – guide management principles of categorizing and prioritizing the care of lawns and fields, monitoring and analyzing turf conditions, and planning and scheduling maintenance (to name just a few). Guided by these fundamental values and organizational principles, the Conservancy follows a rigorous set of turf care practices – mowing, fertilization, irrigation, aeration, Integrated Pest Management (IPM), and restoration. The Conservancy also considers soils, microclimates, landscape design, and the level of routine programming and special events that a turf area must support. Turf management supports the Conservancy's larger goal of preserving the historic and environmental integrity of Park open spaces and natural systems while making the Park accessible for public use.



CHAPTER 2

Guiding Values

Central Park provides New Yorkers and visitors alike with a wealth of cultural, environmental, social, and economic benefits. Its role as the City's foremost public space and its significance as the nation's first major urban public park and a masterpiece of landscape design calls for the highest levels of stewardship. The Conservancy's organizational values and turf management practices seek to preserve the Park's historic integrity, sustain its natural resources and environmental values, and uphold the Conservancy's responsibility to the public, including its supporters, and the City.



The landscape south of the Mount, 2013.

Preservation

Frederick Law Olmsted and Calvert Vaux wanted visitors to experience Central Park one landscape at a time, with all the parts combining to form an impression of a greater, coherent whole. Drawing on the pastoral and picturesque styles, the designers sought to evoke bucolic or dramatic natural scenery. They contrasted dark shapes in the foreground with indistinct boundaries in the distance to create an illusion of greater depth and expansiveness. Sweeping greenswards interrupted by groves of trees inspired a sense of tranquility. That feeling continues in the Park's lawns today – even with the addition of athletic fields throughout the Park.

In maintaining and renovating turf, the Conservancy takes into account the following historic and design elements:

- **The character, scale, and composition of open spaces.** Renovations retain the original size of turf spaces, the density and shape of the surrounding plantings, and the counterpoint of trees and grass. Preserving the character of lawns requires care of both open sunlit areas and shaded grass panels.
- **The original topography of turf area.** This is kept mostly intact by maintaining the health of lawns and preventing erosion.

- **Historic lawns and meadows.** Keeping turf in good condition protects historic landscapes and vistas even as the specific surrounding vegetation changes over the years.
- **Hardscape, site furnishings, and landscape features.** Maintenance practices take care to protect paving, benches, water bodies, and signs within and adjacent to turf.
- **Shading and sunlight** for different lawns in different landscape designs

The management of the Mall – a formal allée of American Elms overarching an avenue of lush grass – is an example of how the Conservancy tailors turf care to preserve historic design features. Although the historic significance and high visibility of this site might seem to call for an intensive turf care regimen, the Conservancy takes a more hands-off approach in order to minimize the loss of trees to Dutch Elm disease. Turf management is largely limited to mowing, irrigating, and reseeding to minimize weeds. Fertilizer is not used because it would encourage too much growth in the elms and increase populations of insects that feed on the foliage and stress the trees, which in turn attracts the elm bark beetle responsible for spreading the fungal disease. Before the Conservancy installed the permanent pipe-rail fencing, the Mall was heavily impacted by foot traffic. The fencing keeps the turf panels off-limits to the public and protects the trees from soil compaction.



The Mall, 1980s.



The Mall, 2008.

Civic Responsibility and Fiscal Stewardship

As part of its agreement with the Conservancy to manage Central Park, the City pays an annual fee that covers approximately 25 percent of the Conservancy's annual operating budget. In exchange, the Conservancy raises and spends a specified minimum amount of private funds in the Park each year. The Conservancy coordinates Park use with NYC Parks, which oversees permit applications for special events and athletic field use. Other essential support for the Conservancy comes from volunteers, who annually invest thousands of hours working alongside staff, and from donors, who provide 75% of the annual operating budget. The Conservancy upholds this public and private support, sustains the confidence of the public in its stewardship of the Park, and demonstrates fiscal responsibility with the following management practices:

Long-term planning

Without planning and funding for continued maintenance, even the most extensive renovations would quickly deteriorate. Before embarking on a major renovation or raising the level of care for a turf space, the Planning, Design and Construction Department consults with the Operations Department on details of the proposed design, including the desired turf species and cultivars, irrigation requirements, and the expected lifespan of the lawn. This allows Operations staff to start thinking about long-term needs for staffing, equipment, and materials, and provide input on the expected maintenance budget.

Communicating with the public

Good turf management relies on effective communication of stewardship practices. Through daily interactions with Zone staff, volunteers, as well as the installation of interpretive signs, the Conservancy provides a clear understanding of the activities that damage lawns and the maintenance needs that call for lawn closures. The renovation of a turf space incorporates extensive civic engagement with Park user groups. An example of this is the 2010 East Meadow renovation, which transformed a partially eroded knoll into a luxuriant lawn, now well used by the public. A consensus-building public process led to the selection of a mix of Kentucky Bluegrass that requires frequent maintenance but provides a lush blanket of green well into the fall. During the first spring after the renovation, Park visitors expressed disappointment that the lawn did not seem as thick and green as the North Meadow. Staff explained that the turf cultivars used in the sod remained dormant longer in the spring, but that the turf's condition and color would return and last long into the fall.

Environmental Stewardship

The Park's 843 acres serve numerous important ecological functions: Trees, turf, and vegetation filter pollutants, cool the air through evapotranspiration, and reduce the urban heat island effect. Soils soak up precipitation, minimizing runoff that can pollute the City's waterways. The Park also supports a diversity of plants and animals and offers many opportunities for people to connect with and learn about nature. Through the implementation of the following practices, the Conservancy seeks to protect and enhance Park ecosystems:

Minimizing the impact of turf care on natural ecosystems

When developing management objectives for each turf area, the Conservancy takes into account the individual and cumulative impacts of fertilizer applications and other lawn care practices on natural ecosystems and wildlife. Athletic fields and major lawns are frequently mowed, fertilized, irrigated, aerated, and treated with pesticides when necessary. But many of the Park's turf spaces are less intensively maintained, especially those next to water bodies and in woodland and wildlife areas. Currently, only 30 percent of the Park's 300 acres of turf are routinely fertilized. Some places are designated as permanent mulch areas, limiting the environmental impact – and cost – of maintaining grass where it is difficult to grow.

When using fertilizer and pesticides, the Conservancy works to minimize runoff with carefully controlled applications, gently watering pesticides into the root zone. In woodlands and wildlife areas, staff avoids making noise that would disturb animals or interfere with visitors' quiet enjoyment.

Integrated Pest Management (IPM)

All of the Conservancy's turf care practices aim to produce healthy, deeply rooted, dense turf that requires the least amount of irrigation, fertilizer, and pesticides. Staff regularly monitors lawns and soils for disease, insects, and weeds, and integrates bio pesticides with synthetic pesticides. Both industry-wide and within the Conservancy, use of pesticides has significantly decreased over the past thirty years. At the same time, the Conservancy has dramatically increased its use of intensive cultural practices, such as aeration and annual fall restoration. *Part Two of this handbook covers the Conservancy's IPM protocols in detail.*

Soil structure monitoring and maintenance

Given the nearly continuous in-season use of athletic fields and the large crowds that attend special events, soil compaction is the most significant stressor of Park turf. Keeping soils loose nurtures turf health by promoting strong root growth and allowing water, nutrients, and air to flow unobstructed. To maintain healthy soil structure, the Conservancy frequently monitors turf areas for soil compaction through a series of bulk density tests analyzed by the Soil, Water, and Ecology Laboratory and addresses any problems that may arise using horticultural practices such as aeration and top dressing.

Equipment selection

The Conservancy complies with the requirements of New York City Local Law 77 to use ultra-low-sulfur biodiesel fuel, purchasing equipment with Tier IV diesel engines, and retrofitting equipment with the best available technology, such as a diesel oxidation catalyst.



Zone Gardeners communicate with Park visitors on a daily basis.



CHAPTER 3

Organizational Best Practices

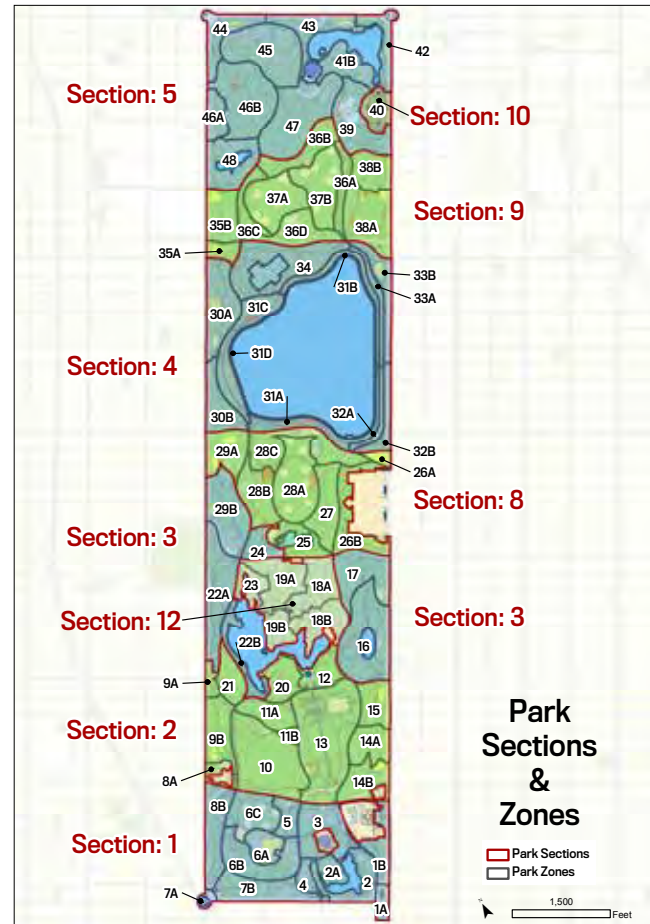
The foundation of effective long-term turf care is an organizational culture and management system that promotes accountability for Park conditions, teamwork, knowledge sharing, and communication among staff, with the City, and with the public.

Culture and Organization

The Conservancy employs a staff of over 375 individuals to care for the Park. The Conservancy's organizational culture supports high standards, teamwork, training, and flexibility to meet changing needs and expectations, as well as effective internal and external communication. Staff effectiveness is achieved through the Conservancy's signature management innovation, the Zone Management System, supported by Parkwide crews with expertise in specific disciplines such as turf care, tree care, and infrastructure management.

Beginning in 1995, the Conservancy organized Central Park into 49 distinct zones to encourage accountability of the Park among staff. Each zone has a Zone Gardener responsible for day-to-day maintenance, supported by Grounds Technicians assigned to the zone. The Conservancy assigns Gardeners to zones that fit their particular areas of horticultural expertise. Those with experience or training in turf care are assigned to areas where turf is a prominent feature. The 49 zones are grouped into nine sections, each overseen by a Section Supervisor. A Director provides management oversight and support for section staff.

The Conservancy developed the Zone Management System as part of a broader strategy to make Park maintenance more effective and to build relationships with the community using the Park. Assigning staff to specific areas of the Park enhances accountability, consistency, and public safety. Staff who work in one area attain a deep familiarity of that part of the Park and can capably answer visitor questions, get to know regular users, and encourage compliance with Park rules.



Zone Management System map.

The Conservancy also has several specialized horticultural teams, including a Turf Crew and a Tree Crew, which work throughout the Park under the guidance of the Director of Horticulture. Having a turf program with a point person in charge is important for accountability and consistent maintenance of the Park's lawns and athletic fields. The Turf Care Manager oversees all functions of the program from scheduling to running regular staff meetings to prescribing overall care for Park lawns, and is responsible for everything from carrying out routine cultural practices to advising on renovations for specific lawns. The Manager is supported by the Turf Crew, whose six members are trained and experienced in turf management. The Crew conducts regularly scheduled maintenance at varying levels of intensity on 300 acres of lawns and athletic fields. Working closely with Zone staff, the Crew also provides preventive care on turf areas and is able to quickly mobilize to address emergency conditions or unexpected needs.

This collaborative effort to care for Park lawns and athletic fields allows the Conservancy to quickly accomplish major maintenance tasks and reduce the amount of time turf spaces are closed. For example, it takes three days for three or four people to aerate the 12.1-acre Great Lawn. While a Grounds Technician marks irrigation components with flags to prevent them from being damaged by equipment, several members of the Turf Crew begin rolling aerators across the lawn. If a machine breaks down or needs new tines, another staff member will keep the process moving by performing quick, on-site repairs. Zone staff answers questions from Park visitors and explains why the lawn is closed. After the Turf Crew completes the aeration process, the Zone staff removes the flags. As directed by the Turf Care Manager, Zone staff either opens the lawn for public use or keeps the lawn closed for a predetermined length of time. The Turf Care Manager determines the opening or closing of the lawn based on the type of maintenance work required.

Smaller turf spaces are typically maintained by Zone staff, supported by the Turf Crew as needed. Working in the same area each day, Zone staff monitors turf closely and alerts the Section Supervisor and the Turf Care Manager when they spot a potential problem, such as a developing pest infestation or the need to adjust the irrigation schedule.

Communication

Effective turf management requires good internal and external communication. A focused approach to communicating with Park users protects the Conservancy's investments in lawn renovations, enlists support for practices that keep turf healthy over the long term, and maintains public confidence in the Conservancy's work. Creating reliable systems for internal communication among Conservancy staff and with NYC Parks produces efficient operations and consistent results.

Internal communication

The Turf Care Manager coordinates schedules and shares time-sensitive information across departments. The Manager meets with all of the Section Supervisors before the growing season to review specific goals for the coming months, including the number of fertilizer applications and aerations scheduled for each lawn, and communicates routinely with them regarding regularly scheduled care and closings for each lawn and field. The Turf Care Manager meets with the Turf Crew and Section Supervisors to establish the critical tasks for each lawn and field.

NYC Parks is responsible for issuing permits for recreation and special events. The Conservancy works closely with NYC Parks on time frames, dates, and scheduling. For example, if the Turf Care Manager recommends closing a lawn for aeration or fertilization, the Conservancy's Director of Community Relations informs NYC Parks to make sure no permits are issued during that time period.

