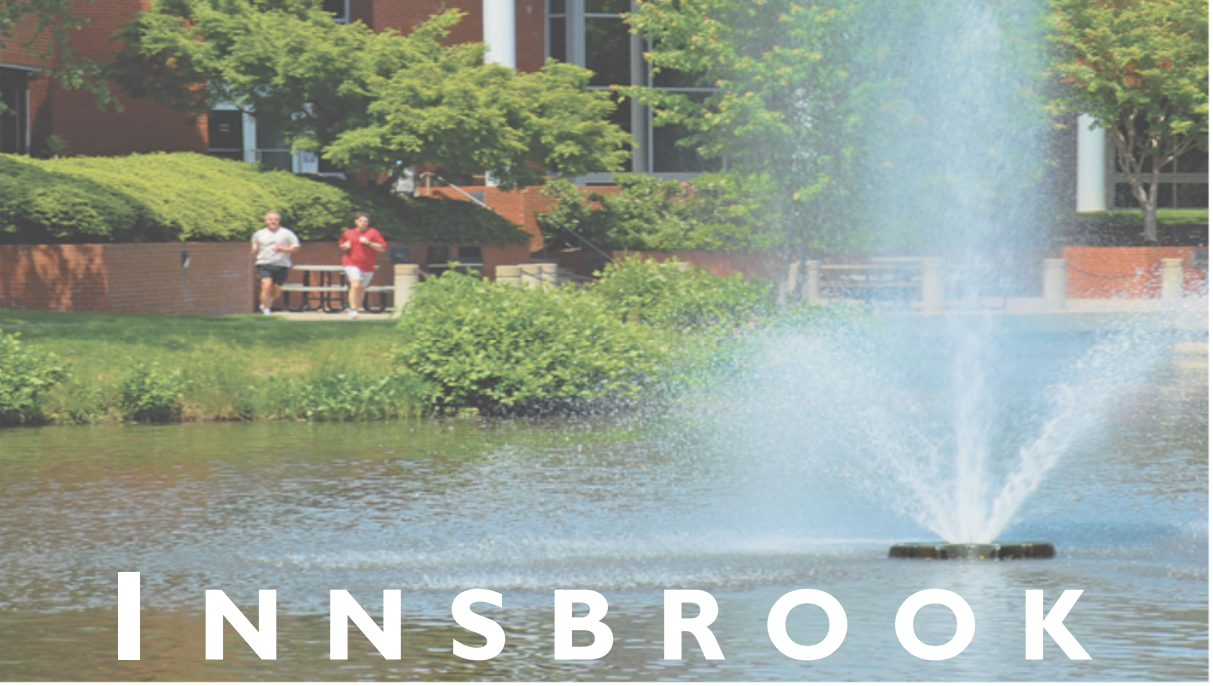
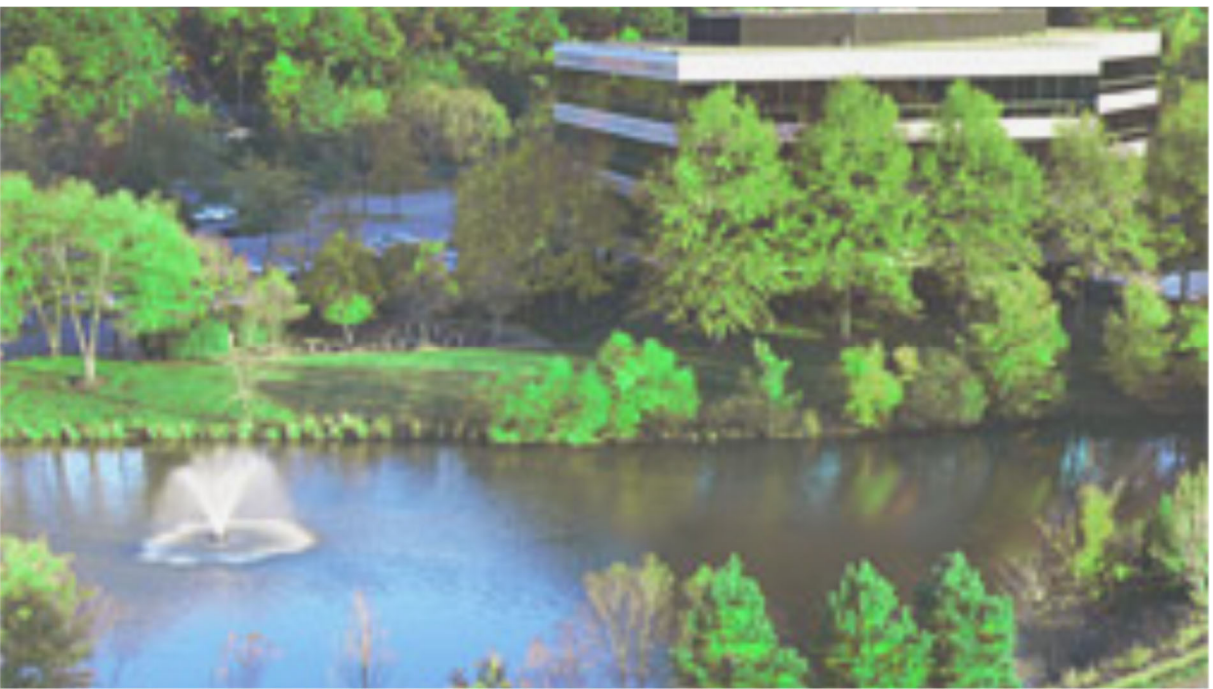


# INNSBROOK

## LANDSCAPE DESIGN GUIDELINES UPDATE

SEPTEMBER 1, 2019



Prepared by:

HG design studio

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# INTRODUCTION

## Intent of the Guidelines

These guidelines operate on two levels: first, as an outline of best practices in landscape design, installation, and maintenance that will be adopted by the Innsbrook Owner's Association (IOA) for all public areas of the park; and second, as a series of requirements and suggestions that may be adopted by private developers within the park. All recommendations are intended to reinforce the goals of the Innsbrook Infrastructure Innovation District (I3D): efficiency, resiliency, and inspiration. The recommendations are also intended to support Innsbrook's goal of being approved as a Regional Stormwater Management System by the Virginia Department of Environmental Quality. To this end, the Landscape Design Guidelines Update addresses planting but also the related topics of stormwater management, water use, soils best practices, maintenance, and documentation and reporting. The goal of Innsbrook 2.0 is to enhance the aesthetic, environmental, and stormwater management elements of the site.

## How the Guidelines Were Developed

In February 2019 the Innsbrook Owner's Association, through Highwoods Properties, engaged HG Design Studio to review the existing 2017 Innsbrook Mixed-Use District Urban Design Guidelines with an eye to updating the recommendations using a more holistic and integrated approach. This current document augments, and in some cases supersedes, the Landscape Design Standards section of the 2017 document.

# PARTNERS AND VENDORS

Organizations
- VCU Rice Rivers Center
- Tricycle Gardens
- Shalom Farms
- Virginia Cooperative Extension
- Sustainable Sites Initiative (SITES)

Maintenance Groups
- Bright View
- Chapel Valley
- Clarke Aquatics
- James River Nurseries

Property Managers
- Highwoods Properties
- Commonwealth Commercial

Vendors:
- Deep Root Partners (Silva Cell)
- Wildflower Farm (Eco-Lawn)
- Project Green (organic turf care)

Nurseries
- North Creek Nurseries, Landenberg, PA - perennials

# LANDSCAPE STRATEGY

These landscape guidelines propose a framework within which Innsbrook will move toward a more sustainable future. The Innsbrook Owner's Association is not looking for visual homogeneity, but overall design coherence and even more importantly, a more forward-looking ethos in design and maintenance of the property.

The following are certain core precepts that the Innsbrook Owner's Association (IOA) will implement:

- Establish quarterly coordination meetings for all on-site maintenance contractors
- Get buy-in from property managers on new direction for the park and related aesthetic
- Require project teams for any new development to include an integrated design team, including:
    - Professionals knowledgeable in design, construction, maintenance, and sustainable practices
    - Professionals with expertise in vegetation, water, soils, landscape ecology, materials, and human health and wellbeing
- Require all projects to do a pre-design site assessment including water, soils, vegetation, materials inventory and to create soils and vegetation protection zones
- Prohibit turf planting or use of fertilizers and pesticides within a minimum 10-foot buffer area around all bodies of water.

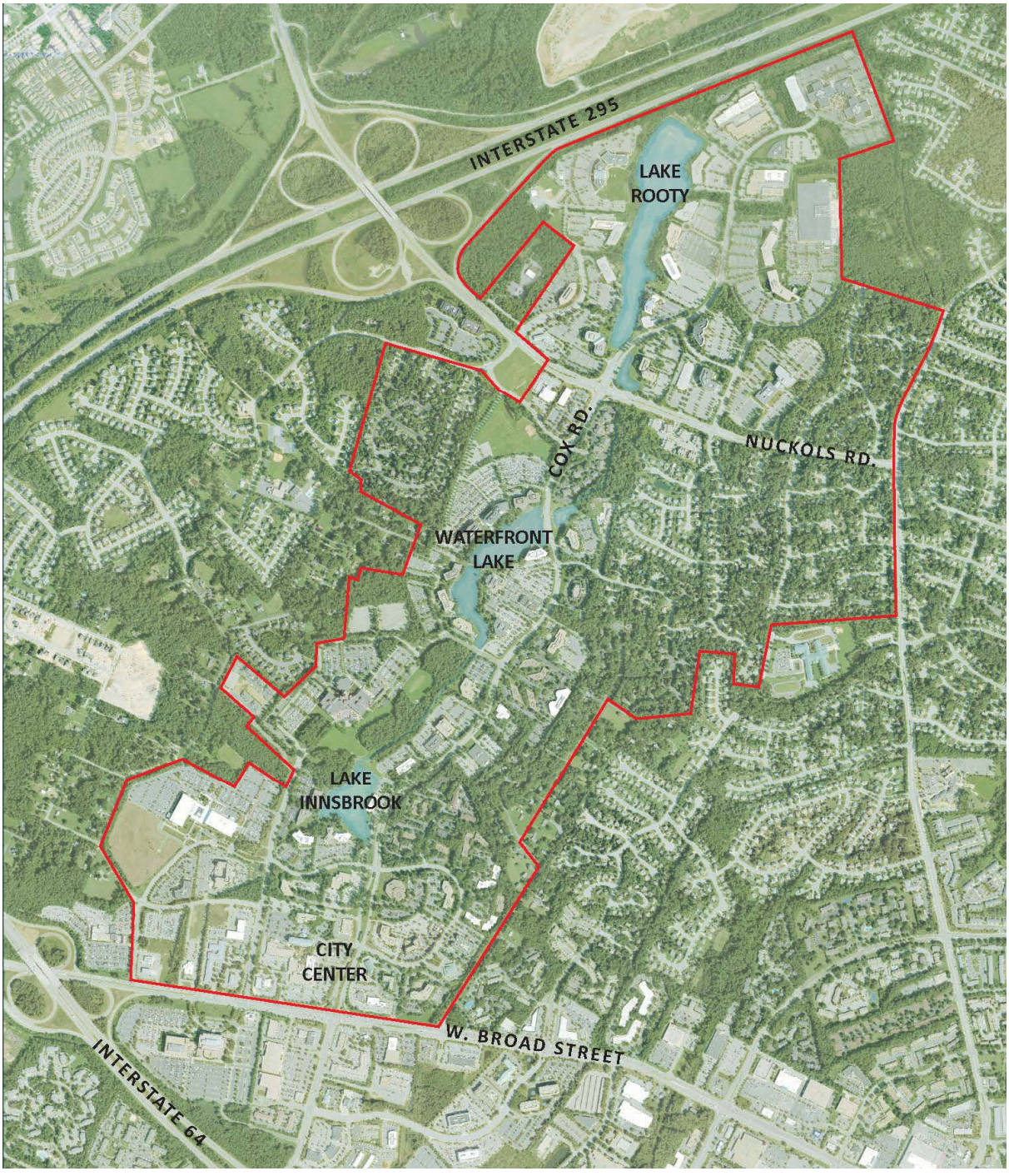
There are many recommendations for future development in the detailed sections that follow, but a few salient items include:

- Encourage new development projects to follow the principles of the Sustainable Sites Initiative (SITES, see page 8) and to apply for certification
- Care should be taken to preserve existing mature vegetation within the park, understanding that the increased densification that is encouraged in the City Center may make this goal difficult. (see Tree Protection specification in Appendix 2 on page 64)
- Encourage minimization of turf areas. Where turf is needed, encourage use of lower-maintenance, low-input lawn species (see Turf section, page 45)
- Discourage use of commercial fertilizers and pesticides throughout the park and encourage development of biologically active soils through the use of compost and compost teas (see Soil Best Practices section, page 19)
- Encourage all new projects to have a construction oversight plan and site maintenance plan (see Maintenance section, pages 46-67)
- Encourage on-site composting
- Encourage innovation

# INNSBROOK SITE ZONES

There are different site zones at Innsbrook. Landscape strategies will differ from zone to zone. In order from more natural to more constructed, they are:

- Lake frontage (10' buffer) and natural areas
- Open park space and trails
- Immediate building environs including parking lots and service areas
- The developing City Center is the most dense and urban area within Innsbrook.



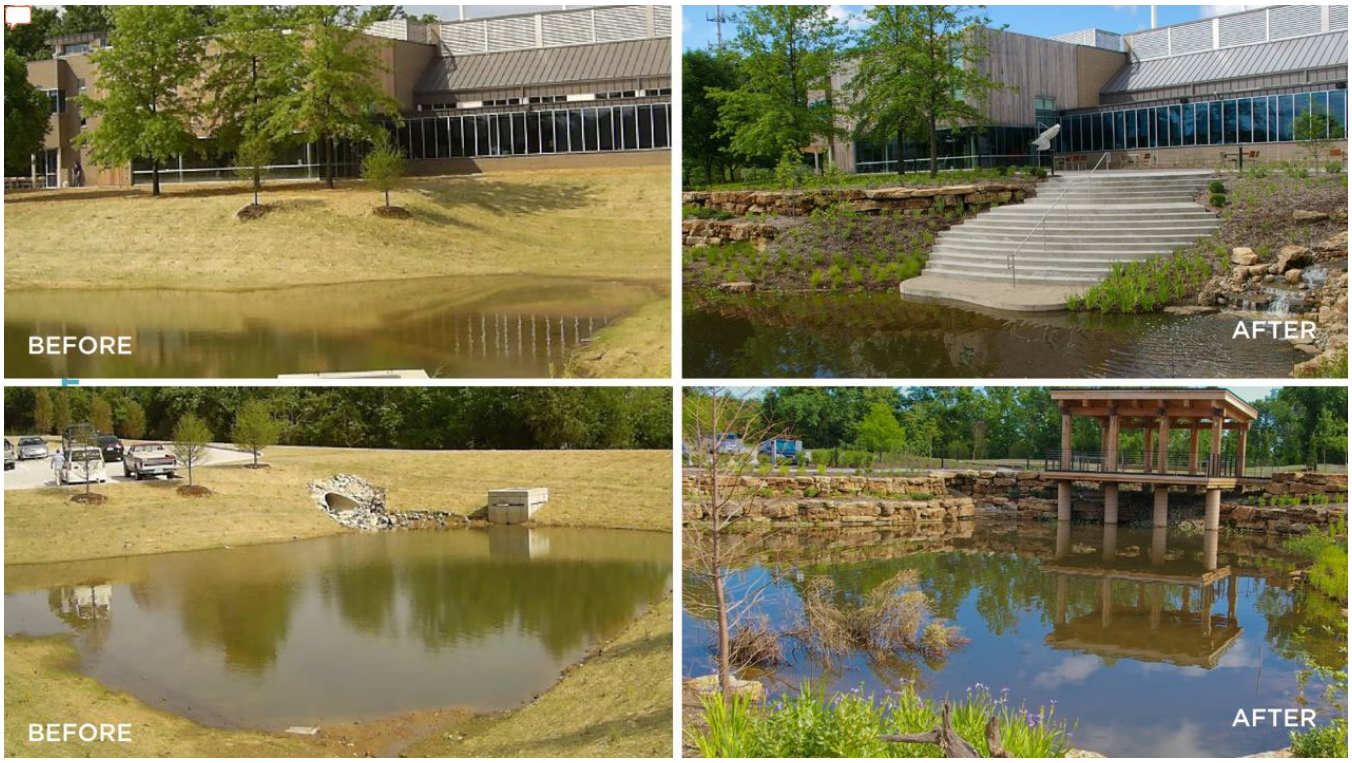
# S.I.T.E.S.

The Sustainable SITES Initiative (SITES) is a comprehensive land design and development rating system that is being used by both private and public sectors all around the world. SITES certification is given to landscapes, site infrastructure, and spaces that demonstrate a high level of environmental and social sustainability. The SITES rating system is administered by Green Business Certification Inc. (GBCI), the premier organization independently recognizing excellence in green business industry performance and practice throughout the world (GBCI also administers LEED). Like LEED, pursuing SITES certification and using the rating system ensures that projects meet high standards and keeps everyone accountable. LEED does not offer sufficient points in the sustainable sites categories to truly incentivize comprehensive environmental site design approaches, which are desired at Innsbrook to protect the amenities of the lakes and streams, protect the James River, and protect the Chesapeake Bay. Because the value of landscapes *increases* over time as plants mature, soils improve, and habitats develop, the value of healthy, sustainable sites to human wellbeing is incalculable.

The SITES rating system starts with a series of prerequisites, goes through the site analysis and design process, through construction, and beyond to maintenance and ongoing operations. It is an integrated approach addressing the full lifecycle of a project. It is a flexible system and applicable to a wide range of projects. SITES projects pick and choose from a variety of sustainable strategies and outcomes that are worth "points" which are designed to create beautiful, functional, and resilient places that strike a healthy balance between people and nature.

Encouraging new-construction projects at Innsbrook to register for SITES certification could provide a useful framework for pushing the park in a more contemporary, sustainable direction and fostering leadership in industry and professional practice. It is a model for transformation. There are powerful PR and storytelling benefits associated with certification. Sustainability is not merely an add-on to their strategy, it is a fundamental piece of the strategy. SITES enables clients to walk the talk and demonstrate to prospective and current employees, visitors, and other users that they care about the environment and that they value those who are living, working, and using their outdoor spaces. It has become increasingly evident that a sound sustainability strategy drives innovation and employee engagement; it attracts people to visit and benefit from a project whether it be a park or corporate campus; it demonstrates compliance and leads to market differentiation - all key ingredients for long-term growth and profitability.

*(Source: SITES v2 Reference Guide for Sustainable Land Design and Development)*




SITES-certified commercial office building in Missouri)

# Green Infrastructure Benefits

**Improved Health and Wellbeing**

Natural spaces produce mental health, cognitive function, and stress reduction benefits, as well as increase community cohesion. Multiple demonstrated studies show the benefit of high-performing landscapes on human wellbeing.

**Societal and Economic Benefits**

Like LEED, SITES places a focus on encouraging sustainable business practices that extend beyond the landscape and into the everyday. SITES projects tend to create a sense of community due to their attention to community infrastructure and access to public transportation. Additionally, these projects support the domestic economy as SITES draws heavily on local service providers and calls for materials to be manufactured within a 500 mile radius.

**Decrease in Material Resources**

SITES projects use fewer resources at a project's inception and throughout the life of a project by using materials with recycled content and by using durable and reclaimed materials. SITES places an emphasis on using regionally sourced supplies and materials, which not only helps the local economy, but reduces transportation costs and energy consumption.

**Better Management of Stormwater and Water Use**

SITES projects use less water by using the right plant for the right place and using captured rainwater or stormwater runoff – all saving potable water and reducing water bills. Sustainably designed stormwater management can increase infiltration and groundwater, reduce runoff, and be a beautiful focal point of a project.

**Improved Air Quality**

SITES projects produce better air quality and provide a healthier and happier environment for people by offering access to the high quality landscapes, fresh air and reduced contaminants in the space. This also optimizes health and well being – very important factors since we spend 90% of our lives indoors.

**Cooling Benefits**

Plants shade surfaces and also provide cooling through evapotranspiration by absorbing solar energy. By properly selecting and locating vegetation, SITES projects can reduce urban heat islands, provide comfortable outdoor spaces, and aid in shading and cooling buildings. Cooler environments equal less smog and less energy consumption and improved health.

# GREEN INFRASTRUCTURE BENEFITS

**Healthier, More Resilient Landscapes**

Sustainably designed projects are more resilient. Landscapes designed for resiliency through green infrastructure are able to avoid damage, reduce risk, mitigate pollution, and protect grey infrastructure. SITES projects are more resilient because they incorporate and protect native vegetation, healthy soils and existing ecosystems.

**Reduced Energy Consumption & Decreased Operating Costs**

SITES projects help to save money. Studies show that sustainably designed outdoor spaces can use less energy by utilizing energy-efficient equipment and lighting, by strategically placing trees and other vegetation near or on buildings, and by taking advantage of alternative energy such as solar, geothermal and wind – to name a few.

These strategies not only lower utility bills, they also reduce the need for dependence on foreign fuel sources and help reduce carbon emissions. Studies have shown that SITES projects can produce the following financial benefits:

- Capital cost savings of 15-80%
- Reduction in energy consumption by 10-50%
- The use of rain gardens cost 42% less over their lifecycle than conventional infrastructure
- Every $1 spent on tree management yields 2-5x in cleaner air, lower energy costs, and improved water quality and stormwater control
- Projects with trees and other inviting green spaces show increased property values of 3-15%.

*(Source: SITES v2 Reference Guide for Sustainable Land Design and Development)*

# RECOMMENDATIONS

SITES guidelines include recommended strategies for incorporating sustainable design and development initiatives that address the following areas:

- Human Health + Wellbeing
- Stormwater Management
- Water Use Management
- Soil Best Practices
- Planting Design
- Plant Lists and Palettes
- Turf
- Maintenance
- Documentation and Reporting

The following pages include more detailed information on each of these areas as well as recommendations and requirements for designing a more sustainable landscape at Innsbrook.