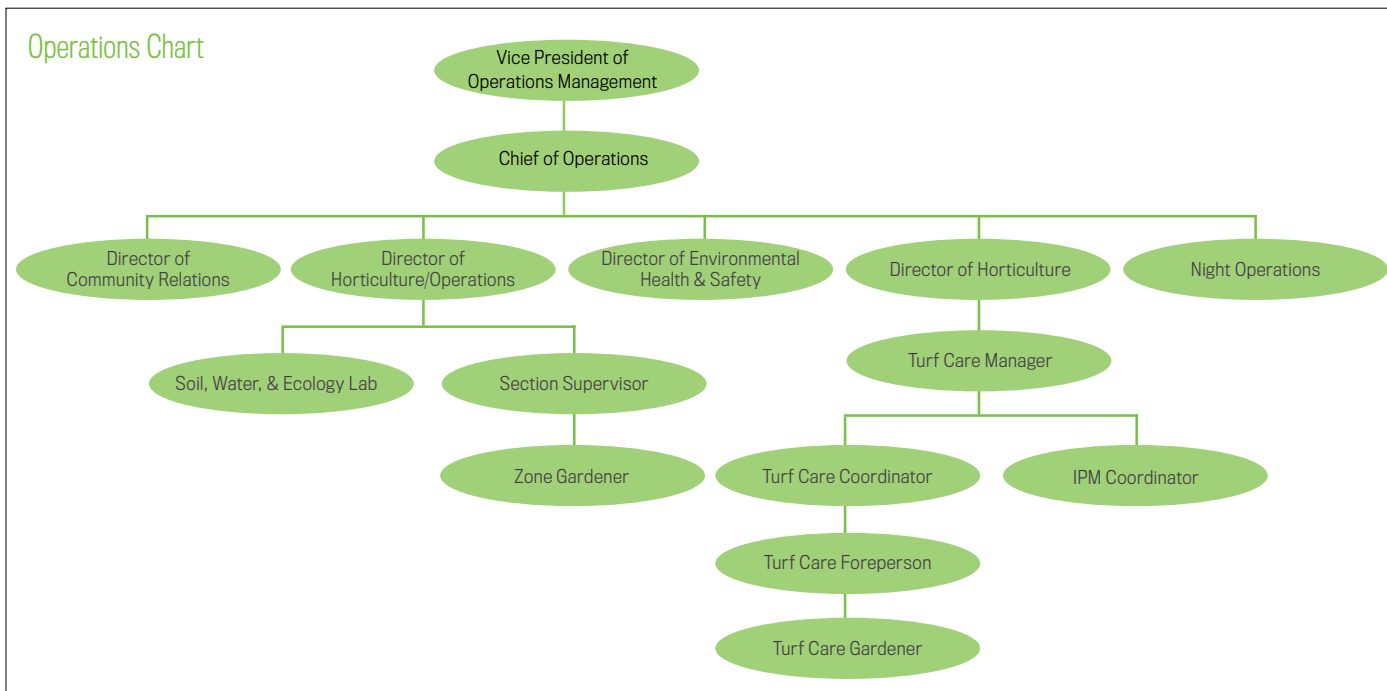
External communication

The Conservancy engages the public by keeping Park users informed about turf care goals, changes in the use of turf spaces, and planned closures. When the Turf Care Manager plans changes to a lawn or field, including temporary closure or new limits on activities, the Director of Community Relations works with the various user groups to gain their cooperation in preventing damage to the grass. The Conservancy uses the following communication channels:

- **Daily interaction:** Everyday contact between the public and the staff is an important form of communication. Staff answers questions, explains practices and rules, and develops relationships with regular Park users. To increase the number of one-on-one interactions, the Conservancy recruits and trains Discovery Guides, staff members who hand out maps and publications and promote awareness of management practices and other rules. Similar volunteer efforts focus on weekends and other high-use times.

- **Community relations:** Before and after restoring or renovating a turf space, the Director of Community Relations, the Director of Horticulture, and the Turf Care Manager meet with special event organizers, sports leagues, schools, and community groups that regularly use that area, to let them know how long the space will be closed and whether there will be any changes in activities allowed. The Director of Community Relations, who is intimately familiar with Park operations, projects, and regular user groups, visits the affected area to talk with Park patrons who use the space.

Operations Chart



- **Informational signs:** The Conservancy has developed a catalogue of signs to notify the public about the hours lawns are open, appropriate uses, renovations, maintenance, and closures. Having a reliable and recognizable signage system makes it easier for Park users to stay informed. When an area is scheduled for closing, the Communications Department creates explanatory text and signage that is installed by Operations staff. Signs work best when combined with direct outreach by Zone staff, who is most often responsible for informing patrons why a lawn is closed and for suggesting alternatives.



- **Red Flag System:** Large red flags placed in prominent locations, sometimes supplemented with smaller red flags throughout a lawn or athletic field, quickly and clearly alert the public to lawn closures. In heavily used recreation areas, flags are accompanied by explanatory signage.



The Red Flag System alerts the public to lawn closures.

- **The ballfield hotline:** A recorded message, updated daily, informs users about weather-related and other planned closings and openings for athletic fields.

- **Web-based offerings and partner emails:** The NYC Parks website provides information about athletic field and special use permits. The Conservancy's website, social media outlets, and email newsletter offer information about Park locations, events, and programs.



Central Park Conservancy website.



Central Park Conservancy Film Festival, 2012.

The Conservancy often uses multiple communication channels simultaneously, especially when disseminating information about a significant lawn restoration in a high-profile location. For example, a combination of extensive community outreach and informational signs were key to the success of the 2013 restoration of the lawn between Sheep Meadow and the Terrace Drive. The lawn is a popular spot with Park patrons, and is the site for the Central Park Conservancy Film Festival. New grass would not have survived without users' cooperation throughout the seven-month closure.

Education

Internal training

New members of the Turf Crew receive extensive on-the-job training from experienced colleagues. The Conservancy regularly employs this one-on-one learning strategy throughout the organization, including in its internship and volunteer training programs. The Conservancy also provides professional development through its internal Horticulture Training Program, which offers opportunities for staff to take classes on a variety of topics that include winter tree identification, spring bulbs, weed identification, and aquatic plants.

External initiatives

Public education begins with personal interactions between Park users and Conservancy staff and volunteers such as a conversation with a staff member in the field or a phone call

prompted by a Park sign or the Conservancy website. Patrons frequently contact the Conservancy seeking information about every aspect of the Park. The Zone Management System fosters one of the most important forms of interaction with Park users. Zone Gardeners, with their in-depth knowledge of a particular Park area, can answer questions and provide visitors with a deeper insight into the Park's design, plantings, and care requirements.

The Conservancy also educates urban park professionals in turf care. The Conservancy regularly receives requests from parks around the world for advice on how best to plan for and manage urban parks. To assure the quality and consistency of information and make the most efficient use of staff time, the Conservancy's Institute for Urban Parks offers a series of integrated resources – publications, trainings, and other learning forums – on the topics raised in these requests.

The Institute, through its Center for Urban Park Management, launched its Turf Care Training Program in 2013. The program, based on 35 years of experience in urban park turf practices, is part of the Center for Urban Park Management's broader work to foster knowledge exchange and professional development to elevate the discipline of urban park management. In both classroom and hands-on field sessions, Conservancy staff teach basic principles and best practices for turf care in urban parks. The Conservancy supplements the training sessions with seasonal newsletters detailing timely turf care activities, guiding participants in reaching specific lawn care milestones for that season.

CHECKLIST

Organizational Best Practices

Culture and organization

- Promote turf care practices that support the organization's mission, maintaining lawns and athletic fields to a high standard while keeping them accessible to the public.
- Educate staff, volunteers, and the public in the organization's mission.
- Hire qualified professionals trained in turf care and related disciplines.
- Assign jobs based on expertise and in response to the needs of the Park.
- Manage lawn care through the Zone Management System, with support from the Parkwide crew trained in turf management.

Communication

Internal communication

- Coordinate annual turf treatment schedules with NYC Parks permit schedules.
- Plan turf care in advance for the growing season. Develop a routine management plan for high priority lawns.
- Communicate turf care plans, goals, and staffing needs with Section Supervisors. The Turf Care Manager and Section Supervisors meet annually in advance of the growing season to review goals and plans for the year, and remain in frequent communication.
- Notify Section and Parkwide staff about field closures.
- Coordinate with executive staff overseeing Parkwide operations.
- Hold regular meetings of the Turf Crew at least once every two weeks.
- Distribute closure notices, updates, and schedules to staff.

External communication

Red Flag System

- Use red flags to alert Park visitors to lawn and athletic field closures.
- Close lawns and athletic fields only as long as necessary.
- Make flags conspicuous – post large flags on permanent fences and small flags on lawns.
- Remove flags promptly when fields are reopened.

Closure notifications and signs

- Post public notices adjacent to lawns, on the Park website, and in social media. Update ballfield hotline before planned closures and as early as possible for unplanned closures due to weather or emergency situations.
- Post closing notifications for maintenance as far in advance as feasible.
- Announce closings for events in advance.
- For post-event restoration, install signs notifying closure at the same time as temporary fencing.

Informational signs

- Place signs at lawn entrances informing the public about permissible and restricted activities on lawns.
- When renovation or maintenance requires temporary closure of a lawn or field, post detailed signs explaining what is being done and why the area needs to be closed.
- Keep informational signs up to date.

Education

Internal training

- Provide on-the-job training for new staff in cultural methods and equipment operation and maintenance, until they are proficient enough to work independently.
- Provide opportunities for internal training and continuing education and encourage staff participation.

External training

- Explain turf care goals and practices to the public through personal interactions between staff or volunteers and Park visitors.
- Train staff to respond appropriately to frequently asked questions regarding turf care and use.
- Share turf care best practices with Conservancy and NYC Parks employees through training programs, educational events, publications, and web-based communications.





CHAPTER 4

Turf Management Fundamentals

The Conservancy has developed procedures and systems that provide a fundamental framework for seasonal and day-to-day turf maintenance. *(These practices – mowing, irrigation, fertilization, aeration, Integrated Pest Management, and restoration – are detailed in Part Two.)* Prioritizing care based on the amount of use that a landscape receives is a key factor in keeping the most popular lawns and fields in good condition. Managing public access limits excessive wear and tear and allows staff to conduct more extensive maintenance and restoration. Thorough planning and the collaborative effort to establish usage schedules set clear expectations for Conservancy staff and users alike. Regular tracking and assessment of lawn conditions, which can change overnight depending on weather and use, allows the Directors, the Turf Care Manager, and Section Supervisors to establish priorities and alter maintenance plans when necessary. Careful budgeting for long-term maintenance and selecting proper equipment and materials results in the most efficient use of resources and protects capital investments.

Categorizing and Prioritizing

Following the restoration of the Great Lawn in 1997, the Conservancy launched a comprehensive maintenance strategy that included a lawn categorization system that is still used today. The sheer size of the Park, the ever-increasing public demand, and the finite amount of resources required the development of a system that prioritizes care based on the intensity of use. Numerous factors influence the maintenance of a lawn, including its historic significance, visibility, and conditions, but the most important factors are the amount and frequency of foot traffic and use per square foot of turf.



Classification map of the southern end of the Park (A, B, C, D, Mixed, Woodlands).

Lawns where use is allocated by permit for recreational use and/or special events receive comprehensive care, while areas with sensitive environmental features, such as woodlands, and those less frequented by the public, receive less intensive treatment. The Conservancy customizes its care for individual spaces depending on their particular conditions, but the following broad classifications guide overall levels of care:

“A Lawns”



The East Meadow.



Heckscher Ballfields.

“A Lawns” have the highest level of use and require the greatest amount of maintenance. Comprising 65 acres of the most popular and active athletic fields, meadows, and lawns, they have the lowest threshold for turf loss. “A Lawns” are permanently fenced to accommodate scheduled maintenance and allow for closing at night and during the winter. These lawns have designated opening and closing times and require permits for scheduled recreational and special event use. Automatic irrigation systems water these landscapes on a regular basis. General management practices include frequent monitoring and maintenance, mowing two to three times a week, regular fertilization, aeration, pest management, and annual restoration.

“B Lawns”



The Sixth Avenue Entrance lawns.



The lawn between Sheep Meadow and the Terrace Drive.

“B Lawns” are designated passive recreation spaces that are highly visible and have historic significance; there are 16 lawns on 37 acres under this classification. These lawns require less maintenance than “A Lawns,” and, depending on user demand and visibility, have a slightly increased threshold for turf loss. “B Lawns” have scheduled opening and closing times and require permits for scheduled special use. They are typically fenced during prolonged maintenance periods, as well as during the dormant season. These spaces are irrigated with either manual or automatic systems. Routine management practices include weekly mowing and regularly scheduled fertilization and aeration. When conditions necessitate, limited application of IPM products prevents weeds from flourishing and mitigates against a significant loss of grass.

“C Lawns”



Cherry Hill.

“C Lawns” make up 69 acres of lawns next to natural or cultural features, where grass is a secondary aspect of the landscape. They receive less intensive maintenance than “A” and “B Lawns” because of low user demand and visibility. These lawns have opening and closing hours and require permits for special use, and are only occasionally closed off during prolonged maintenance or during the dormant season. They receive only limited irrigation to prevent excessive turf loss, and are mowed and managed on an as-needed basis.

“D Lawns”



The landscape between West 86th Street and West 90th Street.

“D Lawns” either get relatively light use or are allowed to absorb heavier use from nearby spaces that are more manicured. There are 162 acres of “D Lawns,” which do not require a permit for use and remain open year round. With no need to limit access, there is little fencing. These lawns receive minimal irrigation and are mowed and maintained as needed. Maintenance is limited and fertilization and IPM control products are administered infrequently. In some cases, “D Lawns” reflect conscious decisions on the part of the Conservancy to limit maintenance costs. This also includes not growing grass in densely shaded areas, instead using mulch with clearly defined edges to cover the ground.

“A Lawns”

Heckscher Ballfields: April through October, these six fields host softball games by teams and leagues that reserve many months in advance. The turf is maintained as an even, safe surface for playing softball and kickball.



Heckscher Ballfields.

Sheep Meadow: The name of this 15-acre meadow alludes to both its historic use and its current pastoral character. The first major lawn space to be renovated by the Conservancy, its use is restricted to passive recreation and it is a favorite spot for sunbathing and picnicking.



Sheep Meadow.

Lawn Bowling and Croquet Greens: A three-quarter-acre highly manicured space is restricted to lawn bowling and croquet. Though few groups use the Greens, the space is still rigorously maintained to provide a suitable surface for lawn sports.



Lawn Bowling Green.

Croquet Green.

The Great Lawn: The Park’s most renowned space for special events, this 12.1-acre greensward can host concerts and large civic events by permit. This area includes eight athletic fields.



The Great Lawn.

The East Meadow: The most recent major lawn in the Park to be restored by the Conservancy, this bucolic meadow is used, by permit, for special events and limited active recreation. Two clay areas were added to support small-scale active recreation.



The East Meadow.

The North Meadow: A hub for active recreational use, this lawn sees activity seven days a week from early April until mid-November. The 12 athletic fields are open for scheduled team sports in-season, and allow for non-permitted passive recreation when not being used by teams.



The North Meadow.

The Conservatory Garden lawn: The Park’s most formal turf, this half-acre lawn hosts occasional special events, but is normally closed to the public. It is maintained to a high standard in keeping with the surrounding formal plantings and its historic importance.



The Conservatory Garden lawn.

CHECKLIST Categorizing and Prioritizing

- Rank turf spaces based on intensity of use, and prescribe management and cultural practices accordingly.
- Confirm or update designation of lawn categories during annual planning, taking into consideration:
 - Change in use.** Has public use changed over the previous year? If so, determine whether to upgrade the lawn to a more intensively managed category, schedule more frequent maintenance, or adjust access policies.
 - Upcoming improvements or events.** Do plans indicate a lawn should be more intensively managed?
 - Public input.** Have there been requests or is there public support to provide greater care for a given lawn space?