# Human Health + Wellbeing

It is a goal of the Innsbrook 2.0 community to create an "active lifestyle park" that supports healthy living and human interaction. This can be accomplished in the landscape through the following means:

**Address Safety and Accessibility**

- Adopt universal design practices to allow use of the site by all people to the greatest extent possible
- Ensure adequate light levels
- Install vegetation and amenities so as not to create hiding places
- Include clear signage and wayfinding devices
- Incorporate clear site lines into the design

**Create Spaces for Mental Restoration**

- Design a variety of quiet outdoor spaces with seating and elements to address microclimate (utilizing strategies like shade and windbreaks)
- Create a series of smaller-scale spaces, which are comfortable for people to occupy, rather than one large open space
- When possible, connect outdoor open spaces with interior common spaces
- Provide multisensory amenities to enhance users aesthetic experience of the site. Such amenities include: plantings, art, water features, green walls, and framed views.
- Provide views of outdoor vegetation from within buildings
- During the design process work with stakeholders to understand what design features are important to them

**Promote Physical Activity**

- Provide supportive elements such as bike racks, lockers, or showers
- Provide a bike/scooter share system
- Provide a continuous sidewalk system throughout the park which connects to a continuous trail system
- Include bike paths
- Create outdoor play areas or fitness courses

# HUMAN HEALTH + WELLBEING

**Support Social Interaction**

- Design gathering spaces in a variety of sizes in order to accommodate small intimate groups or large gatherings
- Carefully consider the needs and ages of user groups when creating gathering spaces
- Possibly include on-site food production (community garden, fruit trees/shrubs, farmer's market, etc.)
- Keep designated smoking areas distant from building entrances

**Encourage Fuel Efficient and Multi-Modal Transportation**

- Establish relationships with agencies responsible for regional bicycle and transit systems
- Provide opportunities for multi-model transportation (including autonomous, and on-demand services) with the goal of cutting the car-to-employee ratio in half. Such a transportation system could include bike lanes, bike and scooter rentals, ride-hailing pick-up, car membership services, and shared parking—all facilitated by comprehensive, coordinated information system
- When possible, design narrower grid streets to offer multiple routes in a more pedestrian friendly environment

# Stormwater Management

A Stormwater Management Plan must be presented to the IOA for all new projects as part of Innsbrook 2.0. The lakes currently handle a 962 acre watershed and remove approximately 490 pounds of phosphorus annually. Additional recommended strategies for stormwater management are as follows:

- Design functional stormwater features (bioswales, rain gardens, vegetated roofs, etc.) as amenities
- Ensure discharge volume and rates don't increase natural rate of erosion in receiving waters or negatively affect natural groundwater replenishment rates and volumes
- Implement strategies to reduce precipitation runoff volumes, peak flows, and pollutant discharges (see below)
- Increase evapotranspiration and infiltration
    - Minimize impervious surfaces
    - Drain hard surfaces into localized depressed landscape areas (disconnection)
    - Include infiltration opportunities such as bioswales, rain gardens, French drains, vegetated buffers
    - Use vegetated channels rather than hard materials for conveyance
    - Select plants that can handle inundation as well as pollutants
    - Incorporate constructed wetlands
- Increase organic matter in soil through adding amendments to increase water retention
- Use rainwater-harvesting to reduce runoff volume and rate
- Minimize use of materials that generate pollutants such as copper and zinc, galvanized materials, and treated lumber
- Use Integrated Pest Management (IPM) practices for pests rather than toxic chemicals
- Minimize the use of fertilizers, or when necessary, use slow-release coupled with optimized application timing for plant uptake
- Incorporate maintenance practices that reduce exposure of pollutants to stormwater:
    - Minimize exposure of stored materials to precipitation
    - Develop a chemical-spill response plan

# STORMWATER MANAGEMENT

    - Minimize use of salt and other harmful de-icing chemicals
    - Avoid on-site maintenance and fueling of construction equipment
- Create an Infrastructure Innovation District - a living lab to develop new stormwater management techniques
- Conservation Design
    - Reduce pavement widths
    - Use shared driveways and other pavements
- Infiltration / Filtration practices
    - Rain gardens / bioretention
    - Vegetated swales
    - Infiltration basins
    - Permeable paving
    - Buffer strips to reduce particulate phosphorus
- Runoff storage practices
    - Parking lot, street, sidewalk runoff storage ("green streets")
    - Cisterns
    - Green roofs
    - Depression storage in landscape islands or other planted areas
    - Ponds
- Runoff conveyance practices
    - Reduce curb & gutter
    - Introduce grassed swales
    - Create long flow paths over landscaped areas
    - Creating terraces and check dams
- Low Impact Landscaping
    - Native, drought-tolerant plants
    - Convert turf to shrubs and trees
    - Reforestation
    - Encourage longer grass length
    - Plant meadows rather than turf
    - Amending soil to improve infiltration
- Maintenance
    - Reduce fertilizer-laden runoff to reduce Cyanobacteria, aka Blue-Green Algae
- Geese mitigation through lights, buffer plantings, statues, and dogs

# Water Use Management

The successful management of water use is tightly linked with the soils having an optimal physical profile as well as selecting and grouping plants that are appropriate for the natural conditions. If the soil is compacted or poorly aggregated, rainwater or applied irrigation water will run off rather than infiltrate the soil and get to the plant roots, where it is needed. Conversely, if too much water is absorbed into the soil, it can carry soluble nutrients to the groundwater and eventually to the surface water, leading to problems with water quality. The risk of leaching of soluble nutrients like nitrites is greater in the late fall and winter when plants are dormant and their roots are taking up less water. The water management system must also be acutely modulated relative to changing weather. Beyond currently standard water reuse regimens, the IOA encourages the use of innovative water recycling technologies in projects.

**Irrigation Guidelines**

The amount of water needed by turf and plants depends on species, soil type, and weather. Ideally, plantings will be designed to be self-sustaining with natural precipitation only, after the establishment period. Rain sensors must be incorporated in any irrigation systems to eliminate overwatering. This will reduce waste as well as cost. The following irrigation guidelines should be adhered to:

- Water only in the early morning or late at night to minimize evaporation
- Test planting areas for soil permeability
- Use crip irrigation for all plant beds
- For turfgrass, water enough to wet the root zone 6-12" deep, not more than twice per week to encourage deep root growth
- For plant beds, water no more than once per week. A general guideline is 1" of water, but this should be analyzed and revised depending on plant species.
- Select appropriate species that will require minimal additional water
- Irrigation frequency will be higher during plant establishment; every 3-4 days
- Use smart controllers and moisture meters
- Consider the installation of water meters to measure against the base case

**The Use of Reclaimed Water**

Reclaimed water should be used for irrigation. It is important that reclaimed water have appropriate salinity and nutrient levels. Turf grass has different needs and tolerances for both than do landscape plantings. Levels of nitrogen and phosphorus allowed in reclaimed water are tightly regulated through the Virginia Water Reclamation and Reuse Regulation; an exception should be made for edible plantings. Irrigation used on edible plantings should in no way harm human health. Potential sources for reclaimed water include the following:

- Captured rainwater
- Air-conditioner condensate
- Non-potable water supplied by the County
- Blowdown water from boilers and cooling towers
- Recycled graywater
- Recycled wastewater

**Ornamental Water Features**

The installation of ornamental water features is discouraged, but if they are incorporated in new projects, ensure that non-potable water is used for make-up water and that no harmful chemicals, such as chlorine and bromine, are used in maintenance.

**Encouragement of Innovation**

Innsbrook 2.0 encourages all property owners to search for and apply the most forward-thinking protocols in all aspects of site design. The IOA would consider for approval projects that attempt to move away from supplemental irrigation and rely primarily on natural rainfall for the provision of water to plants. (A supplemental source such as a yard hydrant will always be necessary to irrigate plants in conditions of extraordinary drought.) In order to get approval for not installing permanent irrigation, a project would need to demonstrate that it includes bioactive soils and appropriate plant selections to be successful with minimal external inputs of water.

(*Source: Virginia Cooperative Extension's Urban Nutrient Management Handbook)*

# Soil Best Practices

**General Recommendations and Requirements**

- New projects must create "soil protection zones" to eliminate disturbance of healthy existing natural resources
- New projects must present a soil management plan to the IOA prior to construction
- Soil testing is mandated for all new projects (Virginia Cooperative Extension provides this service)
- Private projects must do soil testing every two years and adjust maintenance regimen accordingly
- For lakeside and public spaces, the IOA must do soil testing every two years
- All owners as well as the IOA must have nutrient management plan, updated every two years based on soil testing results
- Properly controlling erosion during and after construction is key for managing nutrients
- The creation of a composting area is encouraged

**Soil Amendments and Conditioners**

- Recommended abiotic materials
    - Non-nutritive materials like perlite, polystyrene, vermiculite, expanded clay pellets, rock wool, sand improve porosity and lighten weight
    - Nutritive materials like rock dust, azomite, greensand, gypsum, Epsom salts, rock phosphate, colloidal phosphate, lime - micronutrients needed in addition to NPK
- Recommended biotic materials: sphagnum and peat moss, coir, composted bark, leaf mold, animal manure, green manure, bone meal, compost

**Fertilizing**

- In general terms, nitrogen encourages leaf growth, phosphorus encourages root growth and flowers/ fruiting, potassium supports many processes
- Use fewer fertilizers, more bioactive materials like green manure rather than imported, commercial fertilizers
- Use legumes (crimson clover, hairy vetch) when possible rather than inorganic fertilizer to supply nitrogen
- Only apply commercial fertilizers after testing reveals deficiencies—not in advance
- Utilizing sustainable forms of plant stimulus in place of fertilizers is encouraged including:
    - Mycorrhizae
    - Solid compost
    - Compost tea

**Soil Management**

- Encourage biological complexity in managed soil systems in order to:
    - Improve nutrient cycling which makes beneficial nutrients more available for plants
    - Improve soil structure, water infiltration, and water-holding capacity
    - Suppress of disease which might otherwise impact plants
    - Degrade pollutants
    - Improve biodiversity
- Incorporate soil management practices that reduce pest pressure and increase biological activity, including:
    - Avoid excess nitrogen
    - Maintain adequate nutrient levels
    - Lessen soil compaction
    - Incorporate diverse organic amendments to encourage diverse soil organisms
    - Utilize mycorrhizal fungi to protect from fungal and nematode attack
    - Select cover crops to suppress parasitic nematodes
    - Leave cover crop residue to reduce weed seed germination

# PLANTING DESIGN

The overarching goal of the planting design recommendations for Innsbrook 2.0 is to recognize that different approaches are appropriate for the different zones within the park. The different zones at Innsbrook, in order from more natural to more constructed, are:

- Lake frontage (10' buffer) and natural areas
- Open park space and trails
- Urban areas including immediate building environs as well as parking and service areas

**General Planting Design Guidelines**

- All new projects must create vegetation protection zones to conserve existing healthy resources
- Use native or naturalized plant species, appropriate for their site conditions and aesthetic intent
- Incorporate trees and vegetated roofs to create a cooler microclimate and reduce urban heat-island effects
- 3.5-4" caliper trees are required by the IOA, but exceptions will be considered
- Create seasonal interest - consider the different aesthetic of plants in winter time
- Strive for low maintenance landscapes
- Adopt the concept of the "plant guild" from permaculture practice, with naturally related species being planted together to support one another
- Cover the ground densely with vertically layered plants, which will help minimize the need for mulch
- Minimize the use of annuals
- Emphasize native and naturalized plants that provide food and habitat for wildlife

**Guidelines for Lake Frontage and Natural Areas**

A major proposed change to the current design of the park is the removal of the majority of mown turfgrass within 10 feet of all lakes. Specific plant lists have been developed for these areas, including a number of groundcovers which will create total coverage to minimize runoff but require far less in terms of fertilization, water, and maintenance than traditional turfgrass. Understanding that the lakes are major aesthetic features of the park in addition to being stormwater BMP's, the recommendation is to include a mixture of shrub and tree species to frame views along with lower perennial and groundcover plantings that keep visual access to the water bodies open. When designing, it will be important to keep in mind the rational fear on the part of trail/park users of snakes and other wildlife that will be attracted to "natural" plantings.

**Guidelines for Immediate Building Environs and City Center**

The more densely constructed areas of the park, in particular, the City Center, are arguably more dependent on successful planting design than are the natural areas. Plantings in an urban setting serve a number of important functions including buffering pedestrians from traffic, creating comfortable walking corridors, shading buildings thereby reducing cooling demands, shading walking surfaces, creating habitable pocket parks within dense built environments, framing building entries, and creating an elegant and welcoming public realm. A hallmark of urban development, as opposed to car-dependent suburban development, is the centrality of the pedestrian experience.

It is a goal of Innsbrook to create a heavily planted network of streets with generous sidewalks connecting buildings as well as a series of pocket parks along the way. The design of urban areas should encourage people to walk or bike rather than use their cars. The urban pedestrian network will connect into the park trail system at appropriate points to encourage walking and biking for workers and residents.

While turfgrass is discouraged within the more natural open park settings, and certainly adjacent to the lakes, limited turf areas within dense urban settings can be of benefit in providing usable green space for people to relax and congregate.

Green walls can be used to define spaces in densely built areas. These walls serve to increase biomass while not taking additional site area.

In order to develop and maintain vigorous shade tree growth in densely constructed areas, updated planting

details are provided in this document (see Appendix 4 on pages 96-99. A typical streetscape does not have large enough volumes of soil for tree root growth. These revised recommendations require the use either of a structural soil mix or a pavement support system such as Silva Cells under sidewalks to increase contiguous soil volume for street trees. Other general standards (many of which are drawn from the 2017 Landscape Design Standards) include the following:

1. Select trees from the Plant Lists in this document. Trees should be selected based on ultimate desired size, spacing, and light conditions.
2. Street trees should be large, deciduous species and should be consistent in contiguous sections of streetscape for visual coherence. There will be enough diversity of species naturally from street to street and block to block that there should not be concern about monoculture.
3. Street trees should be aligned across the street and should be spaced between 25 and 40 feet on center.
4. When possible, street trees should be located on the back of curb to create a buffer between traffic and pedestrians and to allow for the greatest possible pedestrian zone in front of buildings.
5. The ground surface within tree wells should be thoroughly planted with a groundcover or mulched with a non-organic materials such as gravel or river rock.
6. ADA-accessible tree grates can be used when sidewalk conditions are too narrow to allow comfortable passage otherwise. Clear sidewalk width should be a minimum of five feet.
7. Create contiguous volumes of soil for tree root growth using either continuous planters or subsurface connection through the use of structural soil or Silva Cells.
8. Street tree caliper size should be at least 3.5” with a minimum branching height of 5’ above grade. The IOA Architectural Review Committee will have the authority to approve smaller plant sizes in specific circumstances.
9. Ornamental trees may be used in urban areas to augment street tree planting, to mark building entries, and in pocket parks or at intersections.
10. Sufficient root volume for ornamental trees , as with larger shade trees, can be attained either through creating large contiguous planting areas or through the use of structural soil or Silva Cells.
11. Utility lines should be designed so as not to interfere with street tree layout.
12. While some plantings in the urban areas of the park will be connected to an automatic irrigation system, street trees typically are not. The use of Gator Bags is recommended in the case of a hot, dry summer when trees in their establishment period might not have enough water to survive. After their establishment period, street trees should be sustained with rainfall alone.
13. Green roofs are encouraged on all new construction.

**Guidelines for Parking Lots and Services Areas**

Innsbrook encourages parking lots to be planted at well beyond the minimum requirements of Henrico County. Many of the benefits of planting in urban areas apply equally to parking lots: trees contribute to a pleasant environment for pedestrians, help to reduce urban heat-island effect by creating areas of shade, keep the interiors of cars from overheating, and create visible structure to orient people looking for parking spaces. In addition to heavy tree planting, the screening the perimeter of parking areas with shrubs and other lower vegetation is encouraged. The use of depressed, planted areas to accept stormwater runoff should be considered in parking lots.

It is strongly recommended that turf be discouraged and eventually eliminated from parking lot islands. In the long term, replacing turf with other types of plantings in parking lots will decrease water and maintenance requirements and will help to create a more visually rich and ecologically vibrant environment.

**Plant Lists**

The plant lists on the following pages are a general guideline to be used as a resource by the specific project designers for new projects or renovations of existing landscapes. As with all aspects of site design in Innsbrook 2.0, innovation is encouraged.

# PLANT LISTS: LAKESIDE BUFFER

| Botanical Name | Common Name | Spacing | Notes and Size |
|---|---|---|---|
| ***Evergreen Shrubs*** | | | |
| *Ilex glabra 'Shamrock'* | Shamrock Inkberry | 3' o.c. | 3-4' x 3-4', berries |
| *Ilex vomitoria 'Nana'* | Dwarf Yaupon Holly | 3' o.c. | 3-5' x 3-6', berries |
| ***Deciduous Shrubs*** | | | |
| *Aronia arbutifolia 'Brilliantissima'* | Red Chokeberry | 3-4' o.c. | 6-8' x 3-4', good near water |
| *Cephalanthus occidentalis 'Sugar Shack'* | Sugar Shack Buttonbush | 3-4' o.c. | 3-4' x 3-4', blooms June |
| *Clethra alnifolia 'Hummingbird'* | Hummingbird Summersweet | 3' o.c. | 2-4' x 3-5', fragrant blooms July-Aug |
| *Cornus alba 'Elegantissima'* | Variegated Redtwig Dogwood | 5' o.c. | 8-10' x 5-10', variegated, red stems |
| *Cornus amomum* | Silky Dogwood | 6' o.c. | 6-12' x 6-12', good for wet areas |
| *Cornus racemosa* | Gray Dogwood | 8' o.c. | 10-15' x 10-15', good near water |
| *Hibiscus moscheutos* | Swamp Mallow | 3' o.c. | 3-7' x 2-4', blooms July-Sept, wet soils |
| *Ilex verticillata* | Winterberry | 3-5' o.c. | 3-12' x 3-12', berries, good near water |
| *Itea virginica 'Henry's Garnet'* | Virginia Sweetspire | 3' o.c. | 3-4' x 4-6', blooms May-June |
| *Rhododendron viscosum* | Swamp Azalea | 3' o.c. | 3-5' ht, part shade, damp soils |
| *Rosa palustris* | Swamp Rose | 3' o.c. | 3-6' ht, wet soils, summer bloom |
| *Salix purpurea 'Nana'* | Purple Willow | 3' o.c. | 3-5' x 3-5', good near water |
| ***Ornamental Grasses*** | | | |
| *Acorus americanus* | Sweetflag | 12" o.c. | 2-3' ht, water's edge |
| *Calamagrostis x acutiflora 'Karl Foerster'* | Feather Reed Grass | 18" o.c. | 3-5' ht, tolerates wet soil, clay |
| *Carex lurida* | Shallow Sedge | 12" o.c. | 2-3' x 1-2', good erosion control |
| *Carex stricta* | Tussock Sedge | 12" o.c. | 2-3' x 3-5', wet soils |
| *Juncus effusus* | Soft Rush | 12" o.c. | 3' x 1-2', wet soils |
| *Juncus tenuis* | Poverty Rush | 10" o.c. | 6-24" x 6-24", wet soils |
| *Muhlenbergia capillaris* | Pink Muhly Grass | 18" o.c. | 2-3' x 2-3', blooms Sept-Oct |
| *Panicum virgatum 'Shenandoah'* | Switchgrass | 18" o.c. | 2-3' x 2' |
| *Schizachyrium scoparium* | Little Bluestem | 18" o.c. | 2-4' ht, dry soils, tolerates clay |
| *Sporobolus heterolepis* | Prairie Dropseed | 18" o.c. | 2-3' ht, dry soils, full sun |

# PLANT LISTS: LAKESIDE BUFFER

| Botanical Name | Common Name | Spacing | Notes and Size |
|---|---|---|---|
| ***Perennials*** | | | |
| *Asclepias incarnata* | Swamp Milkweed | 12" o.c. | 3-5' x 2', blooms June-July |
| *Aster novi-belgii* | New York Aster | 12" o.c. | 3-5' x 3', blooms Aug-Sept, wet soils |
| *Caltha palustris* | Marsh Marigold | 12" o.c. | 8-12" x 12-18", blooms spring, wet soils |
| *Chelone glabra* | Turtlehead | 12" o.c. | 2-4' x 1-2', blooms late summer, wet soils |
| *Eryngium yuccifolium* | Rattlesnake Master | 18" o.c. | 4-5' x 2-3', blooms summer, dry soils |
| *Eupatorium fistulosum* | Joe Pye Weed | 24" o.c. | 5-8' x 3-4', blooms summer, wet soils |
| *Eupatorium perfoliatum* | Boneset | 30" o.c. | 4-6' x 3-4', blooms summer, wet soils |
| *Iris prismatica* | Slender Blue Iris | 12" o.c. | 1-3' ht, blooms May-Jul, wet soils |
| *Iris virginica* | Virginia Blue Flag | 12" o.c. | 1-3' x 1-3', blooms June, wet soils |
| *Lobelia cardinalis* | Cardinal Flower | 12" o.c. | 2-4' ht, wet soils, summer bloom |
| *Peltandra virginica* | Green Arrow Arum | 18" o.c. | 18-24" x 18-24", blooms spring, in water |
| *Pontederia cordata* | Pickerel Weed | 18" o.c. | 2-4' ht, water's edge, summer bloom |
| *Saggitaria latifolia* | Broadleaf Arrowhead | 12" o.c. | 1-4' ht, wet soils, water's edge |

# Plant Palette: Lakeside Buffer

## Evergreen Shrubs


Ilex glabra 'Shamrock'


Ilex vomitoria 'Nana'

## Deciduous Shrubs


Aronia arbutifolia 'Brilljantissima'


Cephalanthus occidentalis 'Sugar Shack'


Clethra alnifolia 'Hummingbird'


Cornus alba 'Elegantissima'


Cornus amomum

# Plant Palette: Lakeside Buffer

## Deciduous Shrubs (continued)


Hibiscus moscheutos


Ilex verticillata


Rosa palustris


Salix purpurea 'Nana'

## Ornamental Grasses


Acorus americanus


Calamagrostis x acutiflora 'Karl Foerster'


Carex lurida

# Plant Palette: Lakeside Buffer

## Ornamental Grasses (continued)


Carex stricta


Juncus effusus


Juncus tenuis


Muhlenbergia capillaris


Panicum virgatum 'Shenandoah'