Park visitors enjoy the lawns surrounding Conservatory Water.

Use and Access

In order to maintain healthy lawns and well-functioning athletic fields in the Park over the long term, Conservancy Directors and Managers carefully consider public access and use. For periods of concentrated use, turf needs to be prepared ahead of time and allowed to recuperate afterward. The Conservancy manages the Park's 300 acres of turf with respect to three general categories of access, depending on type and intensity of use: non-permitted passive recreation and everyday foot traffic; intensive permitted recreational use of athletic fields and open space; and special events. NYC Parks Enforcement Patrol is an active partner in the enforcement of the rules and regulations described in all of the situations below.

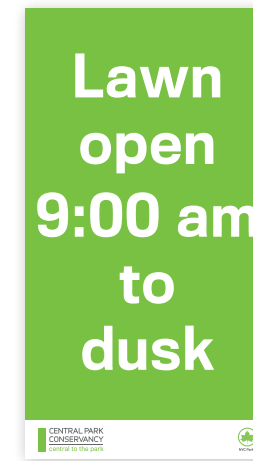
Access for everyday use

In a park receiving over 42 million visits a year, even regular lawn use calls for careful management. On any given weekend from spring through fall, many thousands of people enjoy the Park's spacious lawns for relaxing, sunbathing, and informal picnicking. Others come to watch scheduled softball or soccer games at designated fields, or to get together on any stretch of unoccupied ground they can find. As was seen during the 1960s and 1970s, without proper care, ordinary use can quickly wear down grass into hardpan – a dense layer of compacted soil. The Conservancy uses a host of practices to support healthy turf and soils, but even the most aggressive measures quickly lose their effectiveness without carefully managed public access. To balance turf health and user needs, access to many non-permitted lawns is sequenced or rotated, using the following practices:

- **Fence enclosures:** Fences are essential in guiding pedestrian circulation patterns to limit turf damage. They facilitate Olmsted and Vaux's original intent to encourage strolling on Park paths. To achieve these goals without compromising the Park's visual aesthetic, the Conservancy uses a variety of fence types. The most common style for turf enclosures is a welded wire mesh fence, secured with steel posts driven into the ground at four- to six-foot intervals. Fences range in height from two to four feet; placement and height relationships depend on a number of factors, including the length of closure and amount of pedestrian traffic.



- **Hours of operation:** Specific lawn areas have scheduled hours of closure. In many cases, during those hours, adjacent turf spaces will be open to make sure there are nearby lawns available for public use.



- **9:00 am lawns:** Closed until 9:00 am to give staff time for daily turf care.
- **Scheduled maintenance closures:** The frequency of scheduled closures for annual and routine monthly care depends on a lawn's intensity of use and turf conditions.
- **Off-leash hours:** Thousands of people visit the Park daily with their dogs. Dogs are allowed off-leash in much of the Park before 9:00 am and after 9:00 pm.



Access for permitted recreational use

Most of the athletic fields and courts in Central Park require a permit to use. Organized leagues and individuals who want to reserve fields for soccer, baseball, softball, croquet, or lawn bowling apply for field permits through NYC Parks. Permits are generally issued at least two months in advance of proposed use, and many fields are booked by the end of December for the entire active season in the coming year. This season-long, seven-day-a-week use requires careful management, including closing fields on a rotating basis. The following practices aid the Conservancy in managing use of the Park's most heavily used lawn areas.

- **Fenced lawns:** All athletic fields requiring permits are fenced year-round.
- **Daily opening and closing of entrances.**



- **Off-season closures:** Athletic fields are closed during the dormant winter months to protect turf when it is most vulnerable to damage. Playing on fields when the grass is not actively growing thins turf and makes it susceptible to erosion, weed growth, and compaction. In addition, winter closures allow grass seed planted during fall restorations to take hold by minimizing disruption to developing root systems and allowing vigorous early spring growth. The fields are opened

for cross-country skiing in the winter months only when there is a base of snow at least six inches deep.

- **Scheduled closures for maintenance:** Frequency depends on the intensity of use and observed conditions. Most often, in-season care takes place before or after regularly scheduled hours of play. Field closures are rotated to minimize disruption of public use.

Access by permit for special events

Managing access for and coordinating special events helps the Conservancy sustain the Park's most beloved and iconic open spaces. Park regulations require permits for gatherings of 20 or more people, from company picnics to major concerts that require months of preparation. All permits for special events are coordinated through the NYC Parks Permits Office, which guides and assists applicants in gaining access to the space, and establishes load-in and load-out procedures. The following practices serve to minimize adverse impacts to Park turf during special events:

- **Scheduling:** NYC Parks limits the size and number of events allowed each year on the Great Lawn. Typically, no more than one large-scale special event is scheduled within a six-week period on any given lawn to allow adequate turf recovery time.
- **Logistics planning:** Several months prior to a planned event, NYC Parks, in consultation with the Conservancy, reviews the event set-up plan with the applicant, including dates and times of access, number of vehicles, anticipated attendance, preliminary schedule, crowd control, and cleanup.
- **Preparation and load-in:** Immediately prior to the commencement of the event, Conservancy staff facilitates and monitors the transfer of equipment from the street to the staging or lay-down area. The event organizers assemble portable flooring along the prescribed load-in route to minimize soil compaction by trucks and heavy equipment. Once equipment and materials are delivered to the lay-down or staging area, the Conservancy Special Events staff monitors the completion of event load-in by the applicant.
- **Load-out and clean up:** The event organizers reconstruct temporary access lanes with plywood or portable flooring to facilitate equipment removal. Applicants are responsible for site cleanup.
- **Post-event:** Once trash removal and site cleanup are finished, the Director, the Turf Care Manager, and the Section Supervisor inspect lawn conditions and decide what restorative procedures to implement, if any. After-care procedures may include aeration to undo soil compaction. Sometimes the lawn needs to remain closed temporarily to allow the grass to recover.



Loading in the stage setup using plywood flooring.



Cable runs.



The complete stage and barricade setup for a large event on the Great Lawn.



Stage setup using turf tractors.



Barricade setup using utility vehicle.



The capacity of the Great Lawn for large events is 60,000.



Stage setup.



Barricade and equipment setup.



Using turf tractors for event breakdown.

CHECKLIST

Use and Access

Non-permitted lawns – temporary closures

- Monitor conditions to assess the need for installation of temporary fencing.
- Install temporary fencing, posting appropriate signage.
- Post appropriate signage.

9:00 am lawns

- Maintain permanent fencing around the perimeter.
- Install entrance gates at locations convenient to paths or drives.
- Shift entrance gates periodically to minimize soil compaction.
- Monitor turf conditions for damage, and aerate and treat accordingly.
- Open and close lawns consistently.

Permitted athletic fields

- Maintain permanent fencing around the perimeter.
- Incorporate schedules for permitted access into yearly maintenance calendar.
- Monitor field and weather conditions daily, and post immediate notifications of lawn closures.
- Close fields during wet weather to prevent turf damage.

Permitted special events

Planning and coordination

- By mid-January, review scheduling of all special events permitted by NYC Parks to limit conflicts with scheduled closures and/or maintenance schedules.
- Once events are scheduled, review permits to determine designated area, anticipated attendance, and size and type of equipment needed.

Advise

- For large events, specify the required protocols for load-in, load-out, staging, and equipment.

Load-in and load-out

- Install portable flooring or floating plywood platforms across turf leading from loading to staging areas.
- Supervise equipment transfer into and out of turf areas.
- Use vehicles equipped with turf tires to transport equipment across turf.
- Once an event is over and staging and other structures have been disassembled and stockpiled in the staging and lay-down area, load materials onto vehicles equipped with turf tires for transport.
- Remove temporary flooring after load-out.

Immediate post-event treatment

- Monitor turf conditions immediately following an event and document any damage.
- Within a few days, after load-out is complete, begin turf care practices prescribed by the Turf Care Manager, including aeration.

Planning

Maintaining healthy turf starts with long-range planning for newly renovated or restored lawns. It also requires annual planning for seasonal and daily maintenance procedures. The Conservancy comprehensively plans everything from protocols for major lawn renovations to weekly maintenance schedules.

Long-range planning

Early in the design of any lawn renovation, the Operations Department collaborates with the Conservancy's Planning, Design and Construction Department to establish turf care protocols for the space. Every capital improvement project includes detailed maintenance strategies to ensure the integration of maintenance and design, taking into consideration past public use, intended use, irrigation, drainage, flooding, street vehicle access, lawn rotation, and other localized conditions.

Annual maintenance calendar

The Conservancy plans each year's program of turf care in advance, coordinating with scheduled and regular public uses. In late fall, the Director of Horticulture and the Turf Care Manager develop a calendar of monthly in-season procedures as well as annual fall restorations for the coming year. Treatments are designed to meet the goals and standards of care for each space based on its lawn category, and require scheduling staff and allocating equipment. Balancing maintenance needs with public demand requires a comprehensive approach, including scheduling work during off-peak hours and, sometimes, temporary closures. NYC Parks provides the permit schedules for athletic fields and reservations for special events so that turf care can be scheduled around public use. The result is a master schedule including in-season maintenance, restoration, and renovation projects; scheduled closures; and preparation for and remediation of lawns following special events. This schedule is not set in stone, however. Adjustments allow for flexibility to respond to changing priorities, weather conditions, and unexpected events.

Monthly and weekly scheduling

There are frequent changes to scheduled turf maintenance. The Turf Care Manager meets on a regular basis with the Turf Crew and Section Supervisors to respond to unforeseen intervening factors such as storms, heat waves, heavier-than-usual lawn use, pest outbreaks, or other issues that necessitate changes to the monthly schedule. In the fall of 2012, for example, Hurricane Sandy felled or damaged more than 800 trees, including several lindens that damaged athletic field backstops on the Great Lawn. Conservancy staff spent several weeks clearing debris throughout the Park before returning fully to their regular tasks. Building extra time into weekly and daily schedules allows the Conservancy to immediately respond to weather changes and remediate undesirable turf conditions.

Daily maintenance

Daily turf maintenance practices vary with the time of year and intensity of use of a given lawn, and staff schedules are adjusted accordingly. Regularly planned mowing, irrigation, aeration, and fertilization are timed to coordinate with permitted activities on athletic fields and other turf spaces. The high demand for athletic fields and special events requires that Zone staff and the Turf Crew perform regular mowing and other turf maintenance early or late in the day. Between April and October, every athletic field not already scheduled for routine closure is booked back-to-back throughout the day. In-season, mowing begins in the early morning hours and usually ends by 11:00 am when lawn use starts to increase.

CHECKLIST

Planning

- Participate in the planning process for capital improvements, and specify turf management protocols.
- Plan annual maintenance procedures the fall of the preceding year as NYC Parks permits for events are being issued.
- Schedule lawn and athletic field closures for routine treatment.
- Coordinate turf space closings and maintenance practices with the calendar of permitted events from NYC Parks.
- Rotate maintenance days on athletic fields so that closures do not repeatedly affect the same athletic league.
- Synchronize weekly maintenance schedules with staff schedules.
- Build flexibility into the schedule to respond to unforeseen circumstances and adverse weather conditions.

Monitoring and Recording

When the Conservancy began restoring Park lawns in the 1980s and 1990s, it found that deterioration was the result of three main factors: failed infrastructure, insufficient regulation of use, and a lack of routine maintenance. The Conservancy monitors and records the condition of lawns and athletic fields on a regular basis to guide their intended use and maintenance. Using assessments ranging from visual inspections to testing at the Conservancy's Soil Lab, staff keeps tabs on a variety of factors related to the health of turf, including the color, density, and growth rate of the grass; the moisture level, chemistry, and compaction of the soil; and signs of pests or pathogens. Observations and recommended treatments, with photos, are entered into a Turf Maintenance Database organized by lawn areas. This careful monitoring and record keeping gives the Turf Care Manager the data needed for ongoing analysis and planning.



Sheep Meadow and Heckscher Ballfields, 2011.

CHECKLIST Monitoring and Recording

Monitoring guidelines

Monitor daily:

- Grass color, density, and growth rate.
- Soil moisture.
- Fungal pathogens and evidence of insect infestation.

Check monthly during the growing season:

- Soil fertility and pH level.

Test after events, if needed:

- Soil compaction.

Recordkeeping guidelines

Maintain a log of each managed turf space including:

- Acreage.
- Grass species and cultivar.
- Fertilization history and program.
- Problem areas, with environmental conditions, microclimate, and usage history.
- History of pests and treatments for each problem area.
- Photo record of problem areas.

Organize records of each turf area by type classification and use restrictions:

- Hours of operation.
- Fence type.

Keep a record of infrastructure and adjacent features:

- Location, condition, and operability of irrigation components.
- Special conditions and features influencing turf care treatment, such as:
 - **Vegetation:** trees, shrubs, groundcover, vines, herbaceous plantings.
 - **Hardscape:** drives, paths, paved surface, storm drains, catch basins.
 - **Water features:** lakes, ponds, streams, fountains.
 - **Historic structures and landscape features:** buildings, sculptures, fencing.

Regularly update Turf Maintenance Database.

Budgeting

All too often, urban parks raise funding for turf improvements, but then lack money to maintain the investment, perpetuating a cycle of restore and decline. Breaking this cycle requires an understanding of the costs of maintaining a turf space throughout its expected life span and budgeting accordingly for ongoing care, which includes mowing, irrigation, aeration, overseeding, fertilization, cultivation, and field rotation. During the planning phase of a renovation, the Director and the Turf Care Manager advise on funds required for annual staffing, materials, and equipment for the proposed capital restoration project.

For the most intensively used lawns, maintenance over the long term requires budgeting for additional staff on an ongoing basis. Starting with the Sheep Meadow restoration in 1981, the Conservancy carefully considered maintenance budgets in advance of the capital work. For the East Meadow renovation, for example, the cost of the annual increase in staffing costs equaled the initial investment in materials and equipment the first year post-renovation.

CHECKLIST Budgeting

- Budget for both initial capital investment and long-term care.
- Budget for increased staffing and equipment when required level of care is increased.
- Establish an annual turf maintenance budget as a part of Parkwide budgeting. Include:
 - Provisions for special projects and capital improvements when funds allow.
 - In-house restorations.
- Allocate funds for equipment purchases as well as routine maintenance, repair, and replacement.
- Include cost of communications, including signs, public notices, and education.
- Allocate resources based on prioritization of landscapes.



Sheep Meadow in the fall.

Equipment and Materials

Although the upfront costs may be greater, purchasing the right equipment and materials saves time and money in the long run, and gets better results. Meeting the challenge of caring for heavily used lawns calls for durable machinery with the most effective design, as well as seed, fertilizer, and other products best suited to Park conditions. The Conservancy researches each purchase of turf equipment, selecting models best matched to the intended use and conditions. To make sure equipment will be available for rapid response to compacted soils, pests, or other problems, the Turf Crew and Zone staff routinely check machinery for wear and maintenance needs and address these issues immediately. When project or annual budgets allow, the Director of Horticulture purchases new or additional equipment to keep the fleet modern and in optimal operating condition.