Schizachyrium scoparium

Sporobolus heterolepis

# Plant Palette: Lakeside Buffer

## Perennials


Asclepias incarnata


Aster novi-belgii


Caltha palustris


Chelone glabra


Eupatorium fistulosum


Iris prismatica


Iris virginica


Lobelia cardinalis


Pontederia cordata

# PLANT LISTS: PARKS

| Botanical Name | Common Name | Spacing | Notes and Size |
|---|---|---|---|
| ***Canopy Trees*** | | | |
| *Acer rubrum 'Red Sunset'* | Red Sunset Red Maple | 25' min | 40-50' x 30-40', fall color |
| *Acer rubrum 'October Glory'* | October Glory Red Maple | 25' min | 40-50' x 30-40', fall color |
| *Betula nigra* | River Birch | 20' min | 40-70' x 40-60' |
| *Carya ovata* | Shagbark Hickory | 20' min | 70-90' x 50-70', fruit for wildlife |
| *Catalpa bignonioides* | Catalpa | 30' min | 30-60' x 20-40', flowers May-June |
| *Cercidiphyllum japonicum* | Katsura Tree | 20' min | 40-60' x25-60', fall color |
| *Cladrastis kentuckea* | Yellowwood | 20' min | 30-50' x 40-55', fragrant flowers May |
| *Diospyros virginiana* | Persimmon | 20' min | 35-60' x 25-35', edible fruit |
| *Fagus grandifolia* | American Beech | 25' min | 50-80' x 40-80' |
| *Ginkgo biloba* | Maidenhair Tree | 25' min | 50-80' x 30-40', male only |
| *Gymnocladus dioica* | Kentucky Coffeetree | 30' min | 60-80' x 40-55' |
| *Liquidambar styraciflua* | Sweetgum | 30' min | 60-80' x 40-60', away from pathways |
| *Liriodendron tulipifera* | Tulip Poplar | 25' min | 60-90' x 30-50' |
| *Metasequoia glyptostroboides* | Dawn Redwood | 15' min | 70-100' x 15-25' |
| *Nyssa aquatica* | Water Tupelo | 20' min | 50-80' x 25-50', best near water |
| *Nyssa sylvatica* | Black Tupelo | 20' min | 30-50' x 20-30' |
| *Oxydendrum arboreum* | Sourwood | 15' min | 20-50' x 10-25', flowers June-July |
| *Platanus x acerifolia 'Bloodgood'* | London Plane Tree | 25' min | 75-100' x 60-75' |
| *Quercus bicolor* | Swamp White Oak | 30' min | 50-60' x 50-60' |
| *Quercus falcata* | Southern Red Oak | 30' min | 60-80' x 40-50' |
| *Quercus hemisphaerica* | Darlington Oak | 30' min | 40-60' x 30-40', semi-evergreen |
| *Quercus laurifolia* | Swamp Laurel Oak | 30' min | 40-60' x 40-60' |
| *Quercus phellos* | Willow Oak | 30' min | 40-75' x 25-50' |
| *Quercus shumardii* | Shumard Oak | 30' min | 40-60' x 30-40' |
| *Robinia pseudoacacia* | Black Locust | 20' min | 30-50' x 25-35', fragrant flower May |
| *Salix babylonica* | Weeping Willow | 30' min | 30-50' x 30-50', best near water |
| *Sassafras albidum* | Sassafras | 20' min | 30-60' x 25-40', colonize |
| *Taxodium distichum* | Bald Cypress | 25' min | 50-70' x 20-45', best near water |
| *Tilia americana 'Redmond'* | Linden | 30' min | 40-60' x 30-45', fragrant flower June |
| ***Ornamental Trees*** | | | |
| *Amelanchier arborea* | Downy Serviceberry | 12' min | 15-25' x 15-25', spring bloom, fall color |
| *Amelanchier canadensis* | Serviceberry | 12' min | 25-30' x 15-20', spring bloom, fall color |
| *Cercis canadensis* | Redbud | 15' min | 20-30' x 25-35', spring bloom |
| *Chionanthus virginicus* | Fringetree | 10' min | 12-20' x 12-20', flowers May-June |
| *Cornus florida* | Flowering Dogwood | 12' min | 15-30' x 15-30', spring bloom, fall color |
| *Cornus kousa* | Kousa Dogwood | 15' min | 15-30' x 15-30', blooms May-June, fruit |
| *Crataegus viridis 'Winter King'* | Winter King Hawthorne | 15' min | 25-35' x 25-35', blooms May, fruit |
| *Halesia carolina* | Carolina Silverbell | 15' min | 30-40' x 20-35', blooms April |
| *Halesia diptera* | Silverbell | 15' min | 20-30' x 20-30', blooms April-May |
| *Magnolia x soulangeana* | Saucer Magnolia | 20' min | 20-25' x 20-25', blooms March |

# PLANT LISTS: PARKS

| Botanical Name | Common Name | Spacing | Notes and Size |
|---|---|---|---|
| ***Ornamental Trees (continued)*** | | | |
| *Magnolia virginiana* | Sweetbay Magnolia | 15' min | 10-35' x 10-35', fragrant bloom May-June |
| *Malus floribunda* | Flowering Crabapple | 15' min | 15-20' x 20-30', blooms April |
| *Prunus subhirtella 'Autumnalis'* | Higan Cherry | 15' min | 20-35' x 15-30', April bloom |
| *Stewartia pseudocamellia* | Japanese Stewartia | 15' min | 12-40' x 8-25', flowers June-July |
| ***Evergreen Trees*** | | | |
| *Cedrus deodara* | Deodar Cedar | 30' min | 40-50' x 30-40' |
| *Cryptomeria japonica 'Yoshino'* | Yoshino Japanese False Cedar | 15' min | 30-40' x 20-30' |
| *Ilex opaca* | American Holly | 10' min | 15-30' x 10-20' |
| *Juniperus virginiana* | Eastern Red Cedar | 20' min | 30-65' x 8-25' |
| *Magnolia grandiflora* | Southern Magnolia | 30' min | 60-80' x 30-50' |
| *Pinus bungeana* | Lacebark Pine | 15' min | 30-50' x 20-35' |
| *Pinus strobus* | White Pine | 20' min | 50-80' x 20-40' |
| *Pinus taeda* | Loblolly Pine | 15' min | 40-90' x 20-40', good in wet areas |
| *Thuja occidentalis 'Green Giant'* | Green Giant Arborvitae | 12' min | 40-60' x 12-18' |
| ***Evergreen Shrubs*** | | | |
| *Ilex glabra 'Shamrock'* | Shamrock Inkberry | 3' o.c. | 3-4' x 3-4', berries |
| *Ilex vomitoria* | Yaupon Holly | 8' o.c. | 10-20' x 8-12', berries |
| *Leucothoe fontanesiana* | Drooping Laurel | 2' o.c. | 2-3' x 2-3', stabilize banks |
| *Osmanthus heterophyllus* | Tea Olive | 6' o.c. | 8-10' x 7-9', fragrant bloom in Sept. |
| *Pieris japonica* | Pieris | 6' o.c. | 9-12' x 6-8', blooms April |
| *Prunus caroliniana* | Carolina Cherry Laurel | 8' o.c. | 15-20' x 10-15' |
| ***Deciduous Shrubs*** | | | |
| *Aesculus parviflora* | Bottlebrush Buckeye | 8' o.c. | 8-12' x 8-15', blooms June-July |
| *Aronia arbutifolia 'Brilliantissima'* | Red Chokeberry | 3-4' o.c. | 6-8' x 3-4', good near water |
| *Callicarpa americana* | Beautyberry | 3' o.c. | 3-6' x 3-6', showy berries |
| *Calycanthus floridus* | Carolina Allspice | 5' o.c. | 6-10' x 6-12', fragrant blooms summer |
| *Cephalanthus occidentalis 'Sugar Shack'* | Sugar Shack Buttonbush | 3-4' o.c. | 3-4' x 3-4', blooms June |
| *Clethra alnifolia 'Hummingbird'* | Hummingbird Summersweet | 3' o.c. | 2-4' x 3-5', fragrant blooms July-Aug |
| *Comptonia peregrina* | Sweetfern | 3' o.c. | 2-5' x 4-8', good for stabilizing slopes |
| *Cornus alba 'Elegantissima'* | Variegated Redtwig Dogwood | 5' o.c. | 8-10' x 5-10', variegated, red stems |
| *Cornus amomum* | Silky Dogwood | 6' o.c. | 6-12' x 6-12', good for wet areas |
| *Cornus mas* | Cornelian Cherry | 15' o.c. | 15-25' x 15-20', blooms March |
| *Cornus racemosa* | Gray Dogwood | 8' o.c. | 10-15' x 10-15', good near water |
| *Cornus sericea* | Redtwig Dogwood | 5' o.c. | 8-10' x 5-10', red stems, many varieties |
| *Cotinus coggygria* | Smokebush | 8' o.c. | 10-15' x 10-15', flowers May-July |
| *Fothergilla gardenii* | Dwarf Fothergilla | 2' o.c. | 1.5-3' x 2-4', flowers April-May |

# PLANT LISTS: PARKS

| Botanical Name | Common Name | Spacing | Notes and Size |
|---|---|---|---|
| ***Deciduous Shrubs (continued)*** | | | |
| *Hamamelis x intermedia 'Arnold Promise'* | Witchhazel | 12' o.c. | 12-15' x 12-15', blooms Feb-March |
| *Hydrangea quercifolia* | Oakleaf Hydrangea | 6' o.c. | 6-8' x 6-8', blooms May-July, fall color |
| *Ilex verticillata* | Winterberry | 3-5' o.c. | 3-12' x 3-12', berries, good near water |
| *Itea virginica 'Henry's Garnet'* | Virginia Sweetspire | 3' o.c. | 3-4' x 4-6', blooms May-June |
| *Myrica pensylvanica* | Bayberry | 5' o.c. | 5-10' x5-10' |
| *Phyocarpus opulifolius* | Eastern Ninebark | 4' o.c. | 5-8' ht, blooms spring |
| *Rhododendron atlanticum* | Deciduous Azalea | 2.5' o.c. | 2-6' x 2-5', blooms April |
| *Rhododendron periclymenoides* | Pinxterbloom Azalea | 3' o.c. | 3-6' x 4-7', blooms April-May |
| *Rhododendron viscosum* | Swamp Azalea | 3' o.c. | 3-5' x 3-5', blooms May-July |
| *Rhus glabra* | Smooth Sumac | 8' o.c. | 9-15' x 9-15', blooms June, fruit |
| *Rhus copallinum* | Winged Sumac | 8' o.c. | 7-15' x 10-20', blooms July-Aug |
| *Salix purpurea 'Nana'* | Purple Willow | 3' o.c. | 3-5' x 3-5', good near water |
| *Sambucus canadensis* | Elderberry | 5' o.c. | 5-12' x 5-12, blooms June-July |
| *Vaccinium corymbosum* | Highbush Blueberry | 5' o.c. | 6-12' x 8-12', blooms May, edible fruit |
| *Viburnum dentatum 'Blue Muffin'* | Arrowwood Viburnum | 3' o.c. | 3-5' x 3-4', blooms May-June |
| *Viburnum plicatum var tomentosum* | Doublefile Viburnum | 8-10' o.c. | 10-12' x 12-15', blooms April-May |
| *Viburnum prunifolium* | Blackhaw Viburnum | 6' o.c. | 12-15' x 6-12', blooms May-June |
| *Viburnum x burkwoodii 'Mohawk'* | Mohawk Viburnum | 6' o.c. | 8-10' x 8-10', blooms April |
| ***Ornamental Grasses*** | | | |
| *Acorus americanus* | Sweetflag | 12" o.c. | 2-3' ht, water's edge |
| *Andropogon virginicus* | Broomsedge Bluestem | 18" o.c. | 2-3' x 1-2' |
| *Bouteloua curtipendula* | Sideoats Grama | 12" o.c. | 18-24" x 18-24" |
| *Carex lurida* | Shallow Sedge | 12" o.c. | 2-3' x 1-2', good erosion control |
| *Carex pensylvanica* | Oak Sedge | 10" o.c. | 8-10" x 12-18", good in shade |
| *Carex stricta* | Tussock Sedge | 12" o.c. | 2-3' x 3-5', wet soils |
| *Deschampsia flexuosa* | Wavy Hairgrass | 10" o.c. | 6-18" ht |
| *Hakonechloa macra 'Albovariegata'* | Hakone Grass | 18" o.c. | 24-30" x 30-36" |
| *Juncus effusus* | Soft Rush | 12" o.c. | 3' x 1-2', wet soils |
| *Juncus tenuis* | Poverty Rush | 10" o.c. | 6-24" x 6-24", wet soils |
| *Muhlenbergia capillaris* | Pink Muhly Grass | 18" o.c. | 2-3' x 2-3', blooms Sept-Oct |
| *Nassella tenuissima* | Mexican Feather Grass | 12" o.c. | 18-24" x 18-24" |
| *Panicum virgatum 'Shenandoah'* | Switchgrass | 18" o.c. | 2-3' x 2' |