The Park's fleet includes various sizes of mowers and other turf maintenance machines to meet the requirements of different lawns. Large equipment serves athletic fields and meadows, while smaller machines navigate hillsides and around rock outcrops and plantings. Heavy machines have tires that more evenly distribute loads and allow for wider, less destructive turns.

Different lawn types also need different fertilizers, seed, and pesticides. Every year the Director of Horticulture, the Turf Care Manager, and the IPM Coordinator evaluate the market to identify products best suited to each space. The Conservancy uses high-quality turf fertilizers made from feed-grade-quality meals, which stimulate natural soil microbes and improve the health of the turf. Seed blends and mixtures are reviewed annually. All species and cultivars are selected based on rankings in the National Turfgrass Evaluation Program, as well as on resistance to fungal pathogens. The Conservancy compiles with applicable rules and regulations relating to pesticides.

CHECKLIST Equipment and Materials

- Select the best equipment and materials, within budget, for the identified need.
- Adjust and maintain equipment for the most efficient use.
- Train staff on the operation and maintenance of each piece of equipment.
- Include time for daily equipment maintenance (fuel-up, greasing, cleaning) each work day.
- When possible, budget for at least two working machines with the same specifications, in the event unplanned maintenance is required.
- Rotate equipment for routine maintenance.
- Include routine equipment maintenance as part of job descriptions for Turf Care staff.
- Coordinate maintenance of equipment with the turf care schedule to ensure availability.
- Anticipate and budget for new equipment purchases annually.
- Write specifications for desired equipment performance and solicit competitive bids for each purchase.



PART 2



The Six Principles of Turf Care

This section presents six major turf cultural practices in order of increasing complexity: mowing – the most basic maintenance operation; irrigation and fertilization; and the more advanced procedures of aeration and restoration, as well as Integrated Pest Management, which relies on careful use of the other cultural practices and is fundamental to the Conservancy’s turf care in Central Park. This section is intended to provide practical, hands-on information to support your own turf care program. If you have questions that are not covered here, please contact the Institute for Urban Parks at institute@centralparknyc.org.

Guided by its mission of stewardship and effective management principles, the Conservancy’s turf care program has developed a set of horticultural practices that maintain healthy, attractive turf under challenging urban park conditions. These practices – Mowing, Irrigation, Fertilization, Aeration, Integrated Pest Management, and Restoration – adapt industry standards and university findings to the Park’s environment and level of use. They are continually tested and refined to keep turf in optimal health while allowing as much public use as possible.



CHAPTER 1

Mowing and String Trimming

Regular mowing is the first turf care practice to include when developing a turf care program for an urban park. A regularly mowed lawn indicates to the public that the park is well maintained, and it is the first and most important step in maintaining healthy turf. No other cultural practices, such as fertilization or aeration, should be considered or performed until an effective mowing program is established. Properly done, mowing encourages the vigorous growth of grass, reduces weed pressure, and results in safe and visually appealing public spaces. The mowing routine includes string trimming – cutting the grass along edges, fence lines, paths, and other areas where large mowers cannot reach. String trimming is important because it shows care, attention to detail, and maintains Park lawns in accordance with high aesthetic standards.

Mowing and string trimming are also the most labor-intensive aspects of turf care. During the growing season, the Conservancy mows and trims lawns up to twice a week, depending on the lawn category. When mowing, grass clippings are left to decompose and return nutrients to the soil. Frequent mowing prevents large amounts of clippings from remaining on the surface, which minimizes cleanup and allows the lawn to be immediately available for use. Throughout the fall, lawns are mulch-mowed frequently to keep leaves from smothering the grass and to enrich the soil. Mulch mowing involves mowing lawns when leaves are left on the turf. The blades of the mower grind or break the leaves up in to fine pieces or “mulch.” These small pieces fall between grass blades and are incorporated back into the turf canopy. Like all of the Conservancy’s turf care practices, effective mowing requires flexibility for weather and public use, a well-trained staff, high-quality, regularly maintained equipment, and coordination between the Turf Crew and Zone staff.

Scheduling and Monitoring

The schedule for mowing and string trimming is set largely by the lawn classification: twice a week for “A Lawns,” once a week for “B Lawns,” and as needed for “C” and “D Lawns.” But there is a great deal of flexibility. The exact day of mowing depends on the height of the grass, the weather (grass should not be mowed when it is too wet), and other Park priorities on a given day. The Turf Care Manager sets and adjusts the schedule for mowing “A” and “B Lawns,” while Section Supervisors determine when “C” and “D Lawns” need mowing, which is done either by Zone or Turf Crew staff depending on availability. String trimming – which takes several days for the larger lawns – is handled by Zone staff in coordination with the mowing schedule.

Another important scheduling consideration is coordinating with other lawn care practices, including irrigation and fertilization, and with public use. Mowing of major lawns is scheduled during closed hours and coordinated with athletic use and special events. That means working at off-peak times, typically in the pre-dawn hours. Following are the guidelines used by the Conservancy in scheduling mowing and string trimming:

Monitoring

- Monitor the growth rate and height of grass in each turf space to adjust frequency of mowing.
- Check weather forecasts and assess current turf conditions. Mowing wet or frozen turf damages the grass.
- When mulch mowing, check the amount of leaves on the lawn; mulch only if leaves will not smother the grass. If there are too many leaves, remove before mowing.

Staffing and equipment

- Allocate time in staff schedule for weekly mowing.
- Develop a schedule to share six-foot-wide mowers among the sections and distribute in the spring to Zone staff.
- Reserve mowing and string trimming equipment that will be needed, making sure it is fueled up and blades are sharp.
- Coordinate string trimming with mowing.



String trimming.

Scheduling

- Schedule mowing for “A” and “B Lawns” during daily closed hours.
- Keep athletic fields closed until 11:00 am Monday through Friday, which allows for weekday mowing. (Fields open at 8:00 am on weekends.)
- Mow “C” and “D Lawns” when public use is minimal.

Frequency

- Mow often enough to maintain a recommended height (*Refer to the “Mowing Protocols” worksheet in the Reference Guide for recommended turf height and mowing frequency for Central Park lawns*), while not removing more than a third of the total shoot length. Scalping – mowing or cutting the grass too short – eliminates the actively growing part of the plant.
- Reduce mowing frequency during periods of drought, stresses, or when turf is not actively growing.
- During the spring and summer when grass is growing the most, mow frequently to promote density and lateral growth.



Mulch mowing.

Procedures

The Turf Crew or Zone staff mows lawns using 11- or 6-foot mowing width ride-on mowers. Zone staff string trims fence lines, paths, and other areas mowers cannot safely mow. Zone staff mows smaller spaces with walk-behind mowers. Staff is trained in the operation and maintenance of each piece of equipment. The following best practices for mowing and string trimming reduce operating time, protect turf, minimize clean up, and keep staff and visitors safe:

Preparation

- Take appropriate safety preparations, following equipment guidelines in the operator’s manual.
 - Train staff to operate and maintain equipment, logging 40 to 80 hours of training per piece, depending on skill level required.
 - Require the use of safety glasses and hearing protection.
 - Provide general Personal Protective Equipment (PPE) overview.
- Select the appropriate equipment for each turf area.
- Check equipment before use, including safety shields, baffles, screens, blade condition, oil, fluid levels, tire pressure, fuel, height of cut, and vehicle hours.
- Inspect lawn area:
 - Make sure fence entrances are closed.
 - Remove all trash, stones, or wood that could become airborne during mowing or damage blades.
 - Check for wet areas that should not be mowed.
 - Report to the Supervisor any changes in turf appearance that could indicate excess moisture, fungal pathogens, or other conditions that could result in damage if the grass is mowed.

String trimming best practices

- Operate the string trimmer to cut at the same height as the lawn.
- Be careful not to trim grass too short, less than about three inches.
- Check the nylon string frequently and replace it when it wears out.
- Remove clippings from paths.

Mowing best practices

- Mow to a height that leaves as much of the plant as possible to promote photosynthesis and deeper rooting, while keeping turf short enough for public use. Different species and cultivars tolerate different mowing heights, but three inches is the most common height mowers are set to in Central Park.
- Mow in straight, parallel lines (not in circles).
- Alter the pattern of mowing from the previous mowing.
- If using a mower with a deflector chute, point it away from Park patrons.
- Keep clippings from being discharged onto non-turf areas, and clean up any clippings that do fall onto those areas.
- If the mower is scalping (taking off too much of the leaf blade), leaving visible piles of clippings, cutting at the wrong height, or producing a result that is in any way different than expected, stop and call the Turf Care Manager or Section Supervisor.
- Before leaving a lawn, brush clippings off the mower.
- When finished, leave lawn entrances closed or open, as appropriate for the time of day.

Mulch mowing best practices

- Do not mulch mow leaves on “A Lawns” – leaves should be gathered and removed.
- Make as many passes as needed to break up or grind leaves into fine pieces to fall into turf canopy.
- Do not mulch mow wet leaves or on wet lawns. Wet and shady lawns are more susceptible to damage from mulching blades and being smothered by excess leaf debris.
- Discontinue mulch mowing if there are any signs of wear or damage to the lawn.
- Discontinue mulch mowing if the lawn surface has a quarter inch or more of mulched leaf debris, which may not fall into the canopy and end up smothering the grass.
- Clean the radiator screen frequently.

Equipment

The Conservancy selects mowing equipment for durability, efficiency, and compactness. It uses different sizes and styles of rotary mowers that fit the Park's variety of turf spaces and can readily navigate crowded pedestrian paths and drives. The criteria for selecting string trimmers are similar to those for selection of mowing equipment, with durability, reliability, and effectiveness being the most important considerations.

Regular maintenance keeps the Park's mowers operating properly and efficiently over a long period of time. Poorly maintained mowers can damage turf. For example, dull blades tear leaf tips and faulty bearings can cause scalping. Each staff member of the Turf Crew, from the Coordinator on down, is assigned his or her own 11-foot ride-on mower, and is responsible for keeping it clean and in good repair. Zone staff share six-foot ride-on mowers; like the Turf Crew, they are responsible for cleaning and caring for the machines they operate. This system encourages greater accountability, which results in better care and longer operability. If larger or more complicated repairs are necessary, the Conservancy employs two full-time staff mechanics who assist with repairs at the maintenance facility within the Park. The following procedures guide equipment selection, use, maintenance, and repair:

Selection and use

- Thoroughly research the purchase of new equipment. When possible, use references to determine the applicability and quality of potential purchases.
- Make durability a key factor in selection. The cost of downtime outweighs any up-front savings on lower quality equipment.
- Retire mowers when no longer in good operating condition.
- Select mowers that are the right size for the lawn as well as suited for navigation in crowded areas.
- Focus mower selection on turf. Be wary of "all-in-one" machinery: A tractor that can do everything might not be best suited for all mowing needs.

Maintenance and repair

- Train staff on the maintenance of each piece of equipment.
- Schedule times for routine maintenance, including:
 - Sharpening or replacing mower blades.
 - Checking fluid levels.
 - Lubricating grease fittings.
 - Cleaning air filters and radiator screens.
 - Checking tire pressure.
 - Checking mower deck belt tension and condition.
- Provide safety training and an equipment operator's manual.
- Allocate time to clean mowing equipment. When conditions are dry, blow out grass cuttings with a handheld leaf blower.
- Clean interior of mower decks weekly.
- Clean string trimmers after use.
- Communicate issues and concerns about equipment as needed.

Equipment Guide

The following machines are among the Conservancy's fleet of mowing equipment:



Large area: 11-foot mowing width ride-on mower.



Small area: 6-foot mowing width ride-on mower.



Walk behind: 48-inch mowing width belt-drive mower.



Walk behind: 22-inch mowing width belt-drive mower.



String trimmer: A tool that uses nylon string on a rotational head to cut the grass. The type of string trimmer used by the Conservancy features a fixed-line head that simplifies string replacement and can be used in a variety of conditions.



CHAPTER 2

Irrigation

The Conservancy identified irrigation as a key component of the long-term management and care of the Park's lawns soon after it completed its first major lawn renovation in 1981. Many turf species can survive hot, dry summers by going dormant and then coming back in the cool weather, but Park lawns receiving considerable foot traffic need to keep growing to recover from their extensive wear and tear, and irrigation is essential for that growth to occur. The Conservancy's goal is to provide the minimum amount of water needed to keep the grass actively growing for the public's use and enjoyment.

Today, the Park has both manually operated irrigation and automatic computer-controlled systems. Manual irrigation in Central Park includes hoses connected to water sources, manually attached to sprinklers, and moved to different locations. Automatic irrigation includes in-ground sprinklers activated by electronic controllers that can be centrally controlled through a computer system. With each major lawn renovation, the Conservancy extends the reach of the water supply and installs automatic irrigation as well as soil and drainage improvements that optimize irrigation efficiency. Eleven lawn areas have automatic irrigation, including all "A Lawns" and some "B Lawns." The rest of the "B Lawns" as well as "C Lawns" have access to manual, quick-coupling valves for irrigation. "D Lawns" do not have irrigation readily accessible.

The Turf Care Manager schedules automatic irrigation for "A" and some "B Lawns," adjusting the timing and frequency based on field and weather conditions in coordination with Section Supervisors and Zone staff. (Refer to the "Irrigation Protocols" worksheet in the Reference Guide for general guidelines.) Zone staff irrigates "C Lawns" as needed. The Director of Horticulture collaborates with the Turf Care Manager and the Conservancy's Planning, Design, and Construction Department, and consults with NYC Parks plumbers on water supply expansions and irrigation improvements that accompany lawn renovations.

Scheduling and Monitoring

Like many other aspects of urban park turf management, determining when and how much to water depends on many variables. It calls for an understanding of site conditions, regular monitoring of soil, turf, and weather, and coordination with public use. Too much water can be as much of a problem as too little. Wet turf is prone to soil compaction from foot traffic and the growth of fungal pathogens. Overwatering reduces wear tolerance and discourages deep rooting. It also interrupts public use and wastes water.

Automatic irrigation systems operate overnight when people are not using the lawns, evaporation rates are lower, and there is time for water to soak into deeper soil levels. This allows for active use during the day and reduces the risk of soil compaction. Using the proper amount of water also results in improved drainage and drier surfaces the next day. Manual watering is done during working hours by Zone staff.

Adjusting the irrigation schedule is a balancing act that depends not just on monitoring current turf and atmospheric conditions, but also on the weather forecast. Also factored into the decision of when to water is the upcoming use of a lawn space. With automatic irrigation, the Turf Care Manager has the ability to adjust irrigation levels. However, the system self-adjusts to changing conditions, including rainfall, allowing for conservation of water. The following considerations guide lawn irrigation timing and quantity:

Site-specific conditions

- **Soil texture:** Coarse, sandy soils have less capacity to hold water than finer-textured soils, so sandy soils require more frequent irrigation with smaller amounts of water.
- **Drainage:** How rapidly does a lawn or field drain after rainfall or watering?
- **Topographic features:** Are there depressions where water can pool? Is there underlying rock that will slow drainage? Are there hills that will distribute water unevenly? If so, less water should be used more frequently.
- **Turf species and cultivars, and their drought tolerance.**
- **Root depth:** Newer lawns have shallower roots, so during root establishment, watering rates should keep the top half-inch of soil moist. Following initial root development, water more deeply and less frequently.
- **Public use:** Areas with greater foot traffic require adequate water to regenerate worn-down grass, but irrigation needs to be scheduled carefully to minimize turf compaction and disruption of public use.

Climatic conditions

- **Seasonal:** Lower amounts of water should be used in the spring and fall when turf uses less water.
- **Air temperature and humidity:** In hot and dry weather, greater amounts of water should be used. When both heat and humidity are high, however, less water is applied because the grass uses less water, and excess moisture can stimulate disease.
- **Following rainfall:** Gather information on precipitation rates and use this information to determine when to water turf areas.



Irrigation monitor.



Irrigation controller.

Turf and soil monitoring

- **Appearance:** Is the turf color changing from the expected shade of green to shades of brown or blue? Both are stress responses to drought. Footprinting or tracking from wilt also indicates the need for watering. However, if grass is lush and more vigorous than it should be for the time of year, the lawn may be getting too much water.
- **Core sampling for soil moisture:** The Conservancy uses a three-quarter inch soil sampler to pull a 4- to 6-inch depth core out of multiple locations in a lawn to check if the moisture level is acceptable and consistent throughout the root zone. A swampy or foul odor indicates anaerobic conditions, which call for lower watering rates.
- **Feel:** Is the soil powdery dry in the root zone? Is water dripping out of the core sample? These extremes should be avoided – soil should feel uniformly moist. With practice and experience, correlating the feel of soil moisture with observed turf conditions leads to an accurate assessment of irrigation needs.
- **Rooting depth:** Water needs to be available where the roots are growing. Shallow roots require more frequent watering to keep the top layer of soil moist. If the roots are deep, the top can dry out as moisture collects in lower levels.

Procedures

To maintain the health and appearance of Park turf while minimizing cost, water consumption, and disruption of public use, Zone staff carries out the following irrigation best practices (Refer to the “Irrigation Protocols” chart in the Reference Guide for general guidelines.):

Irrigation best practices

- Irrigate to prevent drought stress on turf plants.
- Use as little water as possible to maintain optimum plant health. It's better to err towards under-watering – water can be added but it cannot be removed.
- Don't try to make up for missed watering by doubling up.
- Do not leave puddles: Standing water can scald the grass or create soil conditions where oxygen may not be available to roots. If soil is hardpan, water will simply run off or the lawn may stay wet, leading to closure or disease.
- Irrigate during times that least impact public use.
- Provide clear warnings about any obstructions to pedestrian paths.
- Inspect and monitor irrigation systems to insure all components are functioning.
- Test automatic irrigation systems regularly to prevent malfunctions.
- If a lawn is scheduled to be used the next day, water the lawn as early the night before as possible.
- During periods of drought, comply with all restrictions mandated by government agencies.

Equipment Selection and Maintenance

Automatic irrigation systems use gear-driven, in-ground rotary sprinkler heads, which are standard in the industry, with commercial-grade electric valves for reliability. Electronic controllers activate the in-ground sprinklers. Manual equipment – heavy-duty hose and roller base sprinklers – are selected to hold up to frequent moving from lawn to lawn. The Turf Crew and Zone staff maintain both automatic and manual systems, conducting smaller repairs during the seasonal irrigation schedule.

Irrigation equipment

- **Automatic:** Computer-controlled systems operated on an adjustable schedule are the most accurate and efficient irrigation method. They are used on “A Lawns” and selected “B Lawns.” Components vary, but may include:
 - Pump stations
 - Controllers
 - Valves
 - Sprinklers
- **Manual:** Manually operated sprinklers or hoses, attached to the nearest water supply, are used in areas that require less irrigation or are not accessible or conducive to automatic installations. Components include:
 - Roller base impact sprinklers
 - Quick coupling valves and keys
 - Heavy-duty hose
 - Hose nozzle



Automatic irrigation.



Manual irrigation.



Automatic sprinkler head.



Roller base sprinkler.

Irrigation maintenance

- Maintain an inventory of parts, such as valves, sprinkler heads, solenoids, fittings, couplings, swing joints, and piping.
- Plan and perform seasonal maintenance tasks:
 - **Spring:** System start-up, functionality check, and repair of any malfunctioning components.
 - **Summer:** Functionality checks monthly and repair of any malfunctioning components.
 - **Fall:** Winterization of all systems and pump stations by draining all irrigation lines of water and forcing water out of all valves and piping using compressed air.
- Hire a contractor for repair and winterization if work cannot be performed in-house.

Irrigation Planning and Design

In planning lawn renovations, the Conservancy considers a variety of factors in determining whether to extend the water supply or install a new irrigation system, such as a desire for higher turf quality or changed use for a particular lawn or field; increased intensity of use; or new plantings requiring regular irrigation. The Director and the Turf Care Manager collaborate with the Conservancy’s Planning, Design, and Construction Department on:

Considerations in planning lawn renovations

- Plan site drainage improvements to make new irrigation systems as efficient as possible.
- Select the most durable and cost-effective equipment, materials, and fixtures.
- Use turf species and cultivars with the least demand for water that are best suited for an area’s microclimate and use.
- Ensure software compatibility of irrigation controllers.
- Remediate lawn areas impacted by construction.



CHAPTER 3

Fertilization

A regular fertilization program is an important component of the portfolio of the urban park management practices that help to maintain healthy soil and turf. Fertilizer provides nitrogen and other nutrients that grass needs to develop a good root system, grow consistently, maintain desirable density and color, and resist environmental stresses. Without fertilization, the turf in Central Park would have difficulty recovering from the Park's heavy public use. The routine use of proper fertilization in conjunction with other turf care practices results in healthier root systems that increase the availability and absorption of nutrients, which may ultimately reduce the amount of fertilization needed.

The Conservancy takes a conservative approach to fertilization, carefully monitoring and testing soils and adjusting practices with each season. The goal is to make sure the grass grows actively, but not too quickly. Overfertilizing can be as bad as overwatering: It makes grass grow so quickly that staff can't keep up with mowing, and may cause fungal pathogens to flourish. The Conservancy primarily uses granular, organic-based fertilizers, which work well, slowly releasing nutrients to grass plants when needed for growth. Occasionally, organic-based fertilizers are supplemented with synthetic fertilizers, particularly during cool weather when soil microbes may not be as active.

The Conservancy complies with applicable laws regulating fertilizer application.

Soil Sampling Schedule

Every year before the growing season begins, the Turf Care Manager prepares a schedule of routine monthly fertilizer applications for each "A Lawn" as well as a general schedule for all "B Lawns." For "A Lawns," the product, timing, and rate of application are adjusted based on the results of soil tests conducted at the beginning of the season and monthly thereafter, as well as on the observation of field conditions throughout the growing season. "B Lawns" are soil sampled once a year, and have a scheduled fertility application in the spring and fall. Additional fertilizer may be applied based on observations. For "C" and "D" Lawns, soil is sampled and fertilizer applied only if a renovation is scheduled. These lawns usually have thinner turf cover and a high percentage of weeds, so fertilizing without renovating or overseeding will not improve their condition.

In the spring, turf is fertilized to promote root and leaf growth and to stimulate maturation before the summer stresses of heat, drought, and heavy use. In the summer, fertilization levels are reduced to stimulate recovery from foot traffic without causing excessive growth. Fall fertilization helps lawns recover from the stresses of the summer. Zone staff and the Turf Crew work together in carrying out the fertilization program. The Turf Care Manager takes soil samples monthly for "A Lawns," and Section Supervisors sample soil for all other lawns. For large turf spaces, the Turf Crew applies fertilizer with a tractor-mounted pendulum spreader. This spreader is capable of holding up to 1000 pounds of fertilizer. Zone staff fertilize lawns smaller than one acre or where the pendulum spreader can't go, using a walk-behind rotary spreader. A typical walk-behind spreader can hold 50 to 100 pounds of fertilizer.

Scheduling guidelines

- For "A Lawns," fertilizer applications are planned at four- to six-week intervals for the entire growing season, April to October.
- During the summer, selected "A Lawns" receive liquid fertilizer applications, which can be more precisely controlled so as not to overstimulate growth.
- "B Lawns" receive an initial fertilization in April and an additional application later in the spring if visual observations indicate the need for improved growth. Applications then resume in the fall, with an initial fertilization and additional applications based on observation.
- Renovated "C" and "D Lawns" receive a starter fertilizer application at the time of renovation and additional applications throughout the growing season as needed, depending on whether there is thinning or dieback.



Soil core sample.

New York State Dishwasher Detergent and Nutrient Runoff Law, Article 17, Title 21

Phosphorus fertilizer for lawns and non-agricultural turf

- Prohibits the use of fertilizers that contain phosphorus on lawns except when a new lawn is being established or a soil test has indicated a need for additional phosphorus.

All fertilizer for lawns and non-agricultural turf

- Fertilizers may not be applied within twenty feet of surface water except where:
 - A minimum 10-foot wide vegetative buffer exists.
 - The fertilizer is applied utilizing a spreader guard/deflector shield or drop spreader three feet from water.
- Fertilizers may not be applied between December 1 and April 1.
- Fertilizers may not be applied on impervious surfaces (e.g. pavement). If an inadvertent application or spill on an impervious surface occurs, it must be contained and cleaned up.

Please refer to the New York State Department of Environmental Conservation website for further information, www.dec.ny.gov/chemical/67239.html

Monitoring

Once the fertilization schedule is determined, turf conditions and soil testing results guide the timing and amount of applications. The Turf Crew and Zone staff monitor "A" and "B Lawns" for color, growth, density, and signs of disease or pests. Soil is tested for pH levels, soil texture, and nutrient level. A soil that is too acidic or alkaline (a pH level lower than 6 or higher than 7, respectively) reduces the availability of essential micronutrients such as zinc, copper, manganese, boron, and iron. Texture – the proportion of particles of different sizes (i.e. clay, silt, or sand) – affects how well a soil holds nutrients, an important factor in determining the amount and frequency of fertilizer applications. Sandier soils do not retain nutrients as well as finer-textured soils, and may require fertilizer to be added in smaller, more frequent doses. In addition, the weather forecast is checked before proceeding with an application. If heavy rains are expected, an application may be postponed to prevent fertilizer runoff. The following guides the Conservancy in the timing and amount of fertilization:

Field conditions

- Regularly assess lawn color, growth, and density. Yellowing of the grass leaves or slow growth may indicate the need for additional fertilization.
- Look for evidence of fungal pathogens, which can indicate the need for more or less fertilizer, depending on the disease. For example, the presence of a fungal disease called dollar spot, associated with low soil fertility, may call for additional fertilizer.
- Check weather forecasts. Applications are typically canceled if the weather forecast is unfavorable.

Soil tests

- Sample soils on "A Lawns" beginning in March, once the ground has thawed. Testing soil early in the growing season allows for the results to be used in planning the season's fertilizer applications.
- "B Lawns" are scheduled to be sampled annually either in the spring (April or May) or fall (September or October). Lawns planned for renovations are soil sampled prior to renovation.
- Sample at a depth of approximately six inches, taking 10 to 15 cores from different areas reflecting the general characteristics of the lawn.
- Partner with a reputable soil lab and closely follow its sampling guidelines. The Conservancy sends soil samples to an outside lab, which analyzes them for pH levels, soil texture, and nutrients, and provides recommendations on fertilizer type or amendments to improve soil conditions.



Soil samples.



Soil test.

Procedures

Following are the Conservancy's best practices for fertilization to promote healthy turf, avoid damage to grass and other park plantings, and prevent water bodies from being contaminated by excess nutrients. The goal for quantity of fertilizer application in Central Park is 3.5 pounds of nitrogen per 1,000 square feet a season, in seven applications of 0.5 pounds each. This amount may be increased or decreased based on soil tests, visual observations, growth rates, lawn use, and heat stress.

- "B Lawns" have a lower total nitrogen goal for each season – approximately 2.5 pounds in four to five applications.
- At the beginning of each season, spreaders are calibrated for each product planned for application. (Refer to the "Spreader Calibration Worksheet" in the Reference Guide.)
- At the beginning of each season, lawns to be fertilized are measured and fertilizer amounts are calculated.
- At time of application, ensure correct setting of spreader, and record setting used.
- At time of application, the size of the lawn and amount of product is verified.
- At time of application, the total amount of product used on the individual lawn is recorded.
- Comply with all applicable rules and regulations relating to fertilizer application.
- Fertilizer should not be applied within the drip-line of mature trees.
- Do not fertilize during sustained heat or drought.
- Do not fertilize when fungal pathogen activity will be increased with additional fertility.

Products

The Conservancy's turf care program relies mostly on granular organic-based fertilizers, which are broken down by soil microbes that slowly release nutrients for turf to absorb. These slow-acting fertilizers avoid intensifying the spring surge of leaf growth and encourage a healthy soil ecosystem containing beneficial microbes. There are two formula types used by the Conservancy – starter and maintenance. Starter fertilizer is used for new lawn seedlings and during a lawn's first growing season. It is a complete fertilizer with phosphorus as well as nitrogen and potassium. Although Park soils generally do not need phosphorus, new lawns have a higher demand for phosphorus but a limited root system for absorbing the nutrient, so additional phosphorus must be provided. Maintenance fertilizer for regularly scheduled applications does not contain phosphorus. The Conservancy uses the following fertilizer products for turf:

- **Granular organic fertilizers:** Solid granules composed of hydrolyzed feather, meat, and blood meals, which are decomposed over time by soil microbes into forms of nitrogen and other nutrients that plants can use. Granular fertilizers may be fortified with methylene urea for consistent and sustained feeding, ammonium phosphate for root development in newly seeded lawns, or ammonium sulfate to lower pH levels in alkaline soils.
- **Liquid fertilizers:** Comprised of urea and methylene urea, which are water soluble, liquid fertilizers can be applied in more precise quantities. They are used on "A Lawns" to keep growth consistent but not excessive, but are more expensive than slow-release granular fertilizers.
- **Biostimulants:** Concentrates in liquid form derived from plants, seaweeds, and weathered humus, as well as compost tea, a liquid extract of compost containing plant-growth compounds and beneficial microorganisms, are used to influence physiological processes in plants. Both liquid fertilizer and biostimulants require specialized application equipment.

Equipment Selection and Use

Each piece of equipment is calibrated by the Turf Crew and Zone staff to deliver the correct amount of fertilizer, which prevents turf damage ("fertilizer burn"), runoff, and inefficient use of products and staff time. The Conservancy uses the following high-quality spreaders and sprayers to distribute fertilizer evenly:



Pendulum spreader: Power Take Off (PTO) driven, with a shaft powered by the engine that makes the spreader run. It has a horizontally mounted chute that distributes fertilizer by shaking back and forth parallel to the ground. Generally used on lawns one acre or larger in size.