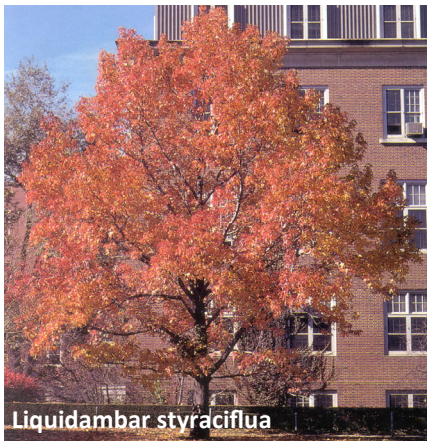
# PLANT LISTS: PARKS

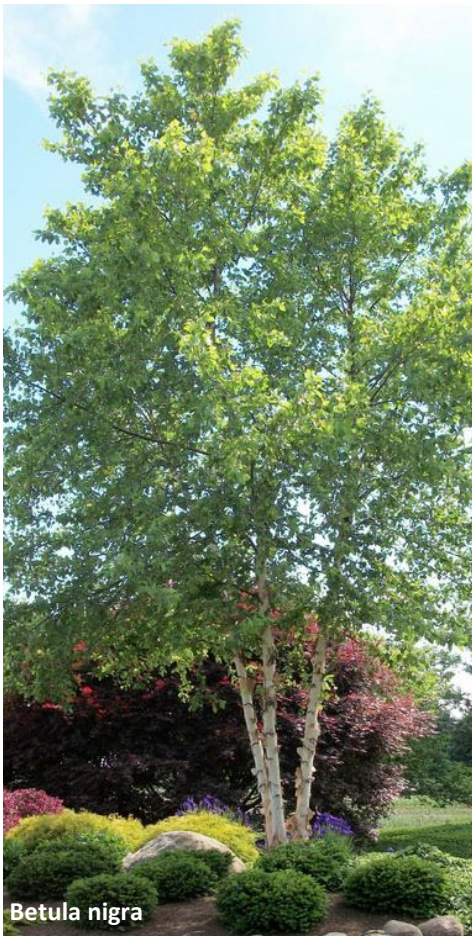
| Botanical Name | Common Name | Spacing | Notes and Size |
|---|---|---|---|
| ***Ferns*** | | | |
| *Adiantum pedatum* | Maidenhair Fern | 10" o.c. | 12-24" x 12-18" |
| *Athyrium filix-feminina* | Lady Fern | 12" o.c. | 2-4' x 2-3' |
| *Dryopteris marginalis* | Eastern Woodfern | 12" o.c. | 12-18" x 12-18" |
| *Matteucia struthiopteris* | Ostrich Fern | 18" o.c. | 3-4' x 2-3' |
| *Osmunda cinnamomeum* | Cinnamon Fern | 18" o.c. | 2-3' x 2-3' |
| *Osmunda regalis var. spectabilis* | Royal Fern | 18" o.c. | 4-6' x 2-3' |
| *Polystichum acrostichoides* | Christmas Fern | 12" o.c. | 12-18" x 12-18" |
| ***Groundcovers*** | | | |
| *Asarum canadense* | Canadian Wild Ginger | 10" o.c. | 6-12" x 12-18" |
| ***Perennials*** | | | |
| *Agastache 'Blue Fortune'* | Hyssop | 18" o.c. | 2-3' ht, blooms July-Sept |
| *Amsonia hubrichtii* | Threadleaf Bluestar | 18" o.c. | 3' x 2-3', blooms May-June |
| *Aruncus dioicus* | Goat's Beard | 3' o.c. | 4-6' x 6', blooms late spring |
| *Asclepias incarnata* | Swamp Milkweed | 12" o.c. | 3-5' x 2', blooms June-July |
| *Aster cordifolius* | Blue Wood Aster | 12" o.c. | 2-3' x 2-3', blooms early fall, wood-edge |
| *Aster novi-belgii* | New York Aster | 12" o.c. | 3-5' x 3', blooms Aug-Sept, wet soils |
| *Baptisia 'Carolina Moonlight'* | Wild Indigo | 24" o.c. | 3' ht, blooms early summer |
| *Caltha palustris* | Marsh Marigold | 12" o.c. | 8-12" x 12-18", blooms spring, wet soils |
| *Chelone glabra* | Turtlehead | 12" o.c. | 2-4' x 1-2', blooms late summer, wet soils |
| *Echinacea purpurea* | Purple Coneflower | 12" o.c. | 2-3' x 18-24", blooms July-Aug |
| *Eupatorium coelestinum* | Blue Mistflower | 12" o.c. | 2-3' x 2', blooms Sept-Oct |
| *Eupatorium fistulosum* | Joe Pye Weed | 24" o.c. | 5-8' x 3-4', blooms summer, wet soils |
| *Iris cristata* | Dwarf Crested Iris | 12" o.c. | 6-8" x 15", blooms early spring, shade |
| *Iris prismatica* | Slender Blue Iris | 12" o.c. | 1-3' ht, blooms May-Jul, wet soils |
| *Iris virginica* | Virginia Blue Flag | 12" o.c. | 1-3' x 1-3', blooms June, wet soils |
| *Liatris microcephala* | Gayfeather | 12" o.c. | 18-24" x 12-18", blooms Aug-Sept |
| *Lobelia cardinalis* | Cardinal Flower | 12" o.c. | 2-4' x 2', blooms summer |
| *Mertensia virginica* | Virginia Bluebells | 12" o.c. | 18-24" x 12-18", blooms March-April |
| *Monarda bradburiana* | Eastern Beebalm | 12" o.c. | 1-2' x 1-2', blooms late spring/summer |
| *Monarda fistulosa* | Wild Bergamot | 12" o.c. | 2-5' x 3', blooms late summer |
| *Peltandra virginica* | Green Arrow Arum | 18" o.c. | 18-24" x 18-24", blooms spring, in water |
| *Phlox divaricata* | Wild Phlox | 10" o.c. | 12-18" x 8-12", blooms April-May |
| *Phlox paniculata* | Garden Phlox | 12" o.c. | 2-3' x 2', blooms summer |
| *Pycnanthemum flexuosum* | Appalachian Mountain Mint | 12" o.c. | 2-3' x 3-4', blooms summer to fall |
| *Rudbeckia laciniata* | Cutleaf Coneflower | 18" o.c. | 5-8' x 3-4', blooms Aug-Sept |
| *Tiarella cordifolia* | Foamflower | 12" o.c. | 12-18" x 12-18", blooms spring, woods |
| *Zephyranthes atamasca* | Rain Lily | 8" o.c. | 8-15" ht, blooms Mar-June |

# Plant Palette - Parks

## Canopy Trees


Acer rubrum 'October Glory'


Liquidambar styraciflua

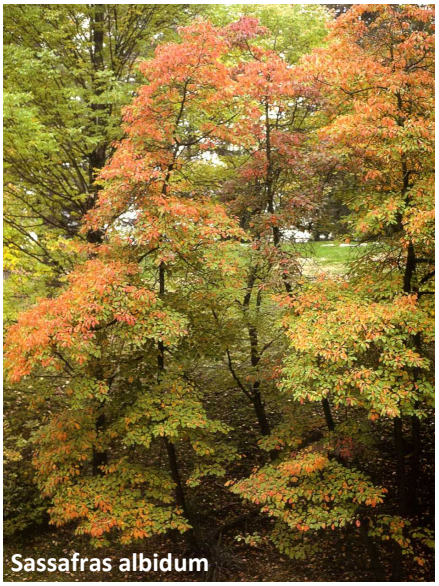

Betula nigra


Fagus grandifolia


Metasequoia glyptostroboides


Nyssa sylvatica


Platanus x acerifolia 'Bloodgood'


Sassafras albidum

# Plant Palette: Parks

## Ornamental Trees


Amelanchier arborea


Cercis canadensis


Halesia diptera


Magnolia virginiana


Prunus subhirtella 'Autumnalis'

## Evergreen Trees


Cedrus deodara

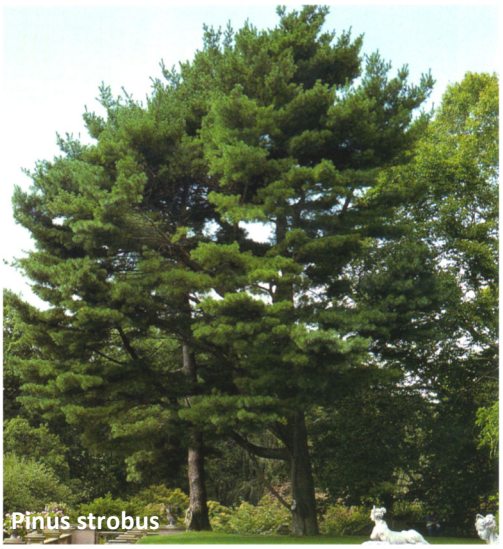

Cryptomeria japonica 'Yoshino'


Juniperus virginiana

# Plant Palette - Parks

## Evergreen Trees (continued)


Magnolia grandiflora


Pinus strobus


Thuja occidentalis 'Green Giant'

## Evergreen Shrubs


Leucothoe fontanesiana


Osmanthus heterophyllus


Prunus caroliniana


Pieris japonica

# Plant Palette: Parks

## Deciduous Shrubs


Callicarpa americana


Cephalanthus occidentalis 'Sugar Shack'


Comptonia peregrina


Cornus alba 'Elegantissima'


Ilex verticillata


Salix purpurea 'Nana'

# Plant Palette - Parks

## Ornamental Grasses


Acorus americanus


Bouteloua curtipendula


Carex pensylvanica


Deschampsia flexuosa


Nassella tenuissima

## Ferns


Adiantum pedatum


Matteucia struthiopteris


Osmunda cinnamomeum

# Plant Palette: Parks

## Perennials


Agastache 'Blue Fortune'


Amsonia hubrichtii


Asclepias incarnata


Baptisia 'Carolina Moolight'