Rotary spreader: Manually pushed, with a metering pot at the center of the rear hopper that drops granules onto a rotating impeller, which slides them out along fins and throws them off. Generally used on lawns less than one acre in size.



Boom sprayer: Consists of pump, tank, agitation system, flow control valves, and the boom. The spray tank is mounted on a vehicle, whose engine drives the pump providing pressure to spray liquid through a valve-controlled boom. Used for precise, low-rate applications of liquid fertilizer and biostimulants.



CHAPTER 4

Aeration

Over 42 million annual Park visits, concentrated foot traffic during special events, and back-to-back athletic activities lead to compacted soils that seal out water, air, and nutrients. Aeration – cultivating and creating spaces in the soil by mechanical means – alleviates this compaction. It is a fundamental Conservancy practice for keeping intensively used turf healthy.

Aeration allows air, water, and fertilizer to infiltrate the soil and tilts the soil microbial balance towards beneficial aerobes that decompose organic matter, make nutrients available to plants, and help control disease. Loose, aerated soils create an environment in which roots can grow more deeply, developing a greater surface area to absorb nutrients and reaching water percolating at lower depths, which leads to healthy, vigorous turf.

Aeration also breaks up the thatch layer, the mat of dried stems and roots at the soil level that accumulates in the natural cycle of grass growth and dieback. Soil microorganisms recycle this decaying matter and its nutrients, but breakdown may not keep up with accumulation. A thatch layer thicker than one inch tends to result in unfavorable conditions for root development and healthy growth – roots remain too wet or dry and do not provide a consistent reservoir for water or nutrients. Because roots get entangled in the thatch, unable to penetrate into the soil below, when the thatch is dry, turf is subject to drought stress even if the soil is moist.

Scheduling and Monitoring

The Turf Care Manager schedules regular aeration for “A Lawns” throughout the growing season and into the fall, which allows turf spaces to withstand compaction during special events and helps them recover at the end of the season. In season, athletic fields are monitored daily and aerated frequently as needed to keep turf durable for intensive sports use. Aeration may also be scheduled after an event for areas that have become overly compacted. For most of the Park’s lawns, regular aeration is a multiple-day procedure. Because lawns can only be closed one or two days per month, the Turf Crew works before opening time for several days before and after the scheduled day of closure as well as on the scheduled closure day. “B Lawns” are aerated in the spring and fall on a rotating basis as staff resources allow. The Conservancy follows these guidelines in determining when to aerate:

Monitoring

- Assess soil compaction and overall turf health frequently through visual observations and checking with a soil probe to see the depth of roots. A soil profile sampler or putting green cup hole cutter can also be used to check root depth and observe the soil conditions where the roots should be growing.



Soil probe.



Soil profile sampler.

- Check for and analyze soil compaction before and after special events.
- Following irrigation, monitor turf for appearance of water in locations where puddles are not normally present.
- Pay careful attention to weather and field conditions, especially soil moisture. If the lawn is overly dry or wet, aeration could add additional stress and may damage the existing turf. Aerating when the soil is too dry can also damage the equipment.

Frequency

- Plan and schedule aeration proactively, and coordinate with permitted use.
- For “A Lawns,” schedule in-season aeration from May to August and restorative treatment in the fall.
- Schedule “B Lawns” for fall aeration on a rotating basis, though sometimes aeration will be done in the spring if there is not enough time in the fall, or if there is a need.
- Aerate “C” and “D Lawns” for renovation.
- Schedule treatment in the early morning during regular closed hours, and arrange lawn closures around the schedule of permitted uses.
- Aerate compacted spots following intensive use and special events.
- Integrate aeration into end-of-season protocols.

Procedures

The Conservancy uses two general aeration methods: solid tine and core (hollow tine) aeration. Solid tine aeration makes holes with cylindrical spikes to loosen soils and to improve root growth and infiltration of air, water, and nutrients. The Conservancy uses this method extensively in season because the solid tines provide excellent penetration without removing soil, so public use can resume on the same day. Core aeration uses hollow tines to bring cores of soil to the surface, which helps break down organic matter in the thatch and is important for successful overseeding. After aeration, the cores must be dragged and cleaned, which requires temporary field closures. Core aeration is used for end-of-season-restoration, in combination with topdressing – working sand or fertilizer into the thatch layer – and overseeding.

For the large “A Lawns,” the Turf Crew and Zone staff work as a team to plan and carry out aeration over several days bookending the day when the lawn is closed. Signs are posted notifying Park patrons about planned closings, and the lawn is mowed. On the morning of the day of the closure, Zone staff flags irrigation components, while the Turf Crew begins running the aeration machines. To complete the job as quickly as possible, other Turf Crew members or Zone staff trained in operating the equipment take over during shift breaks. When aeration is complete, all flags are removed and the lawn is checked to make sure it is in suitable condition to open for use. Larger “B Lawns” also receive solid tine and core aeration treatment by the Turf Crew with the same tractor-mounted equipment used on “A Lawns.” On smaller “B” and “C Lawns,” Zone staff operates lighter drum aerators, either walk-behind or towed by a utility cart or small tractor.

Preparation

- Coordinate with the special events staff and NYC Parks Permits Office to make sure nothing is scheduled on a lawn for when aeration work is planned.
- Select and check the appropriate equipment. Many factors are considered in selecting equipment suited to lawn’s conditions, including how rocky the soil is, the depth of irrigation pipes, and the equipment’s ability to handle rough conditions.
- Schedule mowing in advance of aeration.
- Mark all irrigation heads, valves, other surface objects, and utility and/or service equipment.
- Adjust tine penetration depth to account for wear and rock impact. If tines are worn, the setting can be lengthened to achieve the right depth in the field. If tines are hitting a lot of rock in an area, the depth setting should be raised to avoid damage to the equipment.

Closures

- Close lawn using the Red Flag System.
- Keep lawns closed after aeration until they are in suitable condition to be opened. Before lawns can be used after core

aeration, soil cores brought to the surface must be disintegrated by dragging the turf with a drag mat attached to the back of a utility vehicle. Lawns that receive solid tine aeration can be reopened the same day. After end-of-season restoration, “A Lawns” remain closed until the spring. The timing of reopening of “B,” “C,” and “D Lawns” varies.

- Remove marking flags when aeration is complete; remove red flags and lawn closure notices when the lawn is ready to reopen.

Aeration best practices

- Operate the equipment along the longest dimension of the turf area and with the fewest number of turns possible.
- Alternate direction of subsequent aerations to avoid operating the equipment in the same pattern of the previous aeration.
- After core aeration, clean up soil cores brought to the surface using a keystone mat or similar drag mat with openings that break them into small pieces.
- Monitor lawns to adjust the timing and frequency of aeration, scheduling aeration if grass can handle the stress of disruption. It is preferable to delay aeration if a lawn has not recovered from the previous aeration.



Core tine aerator.



Core tine aerator pulls cores at a 2- to 3-inch depth.



Soil cores.



Solid tine aerator.

Equipment Selection and Maintenance

The Conservancy uses two basic types of aeration equipment: core and solid tine. Core aeration equipment uses hollow tines or spoons to bring cores of soil to the surface. Solid tine aeration equipment makes holes in the soil with solid points or cylindrical spikes (similar to a pitchfork). Contractors can be hired to perform these services for parks that do not own this equipment.

Each member of the Turf Crew as well as Zone staff who operate aerators receive on-the-job training to perform routine maintenance and minor repairs on the equipment. Much time is spent on preventative maintenance, including greasing, checking, and tightening fittings and fasteners. The replacement of worn parts, including tines, is scheduled along with work hours for the equipment. A piece of aeration equipment has 24 to 96 tines, which must be taken off and replaced when worn – which can occur quite frequently, depending on the soil. A member of the Turf Crew may spend one complete day a week just preparing the equipment for the next scheduled work. Extensive or specialized repairs are handled by the Conservancy's Fleet Management staff.

Equipment guidelines

Managing turf to minimize compaction requires high-quality, versatile equipment suited to each lawn's conditions and use. The Conservancy follows these guidelines in selecting aeration equipment:

- Conduct thorough research before making new equipment purchases.
- Make durability a key factor in selection. The cost of downtime and repairs is greater than any up-front savings on lesser quality equipment.
- Maintain an adequate inventory of replacement tines.
- Anticipate and budget for new equipment based on an assessment of equipment condition.
- Select aeration equipment that is the right size for the space and that can be maneuvered safely in crowded environments.

Equipment guide

The following machines are among the Conservancy's fleet of aeration equipment:



Deep tine aerator: Used most extensively on the Park's athletic fields, this versatile solid tine machine makes small pitchfork-like punctures 2 to 10 inches deep, which allows for same-day play. Its ability to achieve deep penetration requires operation at relatively slow speeds of 0.45 to 1.35 miles per hour. It cannot be used on rocky, hardened, or dry soils.



Hollow tine or core aerator: This machine, used on "A Lawns" and larger "B Lawns" for fall restoration, brings cores of soil to the surface to create an opening when seeding. Although its many moving parts require a lot of maintenance and need to be replaced often, it is the most effective machine for reducing compaction.



Rotary decompactor: Used on "A Lawns," this machine has thick, solid curved blades that slice through the soil, leaving a slit the width of the blade and 4 to 10 inches deep. It is effective on highly compacted root zones and subsoils. It doesn't have the pulling effect of a vertical tine, so it keeps turf with limited rooting from being lifted up and becoming damaged. A roller on the back of the machine presses the surface back together, allowing use to resume the same day as treatment.



Tow-behind drum aerator: Used for smaller lawns, this lightweight, non-mechanized piece of equipment requires putting weight on top of the machine to aid the penetration of the tines.



Walk-behind drum aerator: Similar to the tow-behind drum aerator, this small core aeration machine is reserved for smaller lawns and tight spaces, and is effective in moist soils. Multiple passes may be required to achieve an acceptable number of holes per square foot. Good for small, worn spots and areas of heavy use, such as lawn entrances.



CHAPTER 5

Integrated Pest Management

There is a lot going on in and under the grass in Central Park. Turf, roots, and soil are host to innumerable living organisms, including earthworms, insects, fungi, and microscopic bacteria. Many of these organisms are beneficial to the health of turf, but some can cause damage. Weeds – undesirable fast-growing plants that crowd out grass species – are also present. The Conservancy utilizes the IPM approach to pest control. IPM relies on a range of biological, cultural, mechanical, and chemical strategies for pest problems. This is a “managed” approach that keeps pests and weeds at tolerable levels rather than attempting to eliminate them. The Conservancy has continually decreased the use of synthetic pesticides through sound management practices that promote plant health and through testing and integrating biopesticides where appropriate.

Implementing Integrated Pest Management in Central Park

The foundation of IPM is creating an environment that supports plant health. For turf, that means building good soils and routinely using proper cultural practices – mowing, irrigation, fertilization, aeration, and restoration.

As with all of the Conservancy’s turf care practices, pest management starts with lawn classification. For “A Lawns” (and “B Lawns” to a lesser degree), higher lawn quality standards call for more intensive cultural and pest control practices. This is especially important for athletic fields that need even playing surfaces. For “C” and “D Lawns,” where there is a greater tolerance for weeds and pest damage, pesticides are less frequently used. By accepting a certain level of weeds and regularly overseeding lawns to replace turf lost due to disease or pests, the Conservancy has significantly reduced the number of Park acres that are treated with chemicals.

The Conservancy’s turf care practices address weeds as well as insects and fungal pathogens that feed on plant tissue. For “A Lawns” only, the Turf Care Manager schedules up to six preventative applications every year during the growing season to minimize problems known to interfere with the turf’s intended use. For example, a substance used to eliminate white grubs is applied to reduce the chances of an infestation on athletic field turf where firm footing is necessary. The Turf Care Manager, Turf Crew, and Section Supervisors monitor “A” and “B Lawns” for signs of problems, and Zone staff keeps a close watch on the health of turf in their zones. If they observe a problem, they alert the Section Supervisor and the Turf Care Manager, who arranges for testing of soil, plant material, or insect samples, and determines the appropriate treatment based on the results. If pesticides are needed, the Conservancy seeks to use products with the least environmental impact, including biopesticides (natural pest enemies such as parasites or bacteria) that through various modes of action suppress pest populations to levels that cause minimal damage to the turf. Lawns are closed when pesticides are applied, and the IPM Coordinator organizes the required public notification. The IPM Coordinator also monitors the pesticide application, which is primarily carried out by the Turf Care Coordinator.

Following are the Conservancy’s IPM practices:

Planning and establishment

The tolerance of turf to plant pathogens or insects depends on many factors, including plant health, soil composition, temperature, and moisture, as well as the specific grass species and cultivars grown. Dense, healthy turf creates a cover that minimizes the ability of weeds to encroach on grass. When renovating a lawn, the following practices set the stage for fewer pest problems:

- Amend the soil to improve drainage by incorporating compost, topsoil, or sand as indicated by soil tests.
- If needed, add subsurface drainage.
- Use seed mixes appropriate for the microclimate, soil, and use of each turf space, choosing species and cultivars for vigor and resistance to disease, insects, and drought.
- Plan, budget, and staff for the proper care of newly renovated turf areas to prevent weeds and pests from getting a foothold.
- Consult with regional exterior agencies and research institutions. The Conservancy seeks evaluation and recommendations for its turf care program from experts at local universities.

Routine turf care

Well-aerated, moist soils create an environment that encourages beneficial microbes and dense, deeply rooted turf, which reduce stresses associated with pests, diseases, and weeds. The following practices create healthy turf environments:

- Schedule turf care on a regular basis and to repair damage from events or heavy use.
 - Mowing frequently and at the correct height prevents the persistence of some weed species.
 - Appropriate watering and fertilizing keeps grass growing and healthy.
 - Aerating and dethatching loosens compacted soils and keeps thatch from becoming too thick, eliminating barriers to the infiltration of air, water, and nutrients into the soil.
 - Aerating and keeping soils less compacted can decrease the amount of water-logged soils and root disease pressure.
 - Using an acidifying fertilizer to reduce pH levels may suppress some patch diseases.
- Reduce soil compaction and turf damage through the use of fencing, the permit system, and lawn closures during adverse weather conditions.
- Schedule preventive pesticide treatments during the growing season (“A Lawns” only) to prevent known and identified pest pressures.
- Overseed to fill in bare spots and restore turf density after events, heavy use, or at the end of the season to prevent weeds from taking root.
- Fall soccer field management at the North Meadow includes the closure of one (of six) fields each year to allow overseeding with improved cultivars and additions of sand topdressing and aerations to maintain soils for improved drainage.

Monitoring

Knowing if and when intervention is needed is the key to the success of IPM. Frequent monitoring by the Turf Crew and Zone staff allows the Conservancy to identify problems early. Regular exchanges with regional extension agencies and institutional partners keep the Conservancy alert to emerging threats. The Turf Care Manager and IPM Coordinator keep track of pests and diseases over time, developing a clear understanding of potential and ongoing threats that guides appropriate treatments. The Conservancy follows these monitoring protocols:

- Check each “A” and “B Lawns” weekly for:
 - Color, density, and growth rate.
 - Evidence of fungal pathogens or insect activity.
 - Presence of known or previously documented pest problems.
 - Physical or environmental conditions conducive to disease or insects.
 - Effectiveness of aeration to determine whether it is still providing the intended benefits or if the schedule should be modified.
- Conduct laboratory analysis of soil samples on a regular schedule.
- Send samples to outside laboratories to confirm the identification and level of disease or insect infestation.
- Set thresholds for intervention depending on lawn category.