Caltha palustris


Echinacea purpurea


Eupatorium fistulosum


Liatris microcephala


Lobelia cardinalis


Phlox paniculata


Zephyranthes atamasca

# PLANT LISTS: URBAN AREAS

| Botanical Name | Common Name | Spacing | Notes and Size |
|---|---|---|---|
| ***Canopy Trees*** | | | |
| *Acer rubrum 'Red Sunset'* | Red Sunset Red Maple | 25' min | 40-50' x 30-40', fall color |
| *Acer rubrum 'October Glory'* | October Glory Red Maple | 25' min | 40-50' x 30-40', fall color |
| *Carpinus betulus 'Fastigiata'* | Upright European Hornbeam | 15' min | 30-40' x 20-30' |
| *Cercidiphyllum japonicum* | Katsura Tree | 20' min | 40-60' x25-60', fall color |
| *Cladrastis kentuckea* | Yellowwood | 20' min | 30-50' x 40-55', fragrant flowers May |
| *Ginkgo biloba* | Maidenhair Tree | 25' min | 50-80' x 30-40', male only |
| *Liquidambar styraciflua 'Rotundiloba'* | Rotundiloba Sweetgum | 20' min | 60-70' x 20-30', fruitless |
| *Platanus x acerifolia 'Bloodgood'* | London Plane Tree | 25' min | 75-100' x 60-75' |
| *Quercus hemisphaerica* | Darlington Oak | 30' min | 40-60' x 30-40', semi-evergreen |
| *Quercus phellos* | Willow Oak | 25' min | 40-75' x 25-50' |
| *Sophora japonica 'Regent'* | Japanese Pagoda Tree | 25' min | 50-75' x 50-75', flowers July-Aug |
| *Tilia cordata* | European Linden | 25' min | 50-70' x35-50', fragrant flower June |
| *Ulmus parvifolia* | Chinese Elm | 25' min | 40-50' x 25-40' |
| *Zelkova serrata 'Village Green'* | Japanese Zelkova | 25' min | 40-60' x 30-50' |
| ***Ornamental Trees*** | | | |
| *Acer griseum* | Paperbark Maple | 15' min | 20-30' x 15-25' |
| *Crataegus viridis 'Winter King'* | Winter King Hawthorne | 15' min | 25-35' x 25-35', blooms May, fruit |
| *Halesia diptera* | Silverbell | 15' min | 20-30' x 20-30', blooms April-May |
| *Lagerstroemia indica 'Natchez'* | Crapemyrtle | 15' min | 15-20' x 15-20', blooms July - Sept |
| *Magnolia liliflora 'Susan'* | Susan Magnolia | 8' min | 8-12' x 8-12', blooms April |
| *Magnolia stellata 'Royal Star'* | Royal Star Magnolia | 10' min | 10-20' x 8-15', blooms March |
| *Magnolia virginiana 'Green Mile'* | Green Mile Sweetbay | 15' min | 35' x 15', blooms late spring |
| *Parrotia persica* | Parrotia | 12' min | 20-40' x 20-30' |
| *Pistachia chinensis* | Chinese Pistache | 20' min | 30-35' x 20-30' |
| *Styrax japonicus* | Japanese Snowbell | 15' min | 20-30' x 20-30', blooms May-June |

# PLANT LISTS: URBAN AREAS

| Botanical Name | Common Name | Spacing | Notes and Size |
|---|---|---|---|
| ***Evergreen Shrubs*** | | | |
| *Azalea spp.* | Azalea | 2-4' o.c. | 2-5' x 2-5', blooms spring |
| *Buxus microphylla sinica 'Franklin's Gem'* | Franklin's Gem Boxwood | 2' o.c. | 18" x 3', blight resistant |
| *Buxus harlandii* | Harlandii Boxwood | 18" o.c. | 2.25' x 2', blight resistant |
| *Buxus microphylla var japonica 'Green* | Green Beauty Boxwood | 3' o.c. | 3' x 3', blight resistant |
| *Buxus microphylla var japonica* | Wintergreen Boxwood | 3' o.c. | 3.5' x 3.5', blight resistant |
| *Camellia spp.* | Camellia | 3-5' o.c. | 4-12' x 3-10', blooms fall or winter |
| *Cephalotaxus harringtonia 'Prostrata'* | Prostrate Plum Yew | 2-3' o.c. | 2-3' x 2-3' |
| *Cotoneaster dammeri 'Coral Beauty'* | Coral Beauty Cotoneaster | 4' o.c. | 1' x 4-6', flowers May-June, berries |
| *Danae racemosa* | Poet's Laurel | 2-3' o.c. | 2-3' x 2-3' |
| *Distylium 'Vintage Jade'* | Vintage Jade Distylium | 4' o.c. | 3-4' x 4-5' |
| *Distylium 'Cinnamon Girl'* | Cinnamon Girl Distylium | 3' o.c. | 2-3' x 3-4' |
| *Gardenia jasminoides 'Frost Proof'* | Frost Proof Gardenia | 3-4' o.c. | 4-5' x 3-4', fragrant blooms in summer |
| *Ilex crenata* | Japanese Holly | 2-5' o.c. | 3-10' x 3-8', different varieties |
| *Ilex glabra 'Shamrock'* | Shamrock Inkberry | 3' o.c. | 3-4' x 3-4', berries |
| *Pieris japonica 'Cavatine'* | Dwarf Pieris | 2' o.c. | 2' x 2', blooms early spring |
| *Pinus densiflora 'Low Glow'* | Japanese Red Pine | 3' o.c. | 3-4' x 3-4' |
| *Prunus laurocerasus 'Otto Lukyen'* | Otto Lukyen Laurel | 4' o.c. | 3-4' x 6-8', blooms April-May |
| *Viburnum tinus 'Spring Bouquet'* | Laurustinus | 4' o.c. | 4-6' x 4-6', blooms spring |
| ***Deciduous Shrubs*** | | | |
| *Caryopteris x clandonensis 'Dark Knight'* | Blue Mist Shrub | 2' o.c. | 2-3' x 2-3', blooms late summer |
| *Clethra alnifolia 'Hummingbird'* | Hummingbird Summersweet | 3' o.c. | 2-4' x 3-5', fragrant blooms July-Aug |
| *Hydrangea paniculata 'Little Lime'* | Little Lime Hydrangea | 3' o.c. | 3-5'x3-5', flowers July-Sept |
| *Hydrangea quercifolia 'Pee Wee'* | Dwarf Oakleaf Hydrangea | 2.5' o.c. | 3-4' x 2.5-3', blooms June-July |
| *Jasminum nudiflorum* | Winter Jasmine | 3' o.c. | 10-15' x 3-6', blooms March-April |
| *Itea virginica 'Henry's Garnet'* | Virginia Sweetspire | 3' o.c. | 3-4' x 4-6', blooms May-June |
| *Spiraea prunifolia* | Bridal Wreath Spiraea | 4' o.c. | 4-8' x 4-8', blooms March-April |
| *Syringa patula 'Miss Kim'* | Miss Kim Lilac | 4' o.c. | 4-9' x 5-7', fragrant bloom May |
| *Viburnum carlesii 'Spice Baby'* | Koreanspice Viburnum | 3' o.c. | 3.5-5' x 3.5-6', fragrant bloom Mar-April |

# PLANT LISTS: URBAN AREAS

| Botanical Name | Common Name | Spacing | Notes and Size |
|---|---|---|---|
| ***Ornamental Grasses*** | | | |
| *Carex pensylvanica* | Oak Sedge | 10" o.c. | 8-10" x 12-18", good in shade |
| *Hakonechloa macra 'Albovariegata'* | Hakone Grass | 18" o.c. | 24-30" x 30-36" |
| ***Ferns*** | | | |
| *Athyrium filix-feminina* | Lady Fern | 12" o.c. | 2-4' x 2-3' |
| *Polystichum acrostichoides* | Christmas Fern | 12" o.c. | 12-18" x 12-18", evergreen |
| ***Groundcovers*** | | | |
| *Asarum canadense* | Canadian Wild Ginger | 12" o.c. | 6-12" ht, moist soils, shade |
| *Ceratostigma plumbaginoides* | Dwarf Plumbago | 12" o.c. | 9-12" ht, sun/part shade, summer flower |
| *Galium odoratum* | Sweet Woodruff | 9" o.c. | 6-12" ht, moist soils, shade |
| *Hypericum calycinum* | St. John's Wort | 18" o.c. | 12-18" x 18-24", blooms July-Aug |
| *Liriope muscari* | Lilyturf | 9" o.c. | 12-18" x 9-12", blooms Aug-Sept |
| *Mahonia repens* | Creeping Mahonia | 3' o.c. | 1-2' tall, shade, moist soils |
| *Ophiopogon japonicum 'Nana'* | Mondo Grass | 6" o.c. | 3" x 3-12" |
| *Pachysandra terminalis* | Pachysandra | 9" o.c. | 6-12" x 12-18" |
| *Sarcococca hookerana var humilis* | Sweetbox | 12" o.c. | 1-2' x 2-4', blooms March-April |
| *Teucrium chamaedrys* | Germander | 12" o.c. | 9-12" ht, evergreen, dry soils, sun |
| *Thymus praecox* | Thyme | 3" o.c. | 3-6" ht, summer bloom, dry soils, sun |
| *Vinca minor* | Periwinkle | 6" o.c. | 3-6" ht, spring bloom |
| ***Perennials*** | | | |
| *Geranium 'Rozanne'* | Cranesbill | 15" o.c. | 15-18" x 15-20", blooms summer-frost |
| *Helleborus 'Brandywine'* | Lenten Rose | 12" o.c. | 12-18" x 12", blooms early spring |
| *Hemerocallis fulva* | Daylily | 18" o.c. | 2' ht, summer bloom |
| *Heuchera villosa* | Coral Bells | 18" o.c. | 24" x 24", blooms Sept-Oct, shade |
| *Lavandula x intermedia 'Phenomenal'* | Lavender | 18" o.c. | 2-3' x 2-3', blooms summer |
| *Perovskia atriplicifolia 'Superba'* | Russian Sage | 18" o.c. | 3-4' x 2-3', blooms summer-fall |
| *Salvia nemorosa* | Garden Sage | 12" o.c. | 18-30" x 12-15", blooms summer |
| *Tiarella cordifolia* | Foamflower | 12" o.c. | 12-18" x 12-18", blooms spring, shade |

# Plant Palette: Urban Areas

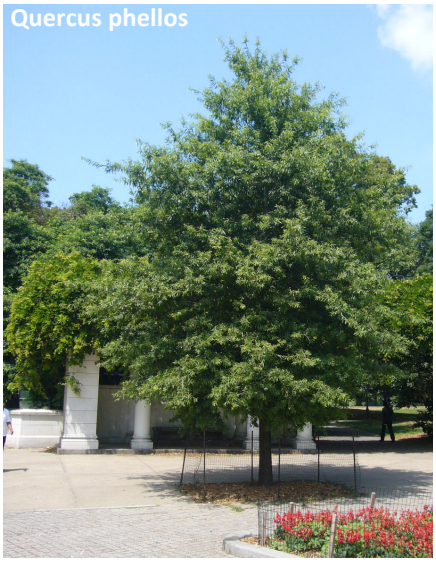
## Canopy Trees


Carpinus betulus 'Fastigiata'


Cercidiphyllum japonicum


Cladrastis kentuckea


Ginkgo biloba


Quercus phellos


Sophora japonica 'Regent'


Ulmus parvifolia


Zelkova serrata 'Village Green'

# Plant Palette: Urban Areas

## Ornamental Trees

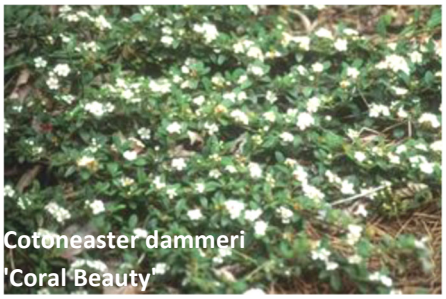

Magnolia liliflora 'Susan'


Magnolia stellata 'Royal Star'


Pistachia chinensis

## Evergreen Shrubs


Camellia spp.


Cotoneaster dammeri 'Coral Beauty'

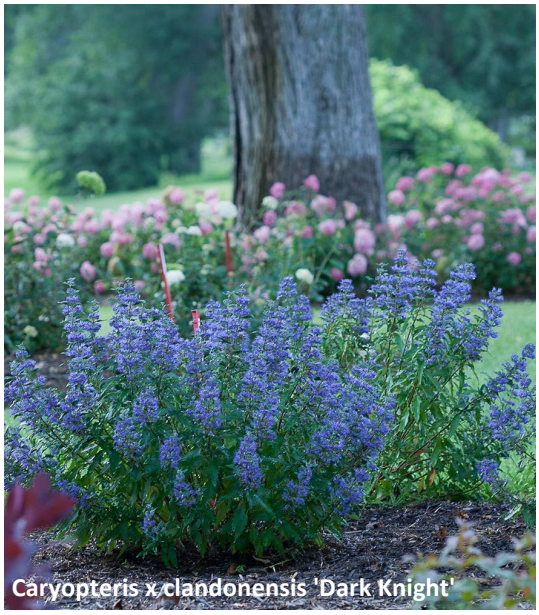

Distylium 'Vintage Jade'


Ilex crenata


Gardenia jasminoides 'Frost Proof'

# Plant Palette: Urban Areas

## Deciduous Shrubs


Caryopteris x clandonensis 'Dark Knight'


Hydrangea quercifolia 'Pee Wee'


Jasminum nudiflorum


Syringa patula 'Miss Kim'


Viburnum carlesii 'Spice Baby'

## Ornamental grasses


Carex pensylvanica


Hakonechloa macra 'Albovariegata'

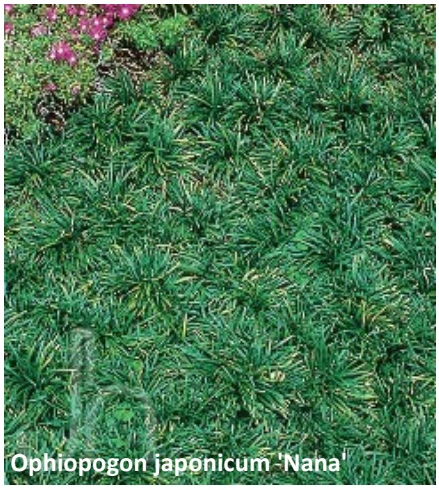
# Plant Palette: Urban Areas

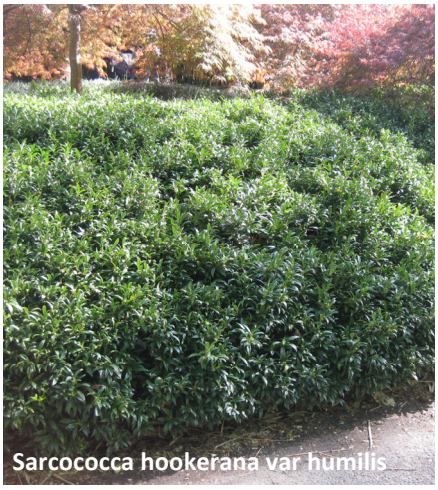
## Groundcovers

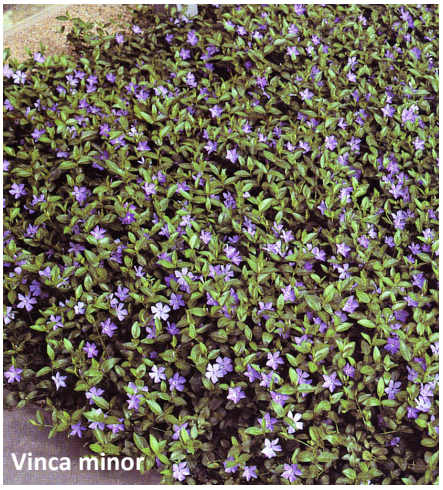

Ceratostigma plumbaginoides


Galium odoratum


Liriope muscari


Ophiopogon japonicum 'Nana'


Sarcococca hookerana var humilis


Vinca minor

## Perennials


Helleborus 'Brandywine'


Hemerocallis fulva


Lavandula x intermedia 'Phenomenal'

# TURF

Of all the various elements that comprise Innsbrook's landscape, turf is the single most demanding in terms of resources (water as well as labor) and use of fertilizers and pesticides. To achieve any meaningful shift in the sustainability of the park's landscape, modifications need to be made over time to the amount and the type of turf planted as well as the way that turf is maintained.

The drivers for using turf in a park like Innsbrook are both aesthetic and financial. People are conditioned to appreciate a beautiful green lawn, despite the fact that in order to get this effect in our climate, an inordinate amount of fertilization and pesticide application is required. Additionally, grass is significantly less expensive to install than other types of plantings, so it is common for new projects with tight budgets to default to large areas of turf to save money.

It would not be realistic or even desirable to eliminate all turf areas from the park; they do have aesthetic value and can also be occupied by people in a way that plant beds cannot. Turf has its place, especially in some of the denser, more urban areas where a green surface is an attractive amenity for people to use. Still, there are great benefits to replacing some areas of lawn with plant beds composed of recommended species. Even more importantly, there are great benefits to gradually switching to newer grass varieties that have been developed specifically to require fewer inputs of pesticides and fertilizers and need less water and mowing. Eco-Lawn, developed and sold by Wildflower Farm, is recommended. Selected turf grass varieties should have the following properties:

- Fast germination
- Slow-growing, which reduces mowing by 50%
- Drought-tolerant, which drastically reduces water requirements
- Deep roots to source water and nutrients naturally
- Grows well in deep shade as well as full sun
- Naturally occurring endophytes for increased insect resistance
- Little to no fertilizers required
- Salt tolerant

# MAINTENANCE

An integrated design team for all projects must create a Site Maintenance Plan to inform and structure maintenance strategies that ensure long-term site sustainability. The plan will serve as a foundation for a more extensive operations and maintenance manual to be created by the Owner or their maintenance contractor.

The following maintenance topics and strategies should be addressed in the Site Maintenance Plan:

**Water**

- Process to ensure stormwater/BMP effectiveness including vegetation care and removal of sediment load
- Water treatment plan for any water features (no chlorine, bromine permitted)
- Methods to reduce exposure to pollutants (for water quality)
- Program for appropriate irrigation quantity and schedule
- Process for maintaining non-potable irrigation water source
- Process for disconnecting temporary irrigation after plant establishment
- Use of drip irrigation and smart irrigation controllers

**Soil**

- Soil testing schedule and process
- List of recommended least-harmful amendments
- Process for alleviating erosion/compaction due to site use or maintenance operations

**Vegetation**

- Process for maintaining vegetation and monitoring health - "preventive maintenance"
- Plan for replacement of pants and list of appropriate replacements if needed
- Process and schedule for composting and or recycling
- Process for disposal of diseased, invasive, and pest-infested vegetation
- Third-party certifications (Greenshield, EcoWise)
- IPM (Integrated Pest Management) combines biological, physical, cultural, chemical tools to minimize health and environmental risk
- Method for addressing and recording invasive species, including procedures and training in recognizing and removing them

**Lawn**

- Mow schedule
- Ways to minimize mown lawn

**Fertilizers and Pesticides**

- Address methods to minimize pesticide and fertilizer use including:
    - Banning all "weed and feed" type fertilizers
    - Requiring the use of physical and mechanical pest controls before biotic, then chemicals as last resort
    - Creating buffer zones where no pesticides may be applied
    - IPM (most companies probably already doing this)
    - Requiring soil or plant tissue testing prior to applying fertilizer
- Process for keeping detailed records for fertilizer and pesticide application

**Hardscape Materials**

- List of requirements (local/regional, recycled, certified, energy-efficient)
- Process for maintaining hardscape and structures
- Site safety plan
- Process for disposing of harmful materials
- Recycling plan
- Composting plan for vegetation trimmings
- Composting plan for food waste
- Plan to reduce outdoor energy consumption (LED lighting, solar?)
- Renewable sources for landscape electricity needs

# MAINTENANCE

**Special site features**

- Maintenance and monitoring techniques to ensure property aquatic ecosystem function
- Method for maintaining vegetation and soil protection zones

**Snow and ice**

- Process for managing snow and ice that protects water quality and does not damage surrounding plants & soil
- Process for managing stockpiling
- List of non-toxic chemicals that are to be used

**Maintenance Team**

- Requirement for specialized training and crews for public area maintenance
- Requirement for training certifications for maintenance companies hired by private land owners
- Monitoring guide for use in field by crews
- Structure for dialog over time between managers and maintenance

**Maintenance Equipment and Products**

- Requirement for selecting the most sustainably powered equipment possible (electric, manual, low-emitting in preference to gas)
- Provide alternatives to two-cycle power equipment
- Process for cleaning equipment to prevent propagating invasive species
- Procedures for minimizing users' exposure to noise, air pollution, other disturbances
- Require use of Green Seal-certified cleaning solutions and post-consumer paper products

**Adaptive Management**

- Process for updating plan on an annual basis

# DOCUMENTATION, REPORTING, EDUCATION

**Documentation and Reporting**

The success of these guidelines will only be ensured through ongoing attention to the goals put forth. It is recommended that for the overall site as well as for individual properties and new projects, that performance monitoring should occur in the following areas:

General Recommendations

- Baseline measurements should be taken for public land and lakes
- Baseline measurements should be taken for any new private projects
- Timeframes should be established for all ongoing testing and reporting

Water

- Review test site info
- Review watershed info
- Review BMP info and design data
- Monitor station info
- Monitor precipitation data
- Monitor flow data
- Third-party review of annual flow monitoring data compared to the mid-summer baseline estimate of irrigation water needs
- Documentation of non-potable water sources
- Documentation of plant composition, mortality, and replacement rates
- Review of annual flow monitoring data for water features

Aquatic ecosystems

- Monitor habitat assessment annually

Soil & vegetation

A third party review of biannual monitoring (spring and fall) should be done using scientific standard monitoring methods such as time-meander sampling, transect sampling, hoop/quadrant sampling, and stem counts. The review should look at:

- Native plant communities to determine the success of conservation/restoration activities
- Invasive plants to determine the effectiveness of control/management plan

Human Health and Wellbeing

The following should be reviewed post-construction then annually:

- Site accessibility, safety, wayfinding
- Site features intended to be used for mental restoration - are they successful?
- Site features intended to be used for physical activity - are they successful?
- The extent to which social interaction occurs across the site - what type (one on one, spontaneous, small groups, large groups) and where?

Construction

- Review annual soil tests for the five categories included in the soil restoration criteria: organic matter, compaction, infiltration rates, soil biological function, soil chemistry
- Document techniques used to restore soil after construction and any changes over time

**Education**

Sustainability awareness and education should be promoted on site via:

- Interpretive signage at any native plantings
- Programming that highlights sustainable features such as biking or walking tours
- Partnerships with Dominion Energy or other owners/ stakeholders to develop educational programs
- Programs with local schools

For any projects that become SITES certified, an educational program, including a certification ceremony, can be structured around aspects of that project that enabled it to achieve certification.

# Sources and Resources

- *SITES v2 Reference Guide*. Green Business Certification, Inc.
- *Redesigning the American Lawn: A Search for Environmental Harmony*. F. Herbert Bormann, Diana Balmori, Gordon T. Geballe.
- *Planting in a Post-Wild World*. Thomas Rainer and Claudia West
- *Urban Farming.* Thomas J. Fox
- *Building Soils for Better Crops: Sustainable Soil Management.* Fred Magdoff and Harold Van Es
- *The Bio-Integrated Farm: A Revolutionary Permaculture-Based System.* Shawn Jadrnicek
- *Integrated Forest Gardening: The Complete Guide to Polycultures and Plant Guilds in Permaculture Systems.* Wayne Weiseman, Daniel Halse Bryce Ruddock.
- *Soil Biology Primer*. Soil and Water Conservation Society in cooperation with the USDA Natural Resources Conservation Service.
- Rodale Institute publications
- *Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices.* US Department of Environmental Protection
- *Urban Nutrient Management Handbook,* Virginia Cooperative Extension.
- Silva Cells Brochure: https://www.deeproot.com/silvapdfs/resources/supporting/silva_cell_brochure.pdf
- High Line Sustainable Practices: https://www.thehighline.org/sustainable-practices/
- High Line Plant List: https://s3.amazonaws.com/fhl-website/content/uploads/2018/08/28175623/High_Line_Plant_List.pdf