Pesticide application guidelines

Once it is determined that pesticides are needed and how they should be applied, the Conservancy follows these treatment protocols:

- Use trained and certified applicators to apply pesticides.
- Use proper protective equipment as required.
- Reconfirm the limits of the infestation or pest damage prior to application.
- Limit application to the targeted area.
- Temporarily close lawn areas to be treated, using the Red Flag System.
- Post public notification 24 hours in advance and keep up for 72 hours afterwards.
- Treat in the very early morning hours from 3:00 am to 6:00 am.
- Determine whether or not the weather will affect the result or environmental impact of a pesticide application, and postpone if conditions are not conducive to good results.
- Ensure the correct calibration of equipment and application of pesticide.
- Keep accurate records of all pesticide applications.

Evaluation and documentation

Post-treatment assessment and long-term documentation are essential for determining the most effective pest-control treatments over time. The Conservancy documents:

- History or prevalence of pests and plant pathogens, including name, location, level of infestation, amount of damage incurred, and environmental conditions present.
- All control measures for each pest, including products, application rates, dates of treatment, equipment used, environmental conditions, and the results of treatment.

Products and Equipment

The following guides the selection of IPM equipment and products for turf care:

Pest-control products

The Conservancy uses effective, ecologically sensitive, and safe pest and weed control products, thoroughly evaluating products, application methods, and rates before incorporating a product into the program. Only pesticides approved by applicable regulating agencies are used. Following are products that may be used by the Conservancy in combating turf pests:

- Biofungicides and synthetic fungicides, to suppress fungal pathogens.
- Selective post-emergent herbicides that suppress specific weeds, used only when threshold levels are reached.
- Pre-emergent herbicides to suppress persistent, known weed populations.
- Insecticides for the control of persistent known insect pressures.

Seed

Choosing grass cultivars tailored to each lawn or field's microclimate is the foundation for successful pest management. After years of experimenting, the Conservancy arrived at the use of four general blends of grass types for different lawn conditions, rotating in new cultivars with improved disease resistance, drought tolerance, and other desirable qualities as they come on the market:

- **Bluegrass 80/20:** 80 percent Kentucky Bluegrass and 20 percent Perennial Ryegrass
- **Shade Mix:** 45 percent Fine Fescue, 30 percent Tall Fescue, 15 percent Kentucky Bluegrass and 10 percent Perennial Ryegrass
- **Tall Fescue:** 85 percent Tall Fescue and 15 percent Kentucky Bluegrass
- **Tri Ryegrass:** 100 percent Perennial Ryegrass

Fertilizer

- Maintain balanced fertility so as not to create a surge in growth that encourages disease or limits nutrients and reduces plant vigor.
- Use an acidifying fertilizer to reduce pH levels, which helps suppress summer patch disease.

Equipment

- Specialized equipment as well as protective gear are necessary to apply chemicals effectively and safely, including:
 - Sprayers
 - Backpack sprayer for small area and targeted applications.
 - Low-pressure boom sprayer for large area applications.
 - Protective equipment, including eyewear, respirators, suits, footwear, and gloves.



Canada geese.

Animals

There are several larger animals that can cause problems on lawns, particularly Canada geese. Good population management limits the effects of animals in Park lawns and landscapes. Although a seasonal problem, large populations of geese and the droppings they leave can wreak havoc on Park turf, limit public access and use, and compromise natural systems. The Conservancy manages geese populations by educating the public not to feed the birds and by employing a contractor that monitors the Park and uses trained dogs to discourage geese from feeding on the lawns. Raccoons and skunks can damage lawns by foraging in turf soil for insects and grubs. The Conservancy manages this problem by monitoring and by a preventative insecticide program for grubs in "A Lawns."

Common Central Park Turf Pests

Weeds

- Prostrate knotweed (*Polygonum aviculare*), a summer annual that germinates early in the spring and spreads quickly.
- Goosegrass (*Eleusine indica*), a summer annual grass that germinates in the late spring and early summer, with spreading growth that can crowd out desirable turf.
- Smooth crabgrass (*Digitaria ischaemum*), a summer annual grass that crowds out turf.
- Yellow nutsedge (*Cyperus esculentus*), a perennial sedge, which reproduces by seed, rhizome, and nutlets and can become aggressive.
- White clover (*Trifolium repens*), a creeping perennial broadleaf that competes aggressively with turf.

Fungal diseases

- Summer patch (*Magnaporthe poae*), a root disease causing circular yellow or brown patches in the summer.
- Leaf spot (*Drechslera poae*), a foliar disease, with symptoms of brown leaf spots or lesions that can be seen year-round. Untreated, it leads to severe thinning of turf. It is controlled with fertility and aeration that encourages healthy growth of turf.
- Dollar spot (*Sclerotinia homoeocarpa*), a foliar disease with symptoms appearing as bleached spots on leaf blades.
- Brown patch (*Rhizoctonia solani*), a foliar disease, with symptoms of circular patches of thinned and blighted turf.

Insects

- Masked chafers or white grubs (*Cyclocephala borealis*), a beetle whose larvae feed on turf roots in late summer and early fall, causing irregular patches of brown, dying grass.



CHAPTER 6

Restoration and Renovation

Managing turf in a park that accommodates over 42 million visits each year requires care beyond day-to-day maintenance. Two essential parts of the continual management of Park lawns are annual restoration and occasional full renovations.

Restoration – aeration, dethatching, topdressing, and reseeding – helps athletic fields and major lawns such as the Great Lawn and Sheep Meadow withstand the concentrated use they receive. This set of practices maintains healthy root development and growth, repairs damage from athletics and special events, improves overall turf quality and vigor, and incorporates new grass cultivars that have been selected because they require less fertilizer, water, and pest control. The annual fall restoration of “A” and “B Lawns” has helped end the cycle of decline and repeated costly renovations that plagued the Park before the Conservancy’s founding.

Renovations are complete renewals of a turf space – removing the existing vegetation, improving the soil and drainage, and replanting grass. These are scheduled to remedy irreversible deterioration due to wear, environmental stresses, or pests. The Conservancy’s turf care program factors in occasional renovations for “C” and “D Lawns” that receive less intensive routine care, in order to manage costs appropriately and keep some lawns available for unrestricted public use. Renovations are also undertaken to significantly change a lawn’s soil composition, grading, or drainage; convert it to an entirely different mix of grass; or upgrade it to a higher classification.



Athletic field maintenance on the Great Lawn.



Using a rototiller for a renovation.



Verticutting.



Topdressing.



Overseeding.



Overseeding – seed to soil contact.



Overseeding with a rotary spreader.



Establishing new turf.

Scheduling

“A Lawn” and athletic field restorations are scheduled during the fall, with the exact timing determined by weather and public use. The exception to this is the soccer fields at the North Meadow. The soccer fields have a unique combination of yearly overseeding when in use and a six-year rotational closure of one field for more extensive restoration similar to other “A Lawns.” After restoration, “A Lawns” are closed for the winter. The Conservancy restores “B Lawns” on a rotating basis, doing most of the work in the fall but sometimes finishing up in the early spring. Each year, a consensus decision by the Director of Horticulture, the Turf Care Manager, and the Section Supervisor determines which “B Lawns” to restore, as well as whether any “C” or “D Lawns” need renovating.

Ideally, lawns are renovated in September or October and remain closed through the next growing season, but this happens only when there is an available lawn nearby for similar use. More typically, a lawn renovated in the fall is closed through the following May or June to allow it to mature before the stress of the summer season. Lawns renovated in the spring are closed for the rest of the growing season if success is a high priority or if the classification has been changed; otherwise, they are closed until June, long enough for grass to grow in and assure soil cover. Restorations and renovations are coordinated with the schedule of events and seasonal athletics to limit downtime and maximize public access.

Restoration and renovation scheduling guidelines

- The Conservancy restores “A Lawns” annually in the fall.
- High-profile “B Lawns” are restored every year. The Turf Crew can accomplish restoring a set number of acres per season with the equipment and labor available, so other “B Lawns” are restored on a rotating basis, with priority given to those found to have a reduction in quality (more weeds, thin turf, or open soil) after the season’s use.
- Fall is the best time to seed the cool-season grasses suited to the City’s climate zone.
- Lawns are closed for the winter after fall restoration to protect newly germinated grass from being trampled.
- Weather or competing priorities may postpone restoration of some “B Lawns” until the early spring, which is more difficult to manage because fast-growing weeds can crowd out newly seeded grass.
- A starter fertilizer should be used following renovation or restoration.

Restoration

"A Lawns" restored annually in the fall:

- **Heckscher Ballfields:** Core aerate, verticut, seed with Perennial Rye, and topdress with sand, which helps dilute the thatch and over time maintains drainage of the top soil layer so fields can be used sooner after rain.
- **Sheep Meadow:** Core aerate, seed with Kentucky Bluegrass/Ryegrass blend, and topdress with sand.
- **The Great Lawn:** Core aerate, verticut, seed Kentucky Bluegrass/Ryegrass, and topdress.
- **The North Meadow soccer fields:** Solid tine verti-drain monthly in September and October. During soccer season from late September to mid-November, overseed with nine weekly applications of Perennial Rye to help keep turf cover. One out of six soccer fields is rotationally closed until spring and undergoes traditional restoration. The process is adjusted annually depending on the quality of turf, but always includes: verti-drain, core aerate, topdress, and overseed with Kentucky Bluegrass/Perennial Ryegrass.
- **The East Meadow:** core aerate, verticut, seed with Tall Fescue, and topdress.
- **Lawn Bowling and Croquet Greens:** core aerate, verticut, seed with Bentgrass/Fine Fescue, and topdress.
- **The Conservatory Garden lawn:** core aerate, verticut, and seed with Kentucky Bluegrass/Perennial Rye.

"B Lawns" – Fall restoration includes a combination of any of the following processes: core aerate, verticut, topdress, and seed.

Restoration procedures

Following are the steps for routine turf restoration:

- Conduct soil tests to determine the need for fertilizer or soil amendments.
- Specify seed species and cultivars based on use and site conditions, amount of sunlight, and drainage.
- Fence work area boundaries to limit foot traffic before restoration and help the establishment of new grass.
- Prior to cultivation, locate and flag irrigation heads or other infrastructure that may be damaged by equipment.
- Mow at a lower range of 2.5 inches.
- Cultivate soil using a core aerifier and/or a verticutter.
- Overseed at rates determined by the Turf Care Manager. General guidelines are as follows:
 - Perennial Ryegrass at 5 pounds per 1,000 square feet.
 - Kentucky Bluegrass at 3 pounds per 1,000 square feet.
 - Tall Fescue at 7 pounds per 1,000 square feet.
 - Shade Mix at 5 pounds per 1,000 square feet.
- Apply fertilizer, sand topdressing, and/or other soil amendments as determined by soil tests.
- Incorporate seed using drag mats, rolling when necessary, such as when the surface of the turf has been lifted or disrupted by the operation of the equipment.
- Irrigate daily during establishment.

Renovation procedures

Each turf renovation is different, depending on location, use, and condition of a lawn, but the Conservancy follows these general guidelines :

- Conduct soil tests to determine need for fertilizer or soil amendments.
- Make drainage and/or soil improvements.
- Specify seed and/or sod species and cultivars.
- Fence boundaries of work area to limit foot traffic during renovation and establishment.
- Locate and flag irrigation heads and other infrastructure prior to beginning work.
- Incorporate existing vegetation into the soil by mowing at a low height (scalping) or rototilling; or remove weeds with a herbicide.
- Cultivate soil using a core aerator, verticutter, vibratory solid tine aerator, and/or rototiller.
- Seed at the same rates as for restoration.
- Incorporate seed by providing soil contact with rollers or drag mats.
- Install jute mesh erosion control matting on slopes that may erode before new grass is fully established.
- Apply straw or hay mulch or lay translucent polyethylene fabric blankets to hold moisture and heat during cool fall nights.
- Irrigate daily during establishment.

Equipment

Cultivation and seeding equipment is carefully selected for each lawn's conditions and use, as follows:



Verticutter: Used to remove thatch and scarify organic material up to one inch in depth. When used along with seeding, this machine can create a slit in the soil to create seed-to-soil contact. Raking or blowing is required following application and prior to seeding. Typical applications require cutting in two different directions.



Large area topdresser: Used to add sand and organic matter prior to seeding.



Vibratory solid tine aerator: Used most often for turf restorations and renovations preparing surfaces for seeding. It can be used in hard and rocky soils. A roller attachment firms up the turf surface. Seeding box attachments allow seeding at the same time as aerating, in a one-pass process.



Rototiller: Used to fracture and break up soil for turf renovation and preparation.



Drag Mat: Used to incorporate seed to make seed-to-soil contact. Available in different sizes, it is pulled behind a utility cart or manually in small areas.



Roller: Firms up the surface and creates seed-to-soil contact after overseeding. The roller is towed behind a utility cart.

REFERENCE GUIDE

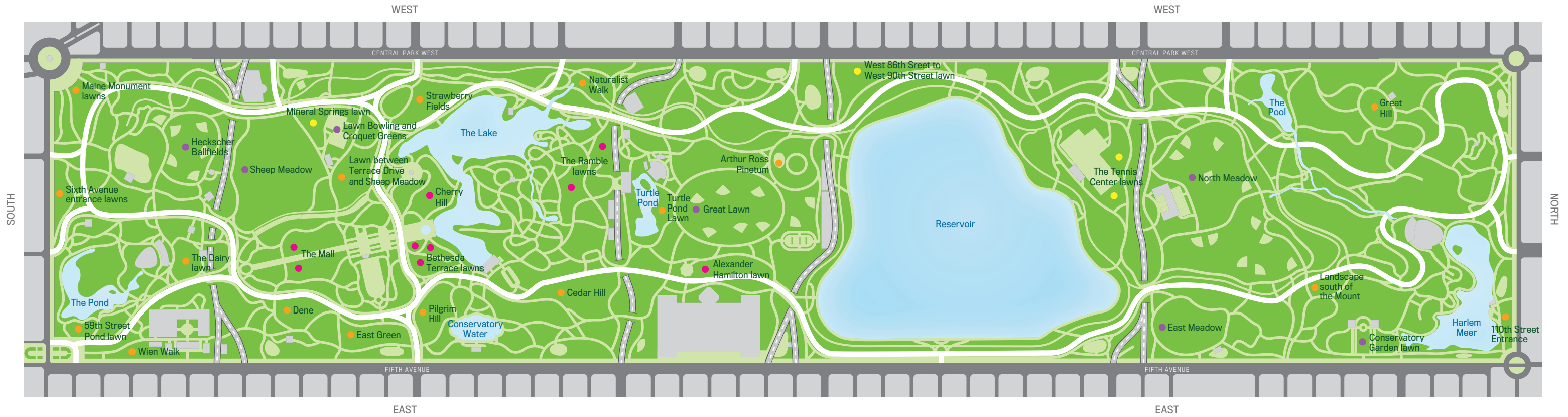


Reference Materials

The following pages contain worksheets for park managers that serve as tools for implementing the turf care principles illustrated in Part Two of the handbook. These worksheets, based on the Conservancy's practices for turf care in Central Park cover lawn classification, mowing, irrigation, aeration, and restoration protocols. They also include instructions for spreader calibration and soil sampling, descriptions of custom seed mixes, and a sample budget worksheet with items to consider when developing a turf care program.

If you have further questions about these reference materials, please contact the Institute for Urban Parks at institute@centralparknyc.org.

Central Park Map



● "A Lawns"

Highest level of use and maintenance. Here is a complete list of locations:

- Heckscher Ballfields
- Sheep Meadow
- Lawn Bowling and Croquet Greens
- The Great Lawn
- The East Meadow
- The North Meadow
- The Conservatory Garden lawn

● "B Lawns"

Passive and highly visible recreation spaces with historic significance. Here is a complete list of locations:

- Maine Monument lawns
- Sixth Avenue entrance lawns
- 59th Street Pond lawn
- Wien Walk
- The Dairy lawn
- East Green
- Strawberry Fields
- Lawn between the Terrace Drive and Sheep Meadow
- The Dene
- Pilgrim Hill
- Cedar Hill
- Naturalist Walk
- Turtle Pond lawn
- Arthur Ross Pinetum
- Great Hill
- Landscape south of the Mount
- East 110th Street Entrance lawns

● "C Lawns"

Low user demand and visibility. Here are some of the locations:

- The Mall
- Cherry Hill
- Bethesda Terrace lawn
- Alexander Hamilton lawn
- The Ramble lawns

● "D Lawns"

Light use, or are allowed to absorb heavier use from nearby spaces that are more manicured. Here are some of the locations:

- Mineral Springs lawn
- West 86th Street to West 90th Street lawn
- The Tennis Center lawns

Lawn Classification

Turf Classification

Features

Access

Turf Care Practices

	A LAWN	B LAWN	C LAWN	D LAWN
Features	<ul style="list-style-type: none"> Most popular, iconic, or historic Event spaces Athletic fields Passive recreation 	<ul style="list-style-type: none"> Historic Event spaces Passive recreation 	<ul style="list-style-type: none"> Secondary aspect of landscape Low usage Passive recreation 	<ul style="list-style-type: none"> Low usage
Access	<ul style="list-style-type: none"> Permitted (most) Scheduled openings/closings Permanently fenced Closed for winter Red Flag System 	<ul style="list-style-type: none"> Permitted (some) Scheduled Openings/closings Permanently fenced or fenced for dormant season only Closed for winter Red Flag System 	<ul style="list-style-type: none"> Unpermitted Limited openings/closings Limited fencing Closed for winter (some) 	<ul style="list-style-type: none"> Unpermitted Closed for renovation only Limited or no fencing Open year-round
Turf Care Practices	<ul style="list-style-type: none"> Mowed 2 to 3 times per week In-season aeration Automatic irrigation Scheduled maintenance Scheduled fertilization and compost tea application Scheduled IPM applications 	<ul style="list-style-type: none"> Mowed 1 time per week In-season aeration or as needed Automatic or manual irrigation Scheduled maintenance Scheduled fertilization and compost tea application IPM applications only as needed 	<ul style="list-style-type: none"> Mowed as needed Aeration as needed Limited manual irrigation Maintenance as needed Fertilization for renovation only IPM applications for renovation only 	<ul style="list-style-type: none"> Mowed as needed Aeration for renovation only Limited manual irrigation or no manual irrigation Maintenance as needed Fertilization for renovation only IPM applications for renovation only

Mowing Protocols

Turf Classification

Scheduling – Time of Day

In-Season Frequency

Optimum Turf Height

Dominant Turf Species

Equipment

Leaf Mulching & Removal

	A LAWN	B LAWN	C LAWN	D LAWN
Scheduling – Time of Day	5:00 am – 11:00 am	5:00 am – 2:00 pm	5:00 am – 2:00 pm	5:00 am – 2:00 pm
In-Season Frequency	April – June 2x July – August 1x Sept – Oct 2x Nov – Final cut	1x per week	As needed	As needed
Optimum Turf Height	2.5" 3" 2.5" 2.5"	3"	3"	3"
Dominant Turf Species	<ul style="list-style-type: none"> Perennial Ryegrass Kentucky Bluegrass 	<ul style="list-style-type: none"> Perennial Ryegrass Kentucky Bluegrass Tall Fescue Fine Fescue 	<ul style="list-style-type: none"> Perennial Ryegrass Kentucky Bluegrass Tall Fescue Fine Fescue 	N/A
Equipment	Large area 11-foot mower	<ul style="list-style-type: none"> Large area 11-foot mower Small area 6-foot mower Walk behind mower 	<ul style="list-style-type: none"> Large area 11-foot mower Small area 6-foot mower Walk behind mower 	<ul style="list-style-type: none"> Large area 11-foot mower Small area 6-foot mower Walk behind mower
Leaf Mulching & Removal	<ul style="list-style-type: none"> Minimal mower mulching Manual removal 	<ul style="list-style-type: none"> Mower mulching Manual removal 	<ul style="list-style-type: none"> Mower mulching Manual removal 	As needed

Irrigation Protocols

Turf Classification	A LAWN	B LAWN	C LAWN	D LAWN
System Type	Automatic	Manual	Manual	Manual
Scheduling – Time of Day	Overnight, 11:00 pm – 6:00 am	· 7:00 am – 2:00 pm · Overnight, 11:00 pm – 6:00 pm (automatic)	7:00 am – 2:00 pm	7:00 am – 2:00 pm
In-Season Frequency	Alternate days	· 2x per week · Alternate days (automatic)	As needed	As needed
Optimum Water Volume	0.3-0.5" per watering	N/A	N/A	N/A
Equipment	· In ground rotary sprinkler · Manual – as needed	· Roller base · Manual · In ground rotary sprinkler	· Roller base · Manual	· Roller base · Manual

Aeration Protocols

Turf Classification	A LAWN	B LAWN	C LAWN	D LAWN
Scheduling – Frequency	5x per year	1 – 2x per year	As needed – 1x per year	As needed
Hollow Tine Aerator	1x – fall	1x – fall	For renovation	For renovation
Walk-Behind Drum Aerator	As needed – used for entrances	1x – spring 1x – fall	1x – spring or fall	As needed
Deep Tine Aerator	1x – May/June 1x – July/August	N/A	N/A	N/A
Rotary Decompaction Aerator	1x – May 1x – August	N/A	N/A	N/A

Spreader Calibration Worksheet

1. Determine speed.
2. Determine effective width:
observed width in feet x 0.70 = _____ (A).
3. Determine recommended rate of product = _____ (B).
4. Determine area based on recommended rate.
 - a. Length of calibration:
 $1,000 \text{ square feet} \div A \text{ (from above)} = \text{_____ (C)}$.
 - b. Mark calibration start and stop points
(the length of C from above).
5. Set spreader to recommended setting on label
(if available).
6. Put known amount of product into the spreader:
Weight = _____ (D).
7. Apply material across the calibration length (C).
8. Weigh the remaining material:
Weight = _____ (E).
 - a. $D - E = \text{_____ (F)}$: this is the amount of product applied.
 - b. If F is greater than B: reduce opening on spreader.
 - c. If F is less than B: increase opening on spreader.
9. Adjust spreader setting and repeat steps 6 to 8 until $F = B$.

EXAMPLE

1. We test a product with our spreader and know we are going 3 miles per hour.
2. We measure the width of material applied at 3 miles per hour is 12 feet. $12 \times 0.70 = 8 \text{ feet (A)}$.
3. Recommended rate of product = **5 pounds (B)** per 1,000 square feet.
4. $1,000 \text{ square feet} \div 8 \text{ feet (A)} = 125 \text{ feet (C)}$.
5. Set spreader to known setting.
6. Weigh product and place in spreader.
Weight = **10 pounds (D)**.
7. Apply material length of **125 feet (C)**.
8. Weigh the remaining material.
Weight = **7 pounds (E)**.
 - a. $10 \text{ pounds (D)} - 7 \text{ pounds (E)} = 3 \text{ pounds (F)}$.
 - b. F is less than B: increase opening on spreader.
9. Increase opening on spreader and repeat steps 6 to 8.

Soil Sampling Instructions

1. Evaluate your sampling area carefully. Be aware of natural or artificial landscape features to define your sampling plan.
2. Each soil sample submitted for testing should be 1 - 2 lb. composite or mixture of approximately 6 - 12 separate scattered samplings taken over a well-defined area. If necessary, label a drawing or map and send a copy along with submission.
3. You can distinguish soils in many ways such as landscape features and/or past treatments. Please note these items (e.g. bottom or top of slopes, curb line).
4. **Avoid sampling soils when:**
 - a. You recently executed any application such as fertilizer and/or pesticide, etc.
 - b. They are very wet, such as during or right after rain, unless the area is always saturated.
 - c. They are located directly at the bottom of a slope.
 - d. They are located along the edge of an area.
5. Using a spade, auger, or soil probe, obtain a representative sample. For established turf, this means, on average, the top six inches of soil.
6. Remember to label the outside of each soil sample bag so that the soil labs can provide you with the relevant results.

Seed Mixes

The Conservancy is often asked what seed mixture is used for overseeding. Currently, the Conservancy uses four different seed mixtures in Central Park:

Bluegrass 80/20 – 80% Kentucky Bluegrass and 20% Perennial Ryegrass

This blend is used on “A Lawns,” where there is a desire for a high quality lawn and a high amount of sunlight is available. Kentucky Bluegrass is a high maintenance grass species, requiring scheduled fertility applications to provide nutrients that promote growth and core aeration to limit thatch accumulation.

Shade Mix – 45% Fine Fescue, 30% Tall Fescue, 15% Kentucky Bluegrass, and 10% Perennial Ryegrass

As the name implies, this mixture is used in locations with low amounts of sunlight. The combination of four different turf grass species also allows use of this mixture in locations where diversity is desired. Diversity of grass species in a lawn is desirable because when one species is not performing well, another may be successful and persist.

Tall Fescue – 85% Tall Fescue and 15% Kentucky Bluegrass

This mixture is used on all classifications of lawns at Central Park. Tall Fescue is a lower maintenance grass that (after establishment) has lower fertility, irrigation, and aeration requirements relative to Kentucky Bluegrass and Perennial Ryegrass. Tall Fescue has the ability to perform well in full sunlight and shade, which allows for the use of this mixture on many lawns.

Tri Ryegrass – 100% Perennial Ryegrass

Perennial Ryegrass is a fast-germinating grass seed and following germination, seedlings are more tolerant to traffic relative to other grass species. This mixture is used when there is a desire of a quick cover for lawns that are being actively used. This scenario of wanting a quick cover that supports active use is very common in many urban parks. Perennial Ryegrass has moderate maintenance requirements, falling in between Kentucky Bluegrass and Tall Fescue. This mixture is used in all lawn classifications and in the greatest quantities. Perennial Ryegrass will germinate later in the season than other grass species as temperatures drop. If there is a need to seed after the middle of November, a selection of Perennial Ryegrass would be made. This mixture is used for overseeding soccer fields for the reasons previously mentioned (rapid germination and tolerant to traffic and to germinating in colder soil temperatures).

Seed Mix Specifications

The Conservancy currently use the following seed mixes:

Type	Breakdown	NTEP Turfgrass Quality
Bluegrass 80/20	12% Nuglade Kentucky Bluegrass	6.2
	12% Solar Eclipse Kentucky Bluegrass	6.3
	12% Everest Kentucky Bluegrass	6.2
	12% 4-Season Kentucky Bluegrass	5.7
	12% Award Kentucky Bluegrass	6.3
	10% Rugby II Kentucky Bluegrass	5.9
	10% Everglade Kentucky Bluegrass	6.3
	10% Paragon GLR Perennial Ryegrass	6.4
	10% Revenge GLX Perennial Ryegrass	6.3
Shade Mix	30% Intrigue 2 Chewing Fescue	6.8
	15% Nuglade Kentucky Bluegrass	6.2
	15% Audubon Creeping Red Fescue	No Rating
	30% Falcon V Tall Fescue	6.2
	10% Paragon GLR Perennial Ryegrass	6.4
Tall Fescue	85% Falcon V Tall Fescue	6.2
	15% Nuglade Kentucky Bluegrass	6.2
Tri Ryegrass	34% Manhattan 5 GLR Perennial Ryegrass	6.1
	33% Paragon GLR Perennial Ryegrass	6.4
	33% Revenge GLX Perennial Ryegrass	6.3

Budget Worksheet: Turf Care Program

Equipment	Cost	Annual	Cost
Turf Tractor		Seed	
Aerator Attachment		Fertilizer	
11-foot Mower		Turf Care Control Products	
48-inch Mower		Materials/Supplies	
String Trimmer		Topsoil	
Utility Vehicle		Sand/Topdressing	
Drag Mat		Fencing	
Roller		TOTAL	
Rotary Spreader		Staffing	Annual Salary (including overhead)
Soil Profile Sampler		Manager/Technician	
TOTAL		Support Staff	
Optional Equipment	Cost	Park Enforcement Staff	
Top Dresser		TOTAL	
Pendulum Spreader		TOTAL BUDGET COST	
Boom Sprayer			
Rotary Decompactor			
Walk-behind Drum Aerator			
Rototiller			
6-foot Mower			
22-inch Mower			
TOTAL			

NOTES

Restoration Protocol Checklist

Following are the steps for routine turf restoration:

1. Conduct soil tests to determine the need for fertilizer or soil amendments.
2. Specify seed species and cultivars based on use and site conditions, amount of sunlight, and drainage.
3. Fence work area boundaries to limit foot traffic before restoration and help the establishment of new grass.
4. Prior to cultivation, locate and flag irrigation heads or other infrastructure that may be damaged by equipment.
5. Mow at a lower range of 2.5 inches.
6. Cultivate soil using core aerifier and/or verticutter.
7. Overseed. General guidelines are as follows:
 - Perennial Ryegrass at 5 pounds per 1,000 square feet.
 - Kentucky Bluegrass at 3 pounds per 1,000 square feet.
 - Tall Fescue at 7 pounds per 1,000 square feet.
 - Shade Mix at 5 pounds per 1,000 square feet.
8. Apply fertilizer, sand topdressing, and/or other soil amendments (but not leaf mold) as determined by soil tests.
9. Incorporate seed using drag mats, rolling when necessary, such as when the surface of the turf has been lifted or disrupted by the operation of the equipment.
10. If necessary, install jute mesh erosion control matting on slopes that may erode before new grass is fully established.
11. If necessary, apply straw/hay mulch to hold moisture and heat during cool fall nights.
12. Irrigate daily during establishment.

Credits

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